3 1761 [illegible]299878 4



Presented to the
LIBRARY *of the*
UNIVERSITY OF TORONTO

FROM THE ESTATE
OF
MISS MARY SINCLAIR

Helen Adair

CHAMBERS'S

ENCYCLOPÆDIA

A DICTIONARY

OF UNIVERSAL KNOWLEDGE FOR THE PEOPLE

WITH MAPS AND NUMEROUS WOOD ENGRAVINGS

REVISED EDITION

UNALTERED AND UNABRIDGED

VOLUME VI.

NEW YORK
COLLIER, Publisher
1887

MAPS FOR VOL. VI.

	Page
PALESTINE	31
PRUSSIA	460
QUEENSLAND	511
ROMAN EMPIRE, ANCIENT	694
RUSSIA IN EUROPE	746

AE
5
C443
1888
v.6



OXFORD.

O'XFORD, an ancient and famous city and seat of learning in England, the chief town of the county of Oxford, is situated on the north-east bank of the Isis, a tributary of the Thames, a little above the point where it is met by the Cherwell. Both streams are crossed by numerous bridges, of which the finest are Folly Bridge over the Isis, and Magdalen Bridge over the Cherwell. Lat. of the city, 51° 45′ 55″ N., long. 1° 15′ 29″ W. Distance from London, 55 miles W.N.W. Pop. (1871) 34,482; (1881) 40,862. O. occupies an undulating site, is surrounded by rich and wooded meadows, and presents to the eye of the approaching visitor a scene of unequalled architectural magnificence—spires, and towers and domes rising as thickly as chimney-stalks in the manufacturing towns of Lancashire or Yorkshire. The four main streets of O. meet at right angles near the center of the town, at a place still called Carfax, a corruption of *Quatre voies*, and which appears in Agas's map (*temp.* Elizabeth) as *Cater voys*. These are —Cornmarket Street, leading into St. Giles's, and running due north; Queen Street, leading to the railway-stations, and running west; St. Aldate's Street, leading to the Isis, and running due south; and High Street, which is the chief street of the city, gracefully curving in an easterly direction, and conducting to the river Cherwell, a smaller river joining the Isis soon after it has passed Oxford.

The western half of the town is the most uninteresting; and it is a misfortune that the railway-stations are placed here, as travelers, on arriving, are introduced to the meanest parts of the city first. The county courts and jail, and the remains of the castle, from which the Empress Maud escaped while it was besieged by King Stephen, will be observed in passing. There is one good street in this part—viz., Beaumont Street, built on the site of the ancient Beaumont Palace, in which Richard I. was born. At the end of this street is Worcester College. Passing to the north from Carfax, along the Cornmarket, the old tower of St. Michael's Church is seen, against which stood formerly the north gate of the city; next St. Mary Magdalen Church; then the Martyr's Memorial, with the Taylor Buildings and Randolph Hold on the left, and part of Balliol College and St. John's College on the right. St. Giles's Church is at the north end of this street, which is very wide, and has a row of elm-trees on each side, forming a picturesque avenue like a foreign *boulevard*. Beyond this, to the north, is the Radcliffe Observatory and Infirmary. The High Street is about 1000 yards in length; it is reckoned one of the noblest streets—architecturally considered—in Europe, and contains, among other edifices, part of the buildings of Magdalen College, Queen's College, All-Souls' College, University College, and St. Mary's and All-Saints' Churches. Parallel to it is Broad Street, in which are situated Balliol, Trinity, and Exeter Colleges, the Ashmolean Museum, the Clarendon Rooms, the Sheldonian Theater, and close by are the Academical Schools, the Bodleian Library, and the Picture Gallery. In St. Aldate's Street, which forms the southern part of the series of streets already mentioned as forming one line, and running north and south, is Christ Church College (the entrance tower of which contains the great bell 'Tom of Oxford,' weighing upwards of 17,000 lbs.) and St. Aldate's Church. The other colleges and important buildings connected with the University of O. lie back from the principal streets.

To attempt particularizing the architectural characteristics of each of these edifices is impossible within our limits. It may suffice to say, that though there is nothing extraordinarily fine about the architecture of the colleges, regarded individually, yet the vast number of the structures and variety of styles present a *tout-ensemble* that is altogether sublime. The effect is wonderfully heightened by the interspersion of gardens, meadows, and venerable trees—old as the buildings that tower above them. Christ Church is celebrated for its magnificent hall, picture gallery, and library, as well as for its extensive grounds; its chapel, the cathedral church of O., is Norman in style, but is inferior, both in size and beauty, to most English cathedrals. Merton College is situated a little to the south of the High Street, and still retains the original chapel and part of the other buildings erected by Walter de Merton in the 13th century. Magdalen College retains its celebrated cloister and tower of the 15th c., and the buildings here are the most complete of any college in Oxford. Oriel College, a comparatively modern structure, is very picturesque, but far from chaste in its design; New College ranks among the noblest buildings in the city—'the chapel, the hall, the cloisters, the groined gateways, and even some original doors and windows remain, in their exterior at least, as they came from the hand of their master architect,' William of Wykeham, 500 years ago; Queen's College is built in the Grecian style of architecture, with a spacious and handsome chapel and a fine library; so is Trinity College; University College is a not unpleasing mixture of Gothic and Italian; Exeter College has a splendid frontage on the west, and its chapel (built 1857—1858), in the Gothic style, is the finest modern building in the city; it has also an excellent hall, and a beautiful library; Balliol College has a remarkably fine chapel, built only a few years ago.

Among the other churches in O., besides the cathedral church and the college chapels, are—St. Mary's, which is attended by the members of the university; St. Martin's, the church of the corporation of O.; St. Peter's-in-the-East, with a Norman crypt; St. Michael's, with a Saxon tower; and St. Aldate's. The chief buildings connected with the university, besides the Bodleian and the Ashmolean Museum already mentioned, are the Radcliffe Library, a circular structure, adorned with Corinthian columns and surmounted by a dome; the Radcliffe Observatory, crowned by an octagonal tower; the University Printing-office, and the Taylor Institution, founded 'for the teaching the European languages.' The Botanic Gardens are nearly opposite Magdalen

College. Other notable buildings are—the Town Hall, the Radcliffe Infirmary, the County Gaol, and one or two dissenting places of worship, including a Wesleyan and an Independent Chapel. Lady Margaret Hall and Somerville Hall, founded in 1879 for lady students taking advantage of the lectures of the Oxford association for promoting the higher education of women, are not as such connected with the university. O. is a mart for the disposal of the agricultural produce of the neighboring country, but has little trade of its own, and is dependent for its prosperity chiefly on the university. It is a municipal and parliamentary borough, and governed by a mayor, nine aldermen, and thirty councillors, whose jurisdiction, however, does not embrace the university. The university sends two members to parliament; the city sent two also, but was disfranchized for bribery from 1883 to 1890.

O., by the Saxons called Oxnaford, and in *Domesday Book*, Oxeneford (probably 'a ford for oxen'), is a place of great antiquity. The date of its origin is unknown, but as early as the 8th c. there was a nunnery established here; and in 802, an act of confirmation by Pope Martin II. describes it as an ancient seat of learning. It is said to have been a residence of King Alfred, and also of Canute, who held several parliaments within its walls. The townsmen closed their gates against William the Conqueror, who stormed the town in 1067, and gave it to one of his followers, Robert d'Oyley, who built a castle here to overawe the disaffected Saxons, some ruins of which are still to be seen. The paction that terminated the strife between Stephen and Henry II. was drawn up at Oxford. In the reign of Edward III., the preaching of Wickliffe excited great commotion among the students, and threatened well-nigh the dissolution of the university. In the reign of the 'Bloody Mary,' it witnessed the martyrdoms of Ridley, Latimer, and Cranmer; and during the great civil war of the 17th c., it was for a while the head-quarters of the Royalist forces, and was conspicuous for its adherence to Charles I. Ever since that period the city—or, at any rate, the university—has been in general characterized by an extreme devotion to the 'church' and the 'king.'

OXFORD UNIVERSITY is said to have been founded by King Alfred. Without claiming for it an origin quite so ancient, it is certain that from very early times students resorted to Oxford in order to attend lectures there delivered by learned men, and that they lived in the houses of the townspeople. In some cases they combined together, so as to secure the service of a common teacher, with whom they lived in a large tenement called an inn, hostel, or hall. For a long time, however, the great majority of the students lodged in rooms hired from the citizens; and as late as the year 1512, regulations were made for the governance of such students. As their numbers increased, the halls were multiplied. Anthony Wood states that he could show the names and places of more than a hundred. A great diminution in the numbers of the students took place about the middle of the 15th century, This, among other causes, led to the gradual disappearance of the halls, which were bought up by the wealthier colleges. Only five of the halls now exist, which differ from the colleges only in that they are unincorporated, and have little or no endowments. Residence in private lodgings had also fallen into disuse; and by the time of Queen Elizabeth, it had become a compulsory rule that all undergraduates should reside in some college or hall, at least for the first twelve terms of residence. Now, however, undergraduates may in most colleges live in lodgings from the beginning of their course.

The colleges were founded at various periods, from the end of the 13th c. to the beginning of the 18th. Fourteen out of the 20 were founded before the Reformation. Their object originally was to support limited societies of students, who were to devote their lives to study—by no means, as at present, to educate large classes of the community. Students, other than those on the foundation, seem not to have been regarded by the founders as an essential part of the college. The colleges arose, as has been already said, partly instead of the old halls, and were partly at first connected with the monasteries, it being by means of these institutions that benevolent persons were enabled to give permanent support to poor secular scholars. University and Balliol, which now rank as the oldest colleges, were in point of fact halls supported by endowments held in trust for the maintenance of their students. The originator of the collegiate system, in anything like its present form, was Walter de Merton, who besides having founded Merton College, is entitled to the honor of having mainly contributed to fix the university in its present site. All those on the foundation of the colleges before the Reformation were called Clerici. The great majority of the fellows were required to take priest's orders within a certain period after their election. This requirement of course involved celibacy, which, besides, was expressly imposed in some colleges; and practically, in old times as now, was enforced by the rule of life and the obligation of residence. Within the last few years, in some of the colleges the restriction of celibacy has been, under certain conditions, remitted in the case of fellows engaged in college work.

Under a statute passed in 1868, any person may now become a member of the university, without becoming a member of a college or hall, provided he satisfies certain disciplinary requirements. For such purposes these unattached students are under the control of a board of delegates; but no special provision is made for their instruction. In 1871, the new foundation of Keble College, built in memory of John Keble, was admitted to enjoy the same privileges (save as regards the academical status of its head) as are possessed by the existing colleges and halls.

Previous to the statute 17 and 18 Vict. c. 81, the constitution of the university was as follows: 1. The Hebdomadal Board, or Weekly Meeting, consisting of the Heads of Houses and the two Proctors, which body exercised the chief share of the administration of the university, and possessed the exclusive power of initating legislation; 2. Congregation, consisting of certain university dignitaries, which met merely for the purpose of conferring degrees; 3. Convocation, consisting of all Masters of Arts, a body whose consent was necessary before any of the measures proposed by the Hebdomadal Board could become law, which elected the chancellor, the two representatives of the university in parliament, several of the professors, and dispensed the ecclesiastical patronage of the university. The statute referred to introduced important changes. The Hebdomadal Board has been changed into the the Hebdomadal Council, consisting of the chancellor, the vice-chancellor, the proctors, six heads of houses, six professors, and six members of convocation of not less than five years' standing—such heads, professors, and members of convocation being elected by congregation, and holding office for six years.

Congregation, again, now consists of all the great officers of the university, the professors, public examiners, and all resident masters; and on this body is now bestowed the power of accepting or rejecting, and of amending any statue framed by the Hebdomadal Council. The composition and powers of Convocation remain unchanged. The students not on the foundation are for the most part commoners. In Worcester College and the halls there is still a class of fellow-commoners, who pay larger fees and enjoy certain privileges. They mainly consist of men above the ordinary age of undergraduates, who wish to have the intellectual advantages of the university without being subjected to the common routine of discipline. All other formal distinctions due to wealth or poverty are almost entirely abolished; such as the special privileges of peers, and the regard had to the poverty of candidates in the case of certain scholarships. It is very difficult to ascertain the actual number of students at any one time in Oxford, but now it is probably seldom above 1800.

There are four terms in each year—viz., Michaelmas Term, which begins on the 10th of October and ends on the 17th December; Hilary Term, which begins on the 14th of January and ends the day before Palm Sunday; Easter Term, which begins on the Wednesday in Easter-week, and ends on the Friday before Whitsunday; Trinity Term, which begins on the Saturday before Whitsunday and ends on the Saturday after the first Tuesday in July. Full Term, as it is called, does not begin till the first day of the week after the first congregation is held. By undergraduates, Michaelmas and Hilary Terms are kept by six weeks' residence, and Easter and Trinity Terms by three weeks each; but more than this is required by most of the colleges. Twenty-four weeks may be taken as the ordinary *length of the academic year*. Twelve terms of residence are required for the degree of B.A. from all.

The degree of M.A. is obtainable in the twenty-seventh term after matriculation. By a statute passed in 1850, the following examinations were made necessary for a degree in arts; but their nature has been considerably changed by the new statutes which came into effect 1873—1874: 1. Responsions, called 'Little Go' or 'Smalls' in the familiar language of undergraduates, are obligatory upon all. The university does not, as to this or any other pass examination, fix a limit of time within which they must be passed; but most colleges require their members to pass responsions, at least within their first year of study. Subjects: one Latin and one Greek author—or portions of them, as five books of Homer, five of Virgil, two Greek plays, &c.—with a paper of grammatical questions; a piece of English to be translated into Latin; two books of Euclid, or algebra up to simple equations inclusive; and arithmetic. 2. The First Public Examination, or Moderations, is also obligatory upon all. Candidates must have entered upon their fourth term. Subjects: the Four Gospels in Greek (except in the case of persons not members of the Church of England, when some one Greek author is to be substituted); one Greek and one Latin author, not the same as those offered for responsions, and one most be a poet, the other an orator; a piece of English into Latin, and a paper of grammatical questions; logic, or Euclid III. and IV., 1—9, and algebra. Honors are awarded at this examination both in classics and pure mathemat-

ics. Candidates are recommended to take up especially poets and orators. Verses, as well as Greek and Latin prose-writing, and a paper of grammatical and philological questions, are set. In the mathematical school, which in this examination exists as a separate school for honors only, candidates are examined in pure mathematics up to the Integral Calculus and the Calculus of Finite Differences inclusive.

3. The Second Public Examination, held twice a year, to be *passed* not earlier than the 12th term, and for honors not later than the 16th term of standing; unless the candidate has been classed in some other school of the Second Public Examination, in which case he may be admitted up to the 20th term inclusive. This examination consists of three parts: (1.) an examination in the rudiments of faith and religion, or in the case of those who (or whose guardians) object to such examination, certain substituted books or subjects; (2.) an examination of those who do not seek honors; and (3.) an examination of those who do seek honors. In this last there are, in Oxford phraseology, six schools: Literæ Humaniores, Mathematics, Natural Science, Jurisprudence, Modern History, Theology. Candidates are entitled to a degree of B.A. who, having passed the two previous examinations, also passed the examination appointed for those who do not seek honors, or who obtain honors in any one of the six honor-schools. But every candidate, except he has obtained honors in the Theology School, must have satisfied in the rudiments of faith and religion or the substitute. By these rudiments are understood the Old and New Testaments (Gospels and Acts of the Apostles in the original Greek); and the 39 articles. The pass examination embraces subjects chosen from at least two out of the three following groups: (*a*) Greek and Roman history and philosophy; (*b*) English modern languages, political economy, and law; (*c*) geometry, mechanics, chemistry, and physics. Out of these the candidate must select three subjects, one of which must be either (1) ancient philosophy and history (in the original Greek, or Greek and Latin); or (2) a modern language, (French or German). The classical books must be other than those offered for Responsions and Moderations. Candidates for honors may select any one, or more than one of the six schools. The most popular and influential of these is the school of Literæ Humaniores. The examination in this school includes (1) the Greek and Latin languages; (2) the histories of ancient Greece and Rome; (3) logic, and the outlines of moral and political philosophy. Candidates may also offer certain special subjects in any of these three departments. The republic of Plato and the ethics of Aristotle form the basis for philosophical study, though they are every year more largely supplemented by modern philosophy.

Next in the numbers of its candidates is the School of Modern History, which includes (1) the continuous history of England; (2) general history during some period, selected by the candidate, from periods to be named from time to time by the Board of Studies; (3) a special portion of history, or a special historical subject, carefully studied with reference to original authorities. The School of Jurisprudence includes (1) general jurisprudence; (2) the history of English law; (3) some department of Roman, and it may be, of English law; (4) international law, or a specified department of it. The School of Mathematics embraces pure and mixed mathematics (algebra, trigonometry, calculus, mechanics, optics, astronomy). The School of Natural Science has a double examination for honors—a preliminary and a final. The preliminary examination, incumbent upon all, is restricted to the elementary parts of mechanics, physics, and chemistry. In the final examination, the candidate may offer himself for examination in one or more of the three general subjects of physics, chemistry, and biology. The examination in the Honor School of Theology includes the Holy Scriptures, dogmatic and symbolic theology, ecclesiastical history and the fathers, the evidences of religion, liturgies, sacred criticism, and the archæology of the Old and New Testaments. A knowledge of Hebrew will have weight in the distribution of honors. The organization of these schools is at present the main function of the university, as distinct from the colleges. Professorial teaching on its own account only exists to a very limited extent. In the main, the teaching power of the colleges is devoted to preparing their undergraduate members for these various examinations.

Examinations also takes place for degrees in law, medicine, divinity, and music; but these are in great measure formal. The examinations for degrees in arts are the proper work of the university.

Besides these honors, various distinctions are conferred by the university. There are several university scholarships, more particularly the Vinerian law fellowships and scholarships; the Eldon law scholarship; one Sanscrit and two Hebrew scholarships yearly; two mathematical scholarships; the Hertford scholarship, for the encouragement of the study of Latin, and the Ireland and Craven scholarships, for the encouragement of the study of classics. There is also the Newdigate prize for the best composition in English verse; and the three chancellor's prizes for the best composition in Latin verse, Latin prose, and English prose; the Gaisford prizes for Greek composition; and the Arnold, Stanhope, and Marquis of Lothian's prizes for the best essays on an historical subject. But the great prizes are the scholarships and the fellowships. By the commissioners under 17 and 18 Vict. c. 81, these have been for the most part thrown open, and are now awarded after examination without restrictions as to kin or place of birth. At All-Souls, and also at St. John's College, since the labors of the commissioners, an attempt has been made to keep up the former exclusiveness. The scholarships, which are so numerous as to be within the reach of any young man of ability, range from £60 to £80 a year, with rooms free, which would go a considerable way towards defraying the expense of a university education. At the close of this education come the fellowships; and it has been calculated that when the arrangements of the commissioners are complete, there will be between 20 and 30 fellowships, mostly about £300 per annum, open yearly to competition.

Oxford is, of course, chiefly fed from the great English schools. A close connection subsists, by the terms of the foundation, between Winchester and New College, between Westminster and Christ-Church, and between Merchant Taylors' and St. John's. For the nature of this connection, see under these colleges. A student desirous of going to Oxford, must apply to the Head of the College to which he wishes to belong. Application in former times had to be made early, as all the good colleges were filled up for several years in advance. But now that undergraduates are allowed by most colleges to live in lodgings from the first, a candidate can have no difficulty in securing admission even to a distinguished college at short notice. There is no *university* examination at matriculation; but all the good colleges have such an examination before they receive any one—the standard of the examination, of course, varying with the college. After being received into the college, the undergraduate is sometimes assigned to a college tutor, who exercises a special control over his reading; but he also attends the instruction of the other college tutors or lecturers, as the course of his studies may require. The cost of tuition varies at different colleges, but an average of £65 may be given as paid by the undergraduate during his whole career. This payment is at some colleges distributed over three, at others over four years. Besides this, almost every undergraduate finds it necessary, at some period before taking his degree, to read with a private tutor, whom he chooses for himself. Private tuition has grown to be quite an institution in Oxford, though not formally recognized. Many of the ablest young men, after taking their degree, remain in Oxford for a year or two, taking private pupils. In this way an undergraduate, even of a badly taught college, could secure the advantages of the best tuition. But during the last few years, the lecturers in different colleges have more and more combined and systematized their work; and thus to a slight extent obviated the need for private tuition.

Much discussion has taken place on the merits and faults of this system; but, on the whole, it must be allowed to be useful for the tutor, as clearing up and concentrating his knowledge, while, at least to undergraduates who read for honors (with a few rare exceptions), it may be considered as absolutely necessary. Private tutors usually charge £10 a term for three hours a week. Previous to 1852, the professoriate of Oxford was strictly ornamental. A great effort was then made to stir it into life, which has been partially successful. New professorships were created, and the endowments of old ones were increased by the commissioners, under 17 and 18 Vict. c. 81. But the former of these measures, at least, whatever it may have done for the interests of science, has produced but little effect on the undergraduates. They still limit their range of studies by the requirements of the examinations of the schools, and it were hard to expect them to do otherwise. But professorial teaching has undoubtedly become more popular in the ordinary branches of study. Lectures by the professors of Law and Modern History, of Moral Philosophy, Logic, Greek, and Latin, are felt to be useful, and are therefore well attended. Considerable changes in the university system were contemplated in 1881, in accordance with the reforms suggested by the university commissioners. Amongst other changes, it was proposed that professors should do more of the teaching, and that fellowships should be more numerous, of less value, and of shorter tenure than at present.

The expenses vary at different colleges, not only indirectly from the tone of the society, but even directly from the charges made for necessaries. A man should be exceedingly comfortable at Oxford with £200 a year; on £150, he can manage with economy. There have been instances of men passing creditably through the university course on £100 a year; the *necessary* expenses do not exceed that sum. It appears that some unattached students cover their board, lodging, and tuition for about £45 a year. Discipline inside the college is maintained by the head of the house and the tutors; in the town and its neighborhood, by the proctors, who are university officers invested with great authority. As a rule, this authority is well exercised. According

to the *Universities Commission Report* (1874), the revenue of the colleges and university in 1871 was £413 000.

The following is a list of the colleges and halls as they rank in the university; an account of each will be found in its alphabetical place: University, Balliol, Merton, Exeter, Oriel, Queen's, New College, Lincoln, All Souls, Magdalen, Brasenose, Corpus Christi, Christ Church, Trinity, St. John's, Jesus, Wadham, Pembroke, Worcester, Keble, St. Mary Hall, Magdalen Hall, New Inn Hall, St. Alban Hall, St. Edmund Hall. To these may be added Charsley's Hall, being a private hall under the mastership of W. H. Charsley, in virtue of a statute passed in 1854, empowering any M.A. of a certain standing to open a private hall on his obtaining a license from the vice-chancellor. The Unattached Students now number upwards of 100; but the present system of university teaching is not very favorable either to their increase or progress.

Among the books which may be consulted are—Ayliffe's *History of Oxford*, Wood's *Annals*, the *University Calendar*, the *Report of the Royal Commissioners for* 1852, and the *Student's Handbook to the University of Oxford*.

OXFORD BLUES. See HORSE GUARDS, ROYAL.

OXFORD CLAY, the principal member of the Middle Oolite series, is a bed of stiff dark-blue or blackish clay, sometimes reaching a thickness of 600 feet. There occur in its lower portion in some places layers of tough calcareous sandstone, called Kelloway Rock, from a place in Wiltshire, where it is quarried. The O. C. lies beneath the plain on which Oxford is built, and extends south-west and north-east from the shore Weymouth to the fen lands south of the Wash, thence it may be traced through Lincoln into Yorkshire, until it disappears under the sea at Scarborough. The close packing of the fossils in the fine compact clay has caused them to be beautifully preserved; the shells frequently retain their iridescence, and even the softer parts of the cephalopods have sometimes left with tolerably clear definition their form in the clay. The fossils are, however, often filled with iron pyrites, which, on exposure to the atmosphere, readily decomposes and destroys all traces of the beautiful organism. The remains of chambered shells of the genera belemnites and ammonites are very abundant, and with them are associated other shells, interesting crustacea, and the species of fishes and reptiles which are characteristic of the oolite.

OXFORDSHIRE, an inland county of England, bounded on the S. by the River Thames, E. by Bucks, W. by Gloucester Area, 472,717 acres. Pop. (1871) 177,975; (1881) 179,650. The surface, where it is not level, is undulating. In the north-west the hills rise in Broom Hill to 836 feet above sea-level, and in the south-east of the county are the Chiltern Hills (q. v.), rising near Nutfield to 820 feet in height. It is watered along its southern border by the Thames, and the other chief rivers are the Windrush, Evenlode, Cherwell, and Thame, affluents of the Thames. By means of the Oxford Canal, which joins the Thames at Oxford, the towns and districts lower down the river (Abingdon, Wallingford, &c.), are supplied with coal from the Leicestershire coal-fields. The soil is fertile; the state of agriculture is advanced, 417,606 acres being under crops, fallow, or grass, in 1881; and the county may be considered one of the most productive in the country. Three members are returned to the House of Commons for the county.

OXIDA'TION is the term applied to the union of any body with oxygen, the body being then said to be *oxidized*, and the resulting compound being termed an *oxide*. Many bodies possess the property of entering into several distinct combinations with oxygen. For example, manganese (Mn) forms no less than six such compounds — viz., MnO, Mn_2O_3, Mn_3O_4, MnO_2, MnO_3, Mn_2O_7, which represent different stages of oxidation.

O'XIDES, METALLIC, are the most important of all the compounds of the metals, and in many cases occur naturally as abundant and valuable ores. They are divided by chemists into three classes—viz., (1) basic oxides or bases, (2) saline or indifferent oxides, and (3) acid oxides or metallic acids. The different oxides of the same metal usually afford illustrations of two, and not unfrequently of all three of these classes. Thus (to take the case of manganese referred to in the last article) the protoxide (MnO) is a powerful base, the red oxide (Mn_3O_4) is a saline or indifferent oxide, showing little tendency to combine either with acids or alkalies, while permanganic acid (Mn_2O_7) presents all the properties of an acid. 'As a general rule, the greater the number of atoms of oxygen which an oxide contains, the less is it disposed to unite with the acids; on the contrary, it frequently possesses acid properties, and then unites with bases to form salts. Protoxides generally are strong salifiable bases; they require one equivalent of a monobasic acid to form neutral salts. Sesquioxides are weaker bases; their salts are usually unstable; they require three atoms or equivalents of a monobasic acid to form a salt which is neutral in composition, though it may not be neutral to test-paper; and in general, all oxides require as many equivalents of acid as they contain atoms of oxygen in their composition. Some of the metallic acids, like the stannic and titanic, contain two atoms of oxygen to one atom of metal, but most of them contain three atoms of oxygen—such, for example, as the manganic, ferric, chromic, tungstic, molybdic, and vanadic acids; whilst in a few cases, such as the arsenic, antimonic, and permanganic, the proportion of oxygen is still higher.'—Miller's *Inorganic Chemistry*, 2d edit. p. 314.

Of the basic oxides, which form by far the most important class, it may be observed that they are devoid of all metallic appearance, and present the characters of earthy matters, and that six only of them are soluble in water to any considerable extent —viz., the three alkalies, and baryta, strontia, and lime. All the oxides are solid at ordinary temperatures, and as a general rule, the addition of oxygen to a metal renders it much less fusible and soluble; the protoxide of iron, the sesquioxide of chromium, and molybdic acid being the only oxides that melt more readily than the metal.

OXLEY'A, a genus of trees of the natural order *Cedrelaceæ*, of which one species, *O. xanthoxyla*, the YELLOW WOOD of Eastern Australia, is a very large tree, 100 feet high, valuable for its timber.

O'XUS, the ancient name of a great river in Central Asia, which is called by the Turks and Persians JIHUN, and AMU or AMU-DARIA by the natives of the country through which it flows. The O. rises in Lake Sari-kol, in the elevated plateau which separates Eastern and Western Turkestan. It flows through Buddakshan, Bokhara, and Khiva, and empties itself by several mouths into the Sea of Aral. In the first part of its course, its volume is increased by numerous affluents, but it receives no tributaries after entering Khiva, from which point its course is wholly through a dry sandy desert. Its total length is about 1150 miles. The value of the Oxus for the purpose of water communication, is said by recent Russian geographers to have been much overrated in Europe; and they add that in summer, vessels of even slight draught could only be got upon the stream by shutting off the irrigation canals, and risking the desolation of the country dependent on them for its crops. The true value of the Oxus lies in the means it will supply of irrigating the sterile alluvial wastes through which it runs.

Before the Christian era, it is believed that the Oxus flowed into the Caspian, and that since 600 A.D. it has twice changed its course (see ARAL). A great part of the old bed of the Oxus has recently been explored by M. Stebnutzki (*Bulletin de la Soc. de Géogr. de Paris*, April 1871), who has ascertained that it has a fall towards the Caspian, from which he infers that its course was not changed by an upheaval of the Turcoman desert, but by the simple accidents of fluvial action on an alluvial soil. In his address to the London Geographical Society in May 1872, Sir Henry Rawlinson said the restoration of the Oxus to its old bed was then under the serious consideration of the Russian government, that it was a work of no engineering difficulty whatever, and would assuredly be accomplished as soon as the neutrality of Khiva was secured.—See *A Journey to the Source of the Oxus*, by John Wood, with Essay of the Geography of the Oxus Valley by Colonel Yale, 1873; also *The Road to Merv*, by Sir H. Rawlinson, in the Proceedings of the Geog. Society, 1879.

OXYA'CIDS. When Lavoisier, in 1789, gave the name of oxygen to the *Dephlogisticated Air* discovered, in 1774, by Priestley, he believed that the presence of that body was essential to the existence of an acid, and this view was supported by the composition of the principal acids which were then known, such as sulphuric, nitric, carbonic, and phosphoric acids. But, by degrees, acids were discovered into which no oxygen entered, but which always contained hydrogen, and hence acids were divided into two great classes, the *oxyacids* and the *hydracids;* oxygen being supposed to be the acidifying principle in the former, and hydrogen in the latter. At the present day, scientific chemists usually restrict the term *acid* to compounds into which hydrogen enters, and the acids are regarded as salts of the last named element; thus sulphuric acid (HO,SO_3) and nitric acid (HO,NO_5) are the sulphate and nitrate of oxide of hydrogen; hydrochloric acid (HCl) is chloride of hydrogen, &c.

OXYCHLO'RIDES, chemical compounds containing both chlorine and oxygen in combination with some other element or radical. Chloride of lime (CaOCl), chloride of potash (KOCl), oxychloride of lead or Turner's yellow belong to this class.

O'XYGEN (symb. O, equiv. 8; new system, 16—see CHEMISTRY.—sp. gr. 1·1056) is a colorless, inodorous, tasteless gas, long regarded as a 'permanent' gas, but liquefied by Pictet of Geneva for the first time in 1877. Its chemical affinities for other elementary substances are very powerful; with most of them it is found in combination, or may be made to combine, in more than one proportion; with several in 4, 5, or 6 proportions; and there

is only one element (fluorine) with which it does not enter into any combination. Owing to the intensity with which many of these combinations take place, this gas has the power of supporting Combustion (q. v.) in an eminent degree. Of all known substances, it exerts the smallest refracting power on the rays of light. It possesses weak but decided magnetic properties, like those of iron, and like this substance, its susceptibility to magnetization is diminished or even suspended by a certain elevation of temperature. It is only slightly soluble in water; 100 cubic inches of that liquid dissolving 4·11 cubic inches of gas at 32°, and only 2·99 inches at 59°.

Oxygen gas is not only respirable, but is essential to the support of animal life; and hence it was termed *vital air* by some of the older chemists. A small animal placed in a bell-glass containing pure oxygen will not be suffocated so soon as if it were placed in the same glass filled with atmospheric air. For further details on this property of oxygen, the reader is referred to the article RESPIRATION.

Oxygen is the most abundant and the most widely distributed of all the elements. In its free state (*mixed* but not *combined* with nitrogen), it constitutes about a fifth of the bulk, and considerably more than a fifth of the weight of the atmosphere. In combination with hydrogen, it forms eight-ninths of all the water on the globe; and in combination with silicon, calcium, aluminium, &c., it enters largely into all the solid constituents of the earth's crust; silica in its various forms of sand, common quartz, flint, &c.—chalk, limestone, and marble—and all the varieties of clay, containing about half their weight of oxygen. It is, moreover, found in the tissues and fluids of all forms of animal and vegetable life, none of which can support existence independently of this element.

There are various modes of obtaining oxygen, the simplest of which consists in the exposure of certain metallic oxides to a high temperature. It was originally obtained by its discoverer, Dr. Priestly, from the red oxide of mercury, which, when heated to about 750°, resolves itself into metallic mercury and oxygen gas. It may be similarly obtained from red oxide and peroxide of lead, the resulting products in these cases being protoxide of lead and oxygen. The following are the chief methods now employed: (1.) The black oxide (or binoxide) of manganese (MnO_2) is much employed as a source of this gas. The mineral is reduced to small pieces of about the size of a pea, and introduced into an iron bottle, with a pipe through which the gas may escape. When the bottle is placed in a furnace, and attains a red heat, the mineral parts with one-third of its oxygen and the red oxide of manganese (MnO,Mn_2O_3) remains behind; the reaction being explained by the equation:

Black oxide of Manganese.		Red oxide of Manganese.		Oxygen.
$3MnO_2$	=	MnO,Mn_2O_3	+	2O

(2.) A very pure and abundant supply of oxygen may be obtained by heating chlorate of potash (KO,ClO_5), which yields up all its oxygen (amounting to 39·16 per cent.), and leaves a residue of chloride of potassium. One ounce of this salt yields nearly two gallons of oxygen gas.

It is found by experiment, that if the chloride of potash is mixed with about a fourth of its weight of black oxide of copper, or binoxide of manganese, the evolution of the gas is greatly facilitated, although the oxides do not seem to undergo any change during the process. (3.) Oxygen is readily obtained by heating strong sulphuric acid with about half its weight of powdered black oxide of manganese, or chlorate of potash, in a glass retort; the reaction in the former case being expressed by the equation:

Black oxide of Manganese.		Sulphuric acid.		Sulphate of Manganese.		Water.		Oxygen.
MnO_2	+	HO,SO_3	=	MnO,SO_3	+	HO	+	O

and in the latter case, being of a more complicated character. (4.) Various processes have been proposed for obtaining the gas on a large scale, of which the following, recommended by St. Claire Deville and Debray, is perhaps the best: The vapor of hydrated sulphuric acid is passed over red-hot platinum, by which it is decomposed into oxygen and sulphurous acid, the latter of which may easily be separated (and made available for the formation of sulphites) by its solubility in water or alkaline solutions. It has been calculated that a cubic mètre (35·375 cubic feet) of oxygen costs 8*s*. 4*d*. when obtained from chlorate of potash; nearly 4*s*. 1*d*. when obtained from manganese; and only 10*d*. when obtained from sulphuric acid.

Of the compounds of oxygen, it is unnecessary to speak here, as they are described in the article on the other chemical elements.

Oxygen was discovered almost simultaneously, in the year 1774, by Priestley and by Scheele, the English chemist having the precedence by a few weeks. Priestley gave it the name of *Dephlogisticated Air;* Scheele termed it *Empyreal Air;* Condorcet shortly afterwards suggested *Vital Air*, as its most appropriate designation; and in 1789, Lavoisier, who, by a series of carefully conducted and very ingenious experiments, proved that the combustion of bodies in the air consisted essentially in their chemical combination with oxygen, and thus overthrew the *Phlogistan* (q. v.) theory, gave it the name which it now retains in consequence of his (erroneously) believing that it possessed a certain property which is described in the article OXYACIDS.

OXYHY'DROGEN MICROSCOPE. See SOLAR MICROSCOPE.

OXYRHY'NCHUS, the name of a celebrated Egyptian fish, said to be reverenced throughout Egypt, and sacred to the goddess Athor. Its name in Egyptian is *kha*, and the fish in the hieroglyphs was used for this syllable, and particularly expressed the idea of the body. In the ritual, the deceased particularly stated that he had not caught this fish. The name appears to have comprised the genus *Mormorus*, distinguished by its pointed nose and long dorsal fin. The fish was worshiped in one of the nomes, which was called after it, and the inhabitants held it in such reverence that they would not touch any fish captured by a hook. When the portions of the body of Osiris were flung into the Nile, this fish alone ate one portion of his body. The O. was not eaten in Egypt, except by the natives of the Cynonopolites Nomos. Its modern names is *Mizeleh*, which seems retained in the Coptic Pemge, the name of the city of Oxyrhynchus. It is represented both in the sculptures and on the coins of the Nome, and was anciently embalmed. The city of Oxyrhynchus is the modern Behneseh, lying on the west bank of the Nile, in Lower Egypt, near the Bahr-el-Jusuf.

OXYU'RIS VERMI'CULARIS is the name now assigned by most zoologists to the intestinal worm described as *Ascaris* (q. v.) *vermicularis*, yet it is the original and true Ascaris. For the mode of recognizing the presence of this worm, and treating patients suffering from its presence, the reader is referred to the articles VERMIFUGES and WORMS.

O'YER AND TE'RMINER Fr. *ouir*, to hear; *terminer*, to determine). A commission of oyer and terminer is granted by the crown to the judges and others to hear and determine all treasons, felonies, and trespasses; and it is by virtue of this commission that the judges on circuit dispose of criminal cases in the various circuits. Sometimes a special commission of the same kind is issued, authorizing the judges to go and try prisoners at other than the ordinary times.

O'YSTER (*Ostrea*), a genus of lamellibranchiate molluscs, of the section with a single adductor muscle. See LAMELLIBRANCHIATA. The shell consists of two unequal and somewhat irregularly shaped valves, of laminated and coarsely foliated structure; and the hinge is without tooth or ridge, the valves being held together by a ligament lodged in a little cavity in each. The animal is, in its organization, among the lowest and simplest of lamellibranchiate molluscs. It has no *foot;* and, except when very young, no power of locomotion, or organ of any kind adapted to that purpose. Its food consists of animalcules, and also of minute vegetable particles, brought to it by the water, a continual current of which is directed towards the mouth by the action of the gills. The gills are seen in four rows when the valves of the shell are separated, a little within the fringed edge of the mantle. In the most central part is the adductor muscle; towards the hinge is the liver, which is large; and between the adductor muscle and the liver is the heart, which may be recognized by the brown color of its auricle.

The mouth—for, as in the other lamellibranchiata, there is no head—is situated beneath a kind of hood, formed by the union of the two edges of the mantle near the Linge. It is jawless and toothless. The ovaries are very large during the season of reproduction, which extends over certain months in summer, when oysters are out of season for the table. Oysters are hermaphrodite. They produce vast numbers of young. Leeuwenhoek calculated that from 3000 to 4000 exist within an O. at once when 'sick,' 'milky' or full of spawn; and according to Poli, one O. produces about 1,200,000 eggs. The eggs are hatched within the shell and mantle of the parent, and the young are to be seen swimming slowly in a whitish and mucous or creamy fluid surrounding the gills, which becomes darker and of a muddy appearance when they are about to be expelled. Each young O. is then about $\frac{1}{120}$th of an inch in length, and about two millions are capable of being closely packed in the space of a cubic inch. When the parent O. expels the young, and this is done simultaneously by multitudes on an oyster-bank, the water becomes filled as with a thick cloud, and the spawn—called *spat* by fishermen—is wafted away by currents; the greater part, of course, to be generally lost, by being driven to unsuitable situations, as exposed rocks, muddy ground, or sand to which it cannot adhere, or to be devoured by fishes and other marine animals, but some to find an

object to which it can attach itself for life. The young come forth furnished with a temporary organ for swimming, ciliated, and provided with powerful muscles for extending it beyond the valves and withdrawing it at pleasure; and when the O. has become fixed in its permanent place of abode, this organ, being no longer of any use, has been supposed to drop off, or gradually to dwindle away and disappear.

Frank Buckland some years ago expressed the opinion, that the swimming organ of the young oyster was in the 'lungs,' and remains as the 'lungs' in the mature oyster. The four figures given represent the young oyster much magnified. Figs. 1, 3, 4

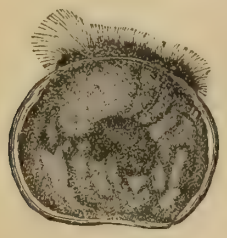


Fig. 1.



Fig. 2.

are views of the upper and under side; fig. 2 is an edge view. In very favorable situations, oysters grow rapidly, so that the Common O. is ready for the table in a year and a half or two years;



Fig. 3.

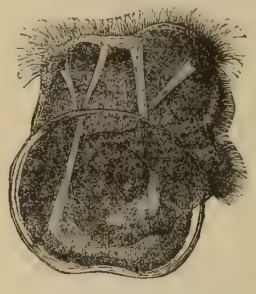


Fig. 4.

but in other places, a longer time is required, often about five years.

The species of O. are numerous, and are found in the seas of all warm and temperate climates. None have been found in the coldest parts of the world. The COMMON O. (*O. edulis*) is the only British species. Like it, the other species are generally found where the water is of no great depth; and some of them, also like it, are very abundant in estuaries, where the water is not very salt. The mangrove swamps of warm climates often abound in oysters of excellent flavor (*O. parasitica*, &c.) adhering to the roots and branches of the trees, within the reach of the tide. Some of the species differ from the Common O. not a little in form, as the LONG-HINGED O. (*O. Canadensis*) of North America, which is very elongated; and some of them far exceed it in size. Sir J. E. Tennent states that he measured the shell of an edible O. in Ceylon, and found it a little more than 11 inches in length by half as many in breadth; 'thus unexpectedly attesting the correctness of one of the stories related by the historians of Alexander's expedition, that in India they had found oysters a foot long.' Some species of O. have the valves plaited with strong longitudinal plaits.—For the illustrations here given, we are indebted to the kindness of the editor of the *Field*.

Young oysters readily attach themselves to the shells of old ones, and thus, in favorable circumstances, oyster-banks increase rapidly, so as to fill up shallow parts of the sea, and to form walls which effectually resist the waves and tide. This is very remarkably the case on the alluvial shores of Georgia and some other parts of North America, where these banks are called *Racoon Banks*, because the racoon, among other animals, visit them to feed upon the oysters. Marshy land extends inwards from 12 to 18 miles from the sea, with tidal rivers meandering through it, and these rivers are kept pretty constant to their channels by the walls of living oysters on both sides. Large bunches of oysters may even be found among the long grass. It is not unusual for the inhabitants of the neighborhood to light a fire and roast a bunch of oysters on the spot. So abundant are the oysters in many places, that a vessel of 100 tons might be loaded within three times her own length. American oysters, which are of excellent flavor, have of late been imported (alive) into Britain to the value of £100,000 a year.

Notwithstanding the prodigious fecundity of the O., however, the beds or banks which yield it for the markets of Britain and other European countries are not sufficiently productive to satisfy the demand, and it is not so much an article of ordinary food for all classes, as a luxury of the wealthy.

The usual mode of taking oysters by dredging is destructive, although, for oyster-beds, which are at all states of the tide covered with a considerable depth of water, nothing better has been devised, and the anxiety of fishermen to make the most of the present opportunity has caused many beds to be almost ruined by over-dredging. But the artificial formation of oyster-beds has been resorted to with great promise of success. It is indeed no novelty, having been practiced by the Romans. Pliny says that 'the first person who formed artificial oyster-beds was Sergius Orata, who established them at Baiæ. . . . This was done by him, not for the gratification of gluttony, but for the sake of gain, as he contrived to make a large income by the exercise of his ingenuity.' Sergius Orata lived in the time of Augustus. Among the *vivaria* of later emperors and other wealthy Romans were *ostrearia*, specially devoted to oysters; and oyster-culture has never ceased to be practised in Italy, although to an inconsiderable extent, and particularly in Lake Fusaro, the Acheron of Virgil, a muddy saltwater pond, nowhere more than two yards deep. In Britain, it has also long been practised to some extent, particularly on the coasts of Kent and Essex, for the supply of the London market.

In 1864, an act of parliament was passed, giving exclusive rights to a Company, called the 'Herne Bay, Hampton, and Reculver Oyster Fishing Company,' over a certain portion of the shore at Herne Bay, extending about six miles in length by 1½ in breath. The oyster-beds fished by the public had, till then, yielded a very small supply; and it was urged that this supply could be largely increased by a well-managed Company. In order that the public should not be injured by this legislation, it was declared by one of the clauses of the Act that 'If the Company fail to maintain and cultivate the beds, or to produce well-fed oysters fit for the public market in such quantities as to be of public advantage, all the privileges conferred on the Company would be withdrawn, and the dredging of the beds, as formerly, thrown open to the public to fish.'

In 1869, the Board of Trade commissioned Mr. Pinwell, Inspector of Oyster Eisheries, to visit the oyster-culture grounds of France, in order to ascertain whether we could gather any useful hints therefrom. In his Report he explained that the English plan, as conducted at Herne Bay, Reculver, Whitstable, Langston Harbor, the Isle of Wight, and other localities, depends on the provision of salt-water tanks or ponds, in which the oysters are kept for a certain time. In France, the system is much more elaborate. He found that the coast is parted off into divisions or districts, each of which is placed under a maritime prefect. Each district is divided and subdivided into smaller portions, managed by commissioners, inspectors, syndics, and watchmen. The determination of 'close-time,' when oyster-fishing is totally prohibited; the decision how much to fish up, and how much to reserve for re-stocking; the discrimination between public oyster-beds and those which are made over to individuals by 'concessions;' the control of the fore-shore; the maintenance of oyster-breeding farms; the prevention of poaching by fishers not belonging to the respective districts—occupy quite an army of officials. Mr Pinwell recommended the adoption of some matters of detail from the French system, but not an imitation of the elaborate official machinery.

In 1872, the enhanced price of oysters in France attracted much public attention. Close observers arrived at an opinion that it was due to three causes—the impoverishment of some of the beds by injudicious dredging; a greatly increased demand for the supply of Germany and Russia; and a private understanding between many of the French Companies, leading to something very like a monopoly. The price per 100 was 1·20 francs in 1840, 2·83 francs in 1856, 4·58 francs in 1860, 7·20 francs in 1868, and no less than 11·20 francs in 1872. For consumption and further development, about 380,000,000 oysters were taken in 1881 from the basin of Arcachon, where the government has preserved banks, and the beds of Marennes and Concarneau; while, in 1880, from twenty-one places where this industry is carried on, about 195,000,000 were sent to market.

In 1874 the free fishers and the public of Herne Bay complained that the oyster company in that locality had not fulfilled the required conditions, while the company declared they had kept their agreement. The Board of Trade arranged a compromise, by which a certain portion of the ground was re-transferred to the public or free fishers; the remainder being left in the possession of the company, who would hold the exclusive right of fishing thereon, so long as they maintained the beds.—It is gratifying to find that oyster-culture is receiving much attention in Australia. Oyster-farms were established both in New South Wales and in Victoria in 1872.

Oysters live equally well in situations where they are constantly

under water, and in those which are left dry by the retiring tide. In 1882, a discovery was made of 10,000 acres of oyster-beds in the North Sea, 20 fathoms deep, and extending over a length of 200 miles, and a breadth of 60 or 70—unhappily not easily dredged. Where ebb-tide leaves them dry, they instinctively keep their valves closed when the water deserts them. It is in such situations that oyster-culture can be most easily and profitably carried on. Our space will not admit of details, which we would gladly give.

Various methods are adopted of preparing the artificial oyster-bed, by providing suitable solid objects for the oysters to attach themselves to. Stones are piled together, and in such a way that there are many open spaces among them; stakes are driven into the mud or sand; bundles of small sticks are fastened to stones or stakes; floors of planks are formed, at a little height above the bottom, with alleys between them, the under surface of the planks being roughened by the adze; and tiles are arranged in various ways, so as to turn to account the whole space at the disposal of the oyster-cultivator as high as the ordinary tides reach. The method must be varied in accordance with the situation, and the probable violence of winds and waves; but sheltered situations are best in all respects; and experience in France seems to prove that tiles covered with cement are preferable to everything that has yet been tried, as convenient for the cultivator, presenting a surface to which oysters readily attach themselves, and from which they can easily be removed, whilst the larger seaweeds do not grow on it so readily as on stones or wood. By the use of tiles covered with cement, the cultivator is also able easily to remove young oysters from breeding-grounds to feeding-grounds; the best breeding-grounds being by no means those in which the oyster most rapidly attains its greatest size, and that greenish tinge which Parisian epicures so much desire to see, and which is owing to the abundant confervæ and green monads of quiet muddy waters.—It has been long known that the oysters of particular localities are finer than those produced elsewhere. Nowhere, perhaps, are finer oysters produced than on some parts of the British coasts. Those of Rutupiceæ, now Richborough, in Kent, were highly esteemed by the Romans, whose epicurism in oysters exceeded that of modern nations.

Of the culinary uses of oysters, it is unnecessary to say anything. Raw oysters, however, are generally believed to be more nutritious and more easily digested, as to many they are more delicious, than oysters cooked in any way; and it does not appear that any such evil consequences ever ensue from eating them, as are known to ensue from eating other kinds of uncooked food. Probably no parasite capable of developing into any form injurious to the human being exists in the oyster.

The genus *Ostrea* gives its name in some zoological systems to a family *Ostreadæ*. The fossil species are more numerous than the recent.

The name O. is popularly extended to many molluscs not included among the *Ostreadæ*, as the Pearl-oyster (q. v.).

Oysters raised in artificial beds are called 'natives,' and are considered very superior to those which are dredged from the natural beds; although to these last the name of 'native' would seem more appropriate than to the other. Some years ago, it was estimated that 500,000,000 oysters were consumed annually in London alone, at a cost of £100,000; but the supply has since lessened, and the price per 100 greatly increased. A large trade in oysters has sprung up in the United States; that of New York alone being estimated at $25,000.000 annually.

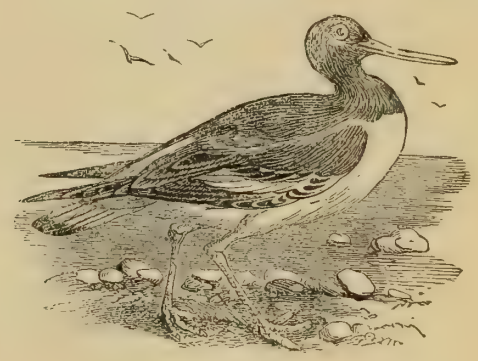
Fossil Oysters.—A single species occurs in the Carboniferous Limestone, and as we rise in the crust of the earth, the genus becomes more and more common, no less than 200 species having been recorded, many of them scarcely distinguishable from the living species. The sub-genus Gryphæa was a free shell, with a large thick left valve and small concave right valve. Thirty species have been found in beds of the Oolite and Chalk periods. In the same beds there occurs another form of Ostrea with subspiral reversed umbones, to which the subgeneric name Exogyra has been given. Forty species of this form have been described.

OYSTERS, Law as to. The rule is, that he who has the right of property in the soil or seashore, is entitled to catch or keep and breed oysters there. But the shore below the medium line of the tides belongs to the crown, and not to any individual; and it is only by virtue of some grant from the crown that an individual or a corporation can establish an exclusive title to the sea-shore, and in such a case is exclusively entitled to any oyster-beds there. It is thus always by virtue of a grant from the crown that oyster-fisheries are claimed as the property of an individual or of a corporation. The act 31 and 32 Vict. c. 45, however, now enables the Board of Trade to grant parts of the sea-shore of Great Britain to individuals for breeding oysters and mussels, and has given new remedies for the protection of this property. The general law is as follows: Whoever steals oysters or oyster-brood from an oyster-bed which is private property, is guilty of felony; and whoever unlawfully or wilfully uses any dredge, net, or instrument within the limits of a private oyster-bed, for the purpose of taking oysters, though none are actually taken, is guilty of a misdemeanor, and is liable to be imprisoned for three months. But persons are not prevented from fishing for floating fish within the limits of an oyster-fishery, if they use nets adapted for 'floating fish. Certain statutes as old as the time of Richard II. were passed to protect oyster-brood, but these were recently repealed by the Sea Fisheries Act, 1868 (Paterson's *Fishery Laws of the United Kingdom*). Under the convention between England and France, confirmed by the statute 31 and 32 Vict. c. 45, a close season is prescribed for oyster-fishing in the seas between England and France, from 15th June to 1st September, during which time oyster fishing-boats may be boarded by officers of the coast-guard or navy; and oysters illegally caught may be seized and destroyed, and the master is liable to a penalty.

In 1877, An act was passed appointing 15th June to 4th August as a close time for fishing deep-sea oysters, and from 14th May to 4th August for other kinds, in the British seas; it also grants power to prohibit the fishing in any locality for not more than a year. The law as to oysters in Scotland is substantially the same as in England. As to Ireland, the Irish Fishery Acts give power to the Irish Fishery Inspectors to grant a license to individuals, as is now done in England, to appropriate a certain tract of the shore for the purpose of forming oyster-beds, and thereupon the beds become private property (Paterson's *Fishery Laws*, p. 257). There is also a close season in Ireland for oysters, like what is established under the convention with France.

OYSTER BAY, a favorite watering-place on the north coast of Long Island, New York, U. S., on a deep sheltered bay, opening into Long Island Sound, 25 miles north-east of New York city. It abounds in handsome residences and fine scenery, and offers facilities for fishing, bathing, &c. Pop. (1870) 10,595; (1880) 11,923.

OYSTER-CATCHER (*Hæmatopus*), a genus of birds of the family *Charadriadæ* (q. v.), chiefly inhabiting sea-coasts, where they feed on molluscs, crustaceans, annelids, and other marine animals—sometimes even on small fishes. Their legs are of mod-



Oyster-catcher (*Hæmatopus ostralegus*).

erate length, like those of the plovers, and, like them, they have no hind-toe. The most remarkable generic distinction is found in the bill, which is long, strong, straight, much compressed and wedge-like towards the point. They are generally said to make use of the bill for opening the shells of oysters and other molluscs; but the late Mr. James Wilson expresses a very reasonable doubt on this point. The habits of the British species (*H. ostralegus*), so far as they have been accurately observed, agree with those of the American. It is only the European species, and is common on all parts of the British coasts, and on those of continental Europe, the north of Africa, and of the north of Asia. Its whole length is about 16 inches. Its finely-contrasted black and white colors have gained it the name of Sea Pie. It is most abundant on the sea-coast, but often visits inland regions and sometimes breeds in them. It does not make a nest, but lays its eggs—usually four—on the shingly beach or bare ground. On some of the sandy flat coasts of Lincolnshire, the O. is so abundant, that a bushel of eggs have been collected in a morning by a single fisherman. The American O. is a bird of passage, deserting the northern regions in winter. It is rather larger than the European species, and differs from it in colors, and in greater length and slenderness of bill.

OZÆ'NA (from the Gr. *ozo*, I smell), signifies a discharge of fœtid, purulent, or sanious matter from the nostrils. It is a symptom rather than a disease, and may arise from ulceration of the membrane lining the nostrils, or from caries of the adjacent bones, and may accompany syphilitic, scorbutic, scrofulous, or cancerous affections of these or adjacent parts. A slighter form of ozœna sometimes follows chronic coryza (or cold in the head).

malignant scarlatina, and erysipelas of the face. The discharge is seldom accompanied by acute pain, unless when caused by cancer; sometimes, however, an aching is complained of. The prognosis must depend upon the nature of the disease, of which the discharge is a symptom. The treatment may be divided into the general or constitutional, and the local. The *general treatment* should consist of tonics combined with alteratives, as the preparations of bark with the alkalies, or with the mineral acids; a dry, bracing air, or a temporary removal to the seaside, is also usually of service. If the discharge arises from syphilis or scurvy, the treatment suitable to those diseases should be prescribed. The *local treatment* consists in the inhalation, once or twice a day, of the steam of boiling water, to which a little creosote or carbolic acid has been added; and in more severe cases, in the thorough syringing of the nostrils, so as to wash away all collections of matter with a copious stream of warm water, to which a little chloride of zinc has been added (about 30 minims of Burnett's solution to half a pint of water).

OZIE'RI, a town of the island of Sardinia, in the province of Sassari, 26 miles east-south-east from Sassari, amongst the mountains which occupy the center of the island. It stands in a deep valley, open only to the north, and is therefore peculiarly exposed to cold winds. Pop. (1871) 7965.

O'ZONE (Gr. *ozo*, I smell). It was remarked long ago that a peculiar odor was produced by the working of an electrical machine. Van-Marum found that, when electric sparks were passed through a tube containing oxygen, the gas became powerfully impregnated with this odor—which he therefore called the 'smell of electricity.' Subsequent writers attributed the phenomenon to the formation of nitric acid, due to a trace of nitrogen mixed with the oxygen; especially as the gas was found to act energetically upon mercury. Thus supposed to be explained, these curious results were soon forgotten. But in 1840, Schönbein (q. v.) with remarkable acuteness, made a closer investigation of the question, and arrived at many most curious results, all of which have not even yet been satisfactorily accounted for. The problem remains, in fact, one of the most perplexing, as well as interesting, questions imperfectly resolved in chemistry.

The earlier results of Schönbein were as follow: (1.) When water is decomposed by the voltaic current, the electrodes being of gold or platinum, the oxygen (which appears at the positive pole) possesses in a high degree the smell and the oxidizing power developed by Van-Marum by means of friction-electricity, (2.) When the positive electrode is formed of an oxidizable metal, these results are not observed, but the electrode is rapidly oxidized. (3.) The oxygen collected at a platinum electrode retains these properties for an indefinite period, if kept in a closed vessel; but loses them by heating, by the contact of an oxidizable substance, and even by contact with such bodies as charcoal and oxide of manganese. To the substance, whatever it may be, which possesses such powerful chemical affinities, Schönbein gave the name ozone, from its peculiar smell.

In 1845, he showed that the same substance can be produced by the action of phosphorus on moist air; and suggested that it might be a higher oxide of hydrogen.

De la Rive and Marignac shortly afterwards repeating the experiments of Van Marum, showed that electric sparks produce ozone even in *pure* and *dry* oxygen; and came to the conclusion, that ozone is oxygen in an *allotropic* state, as diamond is a form of coke or charcoal.

Baumert, in 1853, endeavored to show that there are two kinds of ozone—one formed by pure oxygen by electric sparks, which he allowed to be allotropic oxygen; the other formed in the voltaic decomposition of water, which he endeavored to prove to be a *teroxide* of hydrogen (HO_3). But Andrews, in 1856, completely refuted this view, by showing that no such oxide of hydrogen (at least in a gaseous form) is produced in the electrolysis of water; and that ozone, from whatever source obtained, is the same body; and is not a compound, but an allotropic form of oxygen.

In 1860, Andrews and Tait published the results of a series of *volumetric* experiments on this subject, which led to some remarkable conclusions—among which are the following: When the electric discharge is passed through pure oxygen, it *contracts*. If ozone be oxygen in an allotropic form, it must therefore be denser than oxygen. It was found also that a much greater amount of contraction, and a correspondingly greater quantity of ozone, were produced by a silent discharge of electricity between fine points, than by a brilliant series of sparks. The contraction due to the formation of the ozone is entirely removed by the destruction of the ozone by heat; and this process can be repeated indefinitely on the same portion of oxygen.

In attempting to determine the density of ozone, they used various bodies to take up the ozone from the oxygen containing it; and met with many very curious results. Thus, if mercury be introduced, it is immediately attacked and oxidized, and yet the oxygen *increases* in volume. If iodine be employed, it is immediately oxidized, and *no change* of volume was observed, though the apparatus would have at once rendered visible a change to the amount of $\frac{1}{60000}$th of the bulk of the oxygen. By measuring the contraction produced by electricity in the oxygen, then the effect of introducing a solution of iodide of potassium, and determining the amount of oxygen taken up from the quantity of iodine set free, Andrews and Tait showed that the density of ozone, if it be allotropic oxygen, must be practically *infinite*—i. e., that ozone must have the density of a *liquid* or a *solid* at least, although existing in the gaseous form. This conclusion is, they say, inevitable, unless we make the very improbable assumption, that when iodine, &c., are exposed to ozone, one portion of the ozone (of volume, as oxygen, equal to the volume of the whole ozone) combines with the iodine, and the other portion is restored to the form of oxygen. The paper from whose statements we have quoted concludes with the suggestion that it is *possible* that in the formation of the ozone, oxygen may be decomposed. This is, of course, contrary to all the received notions of chemistry—but such a supposition would at once reconcile all the apparently contradictory facts connected with this singular body.

Soret and Von Babo have recently repeated and verified a few of these results, and the former, by using turpentine as an absorbing substance, and also by measuring its diffusion rate, has endeavored to show that the density of ozone is 50 per cent. greater than that of oxygen—a result on the whole consistent with the recent experiments of Brodie. Andrews has lately shown that ozone is rapidly destroyed when shaken up with dry fragments of glass, &c. He has also proved that the effect which is (almost invariably, and sometimes in fine weather powerfully) produced by the air on what are called ozone-test papers—papers steeped in iodide of potasium (and generally spoiled by the addition of starch) which are rendered brown (or blue) by the liberation of iodine—is really due to ozone. He did so by showing that it acts upon mercury as ozone does, and that it is destroyed by heat at the same temperature. *Nature* reported in 1880 that ozone had been liquefied, as the so-called permanent gases had been a year or two before; other experiments seem to prove that it is explosive.

P.



THE sixteenth letter of the English alphabet, was in Hebrew called *Pe*, i. e., mouth, most probably from its original form. P. is the thin letter of the labial series (*p*, *b*, *f*, *v*), and is interchangeable with the other letters of the series. P, in Sanscrit, Greek, and Latin, is replaced by *f* in the Teutonic tongues. See F. Words *beginning* with *p* in English, and its kindred Teutonic tongues, are almost all of foreign origin (Slavic, Celtic, Latin), as *pain* (Fr. *peine*, Lat. *pœna*), *plough* (Pol. *plug*), *pit* (Lat. *puteus*, a well). The Greek prep. *apo* (Sans. *apa*) became in Lat. *ab;* Gr. *hupo*, Lat. *sub;* Sans. upa, Lat. *ob;* but before sharp letters, as *t* and *s*, the original *p* was retained in pronunciation, as is shown by inscriptions (*apstulit, optinui*). There are remarkable interchanges of *p* with the sharp guttural *k* or *q*. Thus, for Lat. *quis, quod, quam*, the Oscan dialect has *pis, pod, pam;* Lat. *equus, coquo*, corresponded to Gr. *hippos* (Æol. *hikkos*), *pepo;* similarly, Gaelic *mac* (son), *ceathair* (Lat. *quatuor*, four), *coig* (Lat. *quinque*, five), correspond to Welsh *map, pedwar* (Gr. *pettores*), *pump* (Gr. *pente* or *pempe*). In Gr., *p* is sometimes replaced by *t*, as *tis, tessares* for *pis, pettores*. In such words as *redemption, consumption*, *p* has been introduced as an intermediary between the incompatible sounds *m* and *t*. The intial *p* of Latin words has for the most part passed into French unaltered;

in other positions, *p* has become *v;* thus, Fr. *évêque, cheveu, décevoir, pauvre,* from Lat. *episcopus, capillus, decipere, pauper.*

PA'CA (*Coelogenys*). a genus of rodent quadrupeds, allied to the agoutis, cavies, and capybara, and inhabiting Brazil, Guiana, and some of the West India Islands. The dentition very nearly resembles that of the agoutis. The cheek-bones are prodigiously developed, in a way of which no example exists in any other mammalian animal, so that the zygomatic arches enclose a large hollow space, whilst the bone also descends to an unusual depth from the arch, even below the lower jaw-bone. Within this structure, which gives an extraordinary breadth and peculiar aspect to the face, is a sac in each cheek, opening in front, and lined with a fold of the face. The whole of this seems to be intended to preserve the true cheek-pouches from external shocks. The cheek-pouches open from the mouth in the usual way, and are capable of very great distention. The lip is cloven; the ears are small; the eyes are large and full; the neck is short; the tail is a mere tubercle; the feet have each five toes; the legs are thick; the back is rounded. The form and gait are clumsy, yet the P. (*C. paca*) is very quick and active. It lives in moist grounds burrowing like a rabbit, but not so deeply; its burrow, however, is always provided with three openings. It feeds on vegetable substances, and often does great damage to plantations of sugar-cane. It is one of the largest rodents, being about two feet long. It is generally of a dark-brown color, with four rows of white spots along the sides, the throat and belly white. A lighter colored species has been described, but is perhaps a mere variety. The flesh of the P. is much esteemed and is very fat.

PACAY (*Prosopis dulcis*), a tree of the natural order *Leguminosæ*, sub-order *Mimoseæ;* a native of Peru, of rather large size, with a broad head; producing pods from twenty inches to two feet long, which contain black seeds imbedded in a sweet flaky substance as white as snow. This flaky substance is used as an article of food and much relished by the Peruvians,

PACE (Lat. *passus*), in its modern acceptation, is the distance, when the legs are extended in walking, between the heel of one foot and that of the other. Among disciplined men the pace becomes of constant length, and as such is of the utmost value in determining military movements, the relative distances of corps and men being fixed by the number of paces marched, and so on. The pace in the British army is 2½ feet for ordinary marching, and 3 feet for 'double-quick' or running time.—With the Romans, the pace had a different signification, and it is important to bear the distinction in mind, when reading of distances in Latin works; the single extension of the legs was not with them a pace, (*passus*), but a step (*gradus*); their pace (*passus*) being the interval between the mark of a heel and the next mark of the *same* heel, or a double step. This pace was equivalent to 4·84 English feet. The pace was the Roman unit in itinerary measure; the mile being 1000 paces, or 5000 feet equal to ·917 of an English Mile. See MILE. Whether measurements were effected by actually counting the paces, or by the time occupied, is not clear; but either method would, with disciplined troops, give a safe result.

In the middle ages, writers confuse accounts of distances by allusion to a geometrical pace, a measure which varied with different authors.

PACHO'MIUS, an Egyptian monk of the 4th c., is held in high estimation by the Roman Catholic church, as being the first to substitute for the free asceticism of the solitary recluse, a regular cœnobitic system. He was born towards the close of the 3d c., was brought up as a pagan, but converted to Christianity by the kindness of certain Christians whom he encountered at Thebes. About 340 A.D., at Tabenna, an island in the Nile, he founded the first monastic institution. The members agreed to follow certain rules of life and conduct drawn up by P., and to subject themselves to his control and visitation. He also established the first convent for nuns, which was under the presidency of his sister, and labored with so much diligence and zeal, that at his death, according to Palladius, not fewer than 7000 monks and nuns were under his inspection. The various writings extant under the name of P. are—*Regulæ Monasticæ* (of doubtful genuineness), *Monita, SS. PP. Pachomii et Theodori, Epistolæ et Verba Mystica* (a farrago of unintelligible allegory), and *Præcepta S. Pachomii.*

PACHYDE'RMATA (Gr. thick-skins), in the system of Cuvier, an order of Mammalia, including part of the *Bruta* (Rhinoceros, Elephant), and all the *Belluæ* (Horse, Hippopotamus, Tapir, Hog, &c.) of Linnæus, besides one genus (*Hyrax* or Daman) of the Linnæan *Glires.* But subsequent investigation has demonstrated so close an alliance to be unnatural, and probably no Cuvierian order has been so thoroughly broken up. The elephants and hyrax now form two small independent orders—*Proboscidea* and *Hyracoidea.* The pigs and hippopotami form the non-ruminant division of the ungulate sub-order—*Artiodactyla* (q. v.), while the closely-allied tapir, rhinoceros, and horse represent the perissodactyle ungulates. As defined by Cuvier, the order consists of those hoofed mammalia (*Ungulata*) which are not ruminants; all of which possess, as a more positive character, a remarkable thickness of skin. This order he divides into three sections—(1.) *Proboscidea,* having a prolonged snout or proboscis, through which the nostrils pass as elongated tubes, a powerful organ of prehension, and a delicate organ of touch, and having also five toes on each foot, enclosed in a very firm horny skin; (2.) *Ordinaria,* destitute of proboscis, although in some (Tapirs), there is such an elongation of the upper lip and nostrils as approximates to it; and the nose is employed by hogs, &c , in seeking their food, not only as an organ of smell, but as an instrument for turning up the ground, and as an organ of touch; the number of toes varies, four, three, or two on each foot; those with an even number of toes, having in the cleft foot a resemblace to the *Ruminantia;* and (3.) *Solidungula,* in which the foot has but one apparent toe, enclosed in a hoof. Some naturalists have thought it better to separate the *Solidungula* or *Equidæ* (q. v.) from the P., as a distinct order; whilst others have enlarged instead of restricting the limits of the order, by adding, as a fourth section, *Herbivorous Cetacea,* now known as *Sirenia.*

Those P. which have a number of toes differ completely from the mammalia having claws (*Unguiculata*) in their inability to bend their toes in order to seize any object. Some of the *Edentata* have very large hoof-like claws, but this difference still subsists. The fore-limbs of the P. are also incapable of any rotatory motion, serving for support and locomotion only, not at all for prehension; the metatarsal and metacarpal bones being consolidated as in the *Ruminantia,* and they have no clavicles.

The largest terrestrial mammalia belong to this order. Most of the P. are of large size, although the damans are a remarkable exception, and some of the hog family are also comparatively small. Most of them have a clumsy form, with a slow and awkward gait; but they are capable of activity beyond what might be supposed, and sometimes move at a pretty rapid pace. Gracefulness and fleetness are characteristics of the otherwise exceptional *Solidungula.* The *P. Ordinaria* have generally great strength, and the larger ones push their way through the entangled thickets of tropical forests, bending or breaking the lianas, small trees, and branches which oppose their progress, their thick hides resisting the spines and broken branches by which the skins of other animals would be pierced. The horse and other *Solidungula* are not inhabitants of forests and jungles, but generally of grassy plains, and their hides are much less thick and hard than those of most of the Pachydermata.

The physiognomy of the P. in general is rather dull and unexpressive, the eyes being small, and having that character of which a familiar example is found in the common hog. When enraged, however, they manifest their fierceness in their eyes; and although, in general, mild and gentle, they are capable of being aroused to great fury.

The skeleton of the *P. Ordinaria* and *Proboscidea* is strong and massive; the neck short, the processes of its vertebræ strongly developed; the skull affording a large surface for the muscles which support and move it.

The P. generally feed on vegetable substances. Some are omnivorous. The digestive organs are more simple than in the *Ruminantia,* but exhibit considerable diversity. The stomach is simple in some, and in others is more or less completely divided into sacs, approaching to one of the most remarkable characters of the *Ruminantia.* The intestines are generally longer than in the *Ruminantia.* The dentition exhibits considerable diversity; the adaptation to vegetable food being the most prevalent character. The most important peculiarities of the dentition and digestive organs are noticed in the articles on particular families and genera.

PACI'FIC OCEAN, the largest of the five great Oceans (see OCEAN), lies between America on the east, and Asia, Malaisia, and Australasia on the west. The name 'Pacific,' given to it by Magellan, the first European navigator who traversed its wide expanse, is doubtless very appropriate to certain portions of this ocean; but, as a whole, its special claims to the epithet are at the least doubtful, though the name has by long usage become too well established to be easily supplanted by any other.

The greatest length of the P. O. from the Arctic (at Behring's Strait) to the Antarctic circles is 9200 miles, and its greatest breadth, along the parallel of latitude 5° N., about 10,300 miles; while its area may be roughly estimated at 80.000,000 English square miles, or about $\frac{2}{5}$ths of the whole surface of the earth. Its form is rhomboidal, with one corner incomplete (at the south), and its surface is studded with numberless islands, either scattered or in groups; these, however, are chiefly confined to the western side. Along the whole eastern side, there is a belt of sea of varying width, which, with a very few exceptions, is wholly free from islands. The deepest sounding yet found (in N. lat. 11° 24',

E. long. 143° 16′) in the P. O. is 26,850 feet, or above 5 miles—nearly equal to the height of the highest mountain on the globe.

The coasts of the P. O. present a general resemblance to those of the Atlantic, and the similarity in the outline of the western coasts of each is even striking, especially north of the equator; but the shores of the former, unlike those of the latter, are sinuous, and, excepting the north-east coast of Asia, little indented with inlets. The shore on the American side is bold and rocky, while that of Asia varies much in character.

Though the P. O. is by far the largest of the five great oceans, being about equal to the other four in extent, the proportion of land drained into it is comparatively insignificant. Its basin includes only the narrow strip of the American continent to the west of the Andes and Rocky mountains; Melanesia (with the exception of almost the whole of Australia), which contains few rivers, and none of them of large size; the Indo-Chinese states, China proper, with the east part of Mongolia, and Manchuria in the Asiatic continent.

Winds.—The trade winds of the Pacific have certain peculiarities, which have only lately been discovered. In general, they are not found to preserve their peculiar characteristics except within certain limits, thus, the south-east trades are found to blow steadily only between 92° and 140° of west longtitude; while the north-east trades are similarly fluctuating, except between long. 115° W. and 214° W. Beyond these limits, their action is in whole or in part neutralized by the monsoons and other periodical winds peculiar to the tropical regions of the Pacific.

In Polynesia, especially near the new Hebrides group, hurricanes are of frequent occurrence from November to April, but they exhibit few of the terrible characteristics which distinguish the hurricanes of the West Indies and Indian Ocean. North and south of the tropical zone, the winds exhibit little periodicity, being found to blow from all parts of the compass at any given season of the year, though a general westerly direction is most frequent among them. On the coast of Patagonia and at Cape Horn, west winds prevail during the greater part of the year, while in the Sea of Okhotsk they are of rare occurrence. The frightful Typhoon (q. v.) is the terror of mariners in the Chinese seas, and may occur at all seasons of the year. There are many other winds and storms, such as white squalls, cyclones, 'tempestades,' &c., which are confined to particular localities, and will be found noticed under other heads, and also under STORMS.

Currents.—The currents of the P. O., though less marked in character and effects than those of the Atlantic, are yet of sufficient importance to require a brief notice. The *Southern Pacific current* takes its rise south of Van Dieman's Land, and flows eastward at the rate of half a mile per hour, dividing into two branches about long. 98° W., the northern branch or *Current of Mentor* turning northward, and gradually losing itself in the counter equatorial current; the southern branch continuing its eastward course till it is subdivided by the opposition of Cape Horn into two branches, one of which, *the cold Current of Peru* or *Humboldt's current*, advances northward along the west coast of South America, becoming finally absorbed in the equatorial current; the other washing the coast of Brazil, and becoming an Atlantic current.

The P. O., like the Atlantic, also possesses its equatorial current, separated into a northern and southern current by the equatorial counter-current. It sweeps across the whole ocean from east to west. Two subdivisions of the southern current, called respectively the 'current of Rossel' and the 'warm current of Australia,' flow, the one through the Polynesian Archipelago to New Guinea and the other along the east coast of Australia. The northern equatorial current, after reaching the coast of Asia, turns north-east, washing the shores of China and Japan, under the name of the *Black* or *Japan current;* it then sends off a branch along the coast of Kamtchatka, and advances eastward till it becomes lost on the north-west coast of North America. There are other minor currents, the most remarkable of which is that of Fleurieu, which describes a kind of irregular circle with a radius of about 240 miles. It is situated in lat. 25°—40 N., and long. 133°—155° W. All these currents have their corresponding counter-currents.

There are two 'sargassos' or weedy seas of considerable extent in the P. O., one lying 15° east-south-east of New Zealand; the other, and by far the larger, about 15° west of San Francisco in California. There is also a large region lying nearly half-way between Cape Horn and New Zealand, which seems to correspond to the deserts on land, as mariners report it almost wholly destitute of any signs of life either in sea or air.

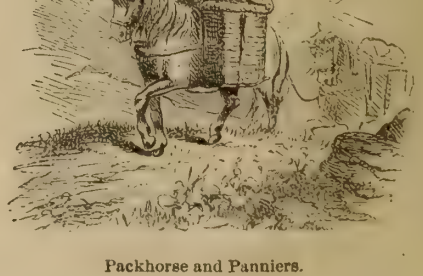
History.—The existence of this ocean first became known to Europeans through Columbus, who had received accounts of it from some of the natives of America, though it was first seen by Balboa, September 29, 1513, and first traversed by Magellan eight years afterwards; but its size, limits, and the number and position of its islands, &c., were little known till long afterwards. Captain Cook deserves the first place among the investigators of the P. O.; and after him come Anson, the two Bougainvilles, La Perouse, Carteret, Vancouver, Kruzenstern, Kotzebue, &c. But the most thoroughly scientific examination of its physical condition is that accomplished by the *Challenger* Expedition of 1873–76.

PACI'NIAN CORPUSCLES are very remarkable structures appended to the nerves. In the human subject, they are found in great numbers in connection with the nerves of the hand and foot, and sparingly on other spinal nerves, and on the plexuses of the sympathetic, but never on nerves of motion. They always present a *proximal end*, attached to the nerves by a stalk of fibrous tissue prolonged from the neurilemma, and occasionally one-tenth of an inch long; and a *distal end*, lying free in the connective or areolar tissue. In the human subject, the corpuscles vary in length from one-twentieth to one-tenth of an inch. They are usually seen very readily in the mesentery of the cat, appearing as pellucid oval grains, rather smaller than hemp-seed.

The microscopic examination of these bodies discloses an internal structure of a very remarkable kind. They consist, first, of a series of membranous capsules, from thirty to sixty or more in number, enclosed one within the other; and secondly, of a single nervous fibre, of the tubular kind, enclosed in the stalk, and advancing to the central capsule, which it traverses from beginning to end, and where it finally terminates in a fixed swollen extremity. The ten or fifteen innermost capsules are in contact with one another, while the rest are separated by a clear space containing fluid, which is so abundant as to constitute far the largest portion of the bulk of the entire corpuscle. Such are the views of Pacini (as given in the *Nuovi Organi Scoperte nel Corpo Umano*, 1840), who is usually regarded as their discoverer, although they had been noticed and roughly described nearly a century before by Vater, of Henle, and of Todd and Bowman; but later observations made by Huxley, Leydig, Kölliker, and others, show that the question of their true nature is still an open one. Huxley asserts that their central portion is solid, and not hollow; that in birds, and in the human hand, there is no fluid between the laminæ—and indeed, that the laminæ themselves have no real existence—the Pacinian corpuscle being merely a solid mass of connective tissue (a thickened process of the neurilemma of the nerve to which it is attached), whose *apparent lamination* depends on the regular disposition of its elastic elements. For a full description of the present state of knowledge as to the structure and function of these remarkable nerve-endings, see Quain's *Anatomy*, vol. ii.; *Histology*, by E. A. Schafer.

PACKFO'NG, or PETO'NG, a Chinese alloy or white metal, consisting of arsenic and copper. It is formed by putting two parts of arsenic in a crucible with five parts of copper turnings, or finely divided copper; the arsenic and copper require to be placed in alternate layers, and the whole is covered with a layer of common salt, and pressed down. When melted, the alloy contains nearly the whole of the arsenic, and is yellowish-white in color when in the rough state, but takes a fine white polish resembling silver. It is not very ductile, and cannot be fused without decomposition, as the arsenic is easily dissipated. It was formerly much used in this country, as well as China and India, for making the pans of small scales, dial-plates, and a variety of other articles requiring nicety of make, such as graduated scales for philosophical instruments. It is probably never imported now, the nickel alloys of Europe having quite superseded its use; in China, however, it is still extensively employed.

PA'CKHORSE, a horse employed in the carriage of goods, which are either fastened on its back in bundles, or, if weighty,



Packhorse and Panniers.

are placed in panniers, slung one on each side across the horse's back. The saddle to which the bundles were fastened consisted of two pieces of wood, curved so as to fit the horse's back, and joined together at the ends by other two straight pieces. This frame was well padded underneath, to prevent injury to the horse's back, and was firmly fastened by a girth. To each side of the saddle, a strong hook was attached, for the purpose of car-

ying packages, panniers, &c. Panniers were sometimes simply hung across the horse's back with a pad under the band. The panniers were wicker baskets, and of various shapes, according to the nature of their usual contents, being sometimes long and narrow, but most generally having a length of three feet or upwards, a depth of about two-thirds of the length, and a width of from one to two feet (see fig.). The packhorse with panniers was at one time in general use for carrying merchandise, and for those agricultural operations for which the horse and cart are now employed; and in the mountainous regions of Spain and Austria, and in other parts of the world, it still forms the sole medium for transport; though the mule has, especially in Europe, been substituted for the horse.

An army requires to be accompanied by several thousand pack-animals, sometimes horses, but preferably mules; and in Asia, commonly camels, or even elephants. Pack-saddles are variously fitted, according to the objects to be carried: some for provisions or ammunition; others for carrying wounded men, tents, and, in mountain-warfare, even small cannon. In battle, the immediate reserves of small-arm ammunition are borne in the rear of divisions by pack-animals; the heavy reserves being in wagons between the army and its base of operations.

PACOURY-UVA, a sweet and delicious Brazilian fruit, a large berry, produced by the *Platonia insignis*, a tree of the natural order *Clusiaceæ*. The seeds have the taste of almonds.

PACTO'LUS, anciently the name of a small brook of Lydia, in Asia Minor, which rises on the northern slope of Mount Tmolus (modern *Buz Dagh*), flows north past Sardis (*Sart*), and empties itself into the Hermus (*Kodus*). It is never more than ten feet broad, and one foot deep. The sands or mud of P. were long famous in antiquity for the particles of gold dust which they contained, and which are supposed to have been carried down by its waters from the bosom of Tmolus—a hill rich in metals. The collection of these particles, according to legend, was the source of Crœsus's vast wealth. But as early even as the time of Strabo, P. had ceased to yield any of the precious dust. The brook is now called *Sarabat*.

PA'CTUM ILLI'CITUM is, in the law of Scotland, a contract or agreement for some illegal purpose, i. e., a purpose either expressly prohibited by statute, or by the general policy of the law. Thus, an immoral contract between a man and woman would be held void on the ground, that the law discountenances practices *contra bonos mores*. A contract between a client and agent, called a *pactum de quota litis*, whereby a share of the property which is the subject of litigation is given to the agent instead of his usual fees, is void in most cases; though it is often difficult to determine what contracts fall within this rule. The courts, however, have construed very jealously every contract which tends to corrupt the administration of the law, and hence an agreement between a town and country agent to divide the profits has been held a *pactum illicitum*. So agreements by a client to give an excessive sum to his law-agent as a gift have been often set aside.—In England, similar doctrines prevail, though the phrase *pactum illicitum*, which was borrowed from the Roman law, is not used, contracts of this description being technically described as illegal contracts.

PADA'NG, the capital of the Dutch government of the west coast of Sumatra, is situated in 0° 59′ 30″ S. lat., and 100° 20′ 30″ E. long., and has about 12,000 inhabitants. The Padang flows through the town, but is only navigable for small vessels, the larger requiring to anchor in the roadstead, about three miles distant. On the left bank, stand the houses of the natives, unsightly bamboo erections, elevated about eight feet from the ground by posts of the cocoa-nut tree, and covered with leaves. The government buildings, houses of the Europeans and Chinese, &c., are on the right, and mostly built of wood or stone, and roofed with tile. P. is picturesquely enclosed by a semicircle of mountains, behind which rises a loftier chain, two being volcanoes. There are a Protestant church, a Roman Catholic church, flourishing schools, a fort, military hospital, government workshops, large warehouses, &c. An agent of the Netherlands Trading Company (q. v.) resides at Padang. Being the center of the exports and imports of Sumatra's west coast, P. has a lively trade, not only with Java, the other islands of the Eastern Archipelago and Europe, but also with the interior of the island.

The climate is considered healthy, although the heat is great. Colonel Nahuys found the thermometer range from 70° to 80° at 6 A.M., from 82° to 88° at noon, 84° to 90° at 2 P.M., 78° to 84° at 6 P.M., and from 72° to 80° at 10 in the evening.

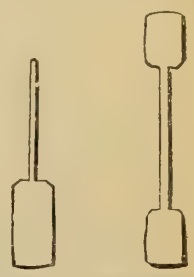
The governor resides at a country-house about two and a half miles above P., and rules over a territory stretching from the Residency of Bencoolen (which has a population of 112,000 souls, and stands immediately under the government at Batavia), northwest over seven degrees of latitude. It is divided into the residencies of Lower Padang, Upper Padang, and Tapanoeli (Tapanuli); the population in 1870 being 1,600,730 natives, 2178 Europeans, and nearly 3000 Chinese.

Lower Padang was the first district of the west coast of Sumatra which submitted to the Dutch, who had formed a settlement at Padang as early as 1660, and by repeated wars, gradually extended their territory.

Upper Padang lies to the north-west of the lower province, from which it is separated by a chain of lofty mountains, some of which, as the Singalang, Merapie, and Sago, attain to nearly 10,000 feet in height; Merapie being an active volcano, the last eruptions of which were in 1845 and 1855, though it sent forth volumes of smoke in 1861. This residency possesses the most lovely districts of the island, or of any tropic land, the mountain slopes being studded with villages, rice-fields, cocoa-nut and coffee trees, of which last, it is calculated that there are 32,000,000 in Upper Padang. In addition to the coffee-culture, gambier, cassia, pepper, ratan, indigo, caoutchouc, &c., are largely produced, and gold, iron, copper, lead, and quicksilver are found. In the district of Tanah Datar is the town of Paggeroejong, formerly the capital of the powerful kingdom of Menangkabo, and the residence of the king.

Tapanoeli, the remaining residency under the government of Sumatra's west coast, lies north-west from Upper Padang. The independent spirit of the inland natives has caused the Netherlanders much trouble, but each fresh outbreak only extends their territory and power further into the interior, and towards the north-west of the island.

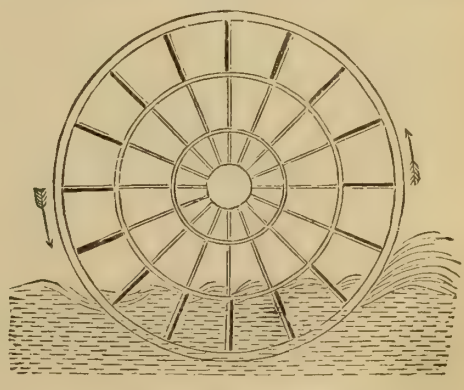
PADDLE, probably the precursor of the OAR (q. v.), and still its substitute among barbarous nations, is a wooden implement consisting of a wide flat blade with a short handle, by means of which the operator spoons the water towards him. In canoes for only one sitter, a double paddle is generally used, which is dipped alternately on either side: the inhabitants of Greenland are especially skilful in this operation. The action of the paddle is the same as that of the oar. The paddle has however, one advantage—viz., that the rower faces the bow of his boat, and therefore sees what is before him. In threading narrow streams, &c. this is an appreciable gain.



Paddle. Double Paddle.

PADDLE-WHEEL—one of the appliances in steam-vessels by which the power of the engine is made to act upon the water and produce locomotion—is a skeleton wheel of iron, on the outer portion of whose radii flat boards, called floats or paddles, are fixed, which beat upon the water, and produce, continuously, the same effect as is given, in an intermittent manner, by the blades of oars. The use of paddle-wheels in conjunction with steam as a motive-power dates from about the commencement of the present century, but the employment of the paddle-wheel itself is as ancient as the time of the Egyptians. A specimen is also known to have been tried in Spain in the 16th century.

The fig. shows the usual form of paddle-wheel, that called the radial, in which the floats are fixed. It will be seen that a certain loss of power is involved, as the full force of the engine on the water is only experienced when the float is vertical, and as on entering and leaving the water the power is mainly employed in depressing or lifting the particles of water. This objection has

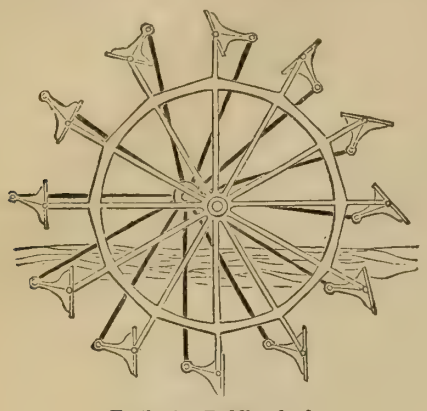


Ordinary Paddle-wheel.

great force at the moment of starting, or when progress is very slow, as is illustrated by the small power a paddle-steamer evinces when trying to tug a stranded vessel off a sandbank; but when in full progress, the action is less impeded by this circumstance, the water in front of the wheel being depressed, and that abaft being thrown into the form of a wave. The extent of the immersion much influences the economy of power, as will be readily

understood if the consequences of immersion up to the center of the wheel be imagined. An immersion somewhat over the top of the lowest float is about the most advantageous, and in order that the floats may be as nearly as possible vertical when they strike the water, it is advisable to give the wheel as large a diameter as possible, and to place the axis at the highest available point in the vessel.

To overcome the drawbacks to the radial wheel, Elijah Galloway patented, in 1829, the *Feathering Paddle-wheel*, in which the floats are mounted on axes, and are connected by rods with a common center, which revolves upon a pin placed eccentrically to the axis of the paddle-wheel. By this method, the floats are



Feathering Paddle-wheel.

kept, while immersed, at right angles to the surface of the water. So long as the water is smooth the gain is great, consequently feathered floats are much used in river-steamers; but for ocean-steamers the liability to derangement, perhaps at a critical period, is a great objection to their use.

The paddle-wheel, in revolving, imparts both a forward velocity to the vessel and a backward velocity to the water. The latter is called the *slip*, and sometimes bears a very large and wasteful proportion to the former. The absolute velocity of the paddle floats is equal to the sum of the slip and the forward motion of the ship, so that the wheel always revolves faster than the ship makes way.

PADDY, or PADDIE, the name commonly applied in India to rice in the husk. It is the Tamul and the Malay name. See RICE.

PADE'LLA (Ital. a frying-pan; plur. *padelle*), a shallow vessel of metal or earthenware used in illuminations. The illumination of St. Peter's at Rome, and other buildings in Italy, is effected by the tasteful arrangement of large numbers of these little pans, which are converted into lamps by partly filling them with tallow or other grease, and placing a wick in the center. This mode of illuminating was first adopted on a large scale in Great Britain on the occasion of the marriage of the Prince of Wales with the Princess Alexandria, when the inhabitants of Edinburgh produced by this means a most magnificent illumination of their city.

PA'DERBORN, the chief town of a district in the Prussian province of Westphalia, situated in 51° 43′ N. lat. and 8° 45′ E. long., in a pleasant and fruitful district, is built at the source of the Pader, which bursts forth from below the cathedral with sufficient force to drive mills within 20 paces of its point of exit. Pop. (1880) 14,689. P. has narrow dark old-fashioned streets, presenting no special attractions, although it has some interesting buildings, as, for instance, the fine old cathedral, completed in 1143, with its two magnificent façades, and containing the silver coffin in which are deposited the remains of St. Liborius. It is the seat of a bishop and chapter, and of an administrative court. The manufactures of P., which are not very considerable, include tobacco, starch, hats, and wax-cloths, and there are several breweries, distilleries, and sugar-refineries in the town, which carries on a considerable trade in cattle, corn, and oils. P. is one of the important stations on the Great Westphalia Railway.

P., which ranked till 1803 as a free imperial bishopric, owes its foundation to Charlemagne, who nominated the first bishop in 795. Several diets were held during the middle ages at P., which at that period ranked as one of the most flourishing of the Hanseatic Cities, while it was also numbered among the Free Imperial Cities. In 1604, it was forcibly deprived by the prince-bishop, Theodor of Fürstenburg, of many of the special rights and prerogatives which it had enjoyed since its foundation, and compelled to acknowledge the Roman Catholic as the predominant church, in the place of Protestantism, which had been established during the time of Luther. In 1803, P. was attached as an hereditary principality to Prussia, and after being for a time incorporated in the kingdom of Westphalia, was restored to Prussia in 1813, and incorporated in the Westphalian circle of Minden.

PA'DIHAM, a large chapelry and township, in the higher division of the hundred of Blackburn, seated on an eminence springing from the north bank of the Calder, and reached by the Rose Grove station of the Lancashire and Yorkshire Railway, and also by the Leeds and Liverpool Canal. It is about 9 miles north-east of Blackburn. The cotton trade employs a great proportion of the population—with Hapton (1881) 8983—but coal-mines and extensive quarries also add to industrial activity and the prosperity of P.; which has been greatly improved in appearance recently by several new streets.

PADILLA, JUAN DE, one of the most popular heroes in Spanish history, was a scion of a Toledan family, and was appointed by the Emperor Charles V. military commandant of Saragossa. While he was so employed, a formidable rebellion, caused by the excessive taxes which the emperor imposed on the Spaniards, to defray the cost of his various wars in Italy, Germany, and the Low Countries, broke out among the towns (*communidades*) of Castile, and the rebels, who were known as *communeros*, called upon P. to put himself at their head. The introduction of the religious element into the quarrel tended greatly to strengthen the insurgents, and for an instant P. was the ruler of Spain, and formed a new junta to carry on the government. He was successful in a number of enterprises undertaken against the royalist party; but on the 23d April 1521, was completely beaten by the royalists at Villalos. This conflict decided the fate of the rebellion and of P. himself, who was taken prisoner, and next day beheaded.

His wife, DONA MARIA DE PACHECO, rallied the wrecks of the rebel army, and for a long time held Toledo against the royalist besieging army, and after its fall, retired to Portugal, where she died soon afterwards. With P. and his wife expired the last remnant of the ancient freedom of Spain. Numerous poems and dramas celebrate their deeds.

PADI'SHAH, in Turkish PADISHAG (Persian *padi*, protector or throne, *shah*, prince), one of the titles of the Sultan of the Ottoman Empire, and of the Shah of Persia. Formerly, this title was accorded only to the kings of France among European monarchs, the others being called *Kral*, king. It was subsequently allowed to the Emperor of Austria, and still later, by a special article in the treaty of Kutshuk-Kainardji (10th January 1775), to the autocrat of All the Russias. Of late it has been accorded to the monarchs of all the great European nations, and even to those of secondary states.

PADRO'N, a very ancient town of Spain, in the province of Coruña, 15 miles south-west of Santiago, on the Sar, a few miles from the coast. P. being the place at which the body of Santiago is said to have landed itself, was formerly an important place of pilgrimage. Pop. (1877) 8424.

PA'DUA (Ital. *Padova*), capital of the province of the same name in Northern Italy, stands on a beautiful plain on the Bacchiglione, 23 miles by railway west-south-west of Venice. It is surrounded by walls and ditches, and is fortified by bastions. Its houses are lofty, supported for the most part on long rows of arches, generally pointed; and most of its streets, especially in the older quarters, are narrow, dark, dirty, and ill-paved. There are, however, several handsome gates, as those of San Giovanni, Savonarolo, and Falconetto; a number of fine squares, of which the Prato della Valle is the largest and the finest, and is surrounded by a stream, and planted with trees; and several magnificent buildings. Of these, the Café Pedrocchi is esteemed the finest edifice of the kind in Italy.

Portions of a Roman edifice were discovered while the foundations of this building were being made, and the marbles found now adorn the pavements, &c., and the *salone*. The Palazzo della Municipalità, built 1172—1219, is the most peculiar and most national in the city. It is an immense building, forming one side of the market-place, rests wholly on arches, and is surrounded by a loggia (q. v.). Its east end is covered with shields and armorial bearings, and its roof is said to be the largest unsupported by pillars in the world. Its hall is 267½ feet long, and 89 feet wide, is covered with mystical and metaphorical paintings, and contains a monument of Livy, the Roman historian, and a bust of Belzoni, the traveler, both natives of this city. The other chief edifices are the cathedral, the church of Sant' Antonio, a beautiful building in the Pointed style, with several Byzantine features, and remarkably rich and splendid in its internal decorations; and the churches of San Giorgio and of Santa Giustina; all of them richly decorated with paintings, sculptures, &c. The university of P., the most famous establishment in the city, was celebrated as early as the year 1221. It embraces 61 professers and other teachers, and is attended by about 1000 students. Connected with the university are an anatomical theater and a botanic garden, both dating from the 16th c., and each the first of its kind in

Europe. There is also a museum of natural history, an observatory, a chemical laboratory, and a library of 120,000 volumes and 1500 manuscripts. There are also numerous palaces, theaters, and hospitals. Pop. (1881) 72,174.

P., the Roman *Patavium*, is one of the most ancient towns of of Italy. According to a wide-spread belief of antiquity, alluded to by Virgil, it was founded by the Trojan chief Antenor, but we really know nothing of its history until it became a Roman town. During the first centuries of the empire, it was the most flourishing city in the north of Italy, on account of its great woollen manufactures, and could return to the census more persons wealthy enough to be ranked as *equites* than any other place except Rome. But in 452 Attila utterly razed it to the ground. It was, however, rebuilt by Narses, again destroyed by the Lombards, but once again rose from its ashes, and became a very famous city in the middle ages. It fell into the hands of the Carrara family in 1518, and in 1405 it was conquered by Venice, the fortunes of which it has since shared.

PADU'CAH, a city of Kentucky, U. S., on the south bank of the Ohio River, just below the mouth of the Tennessee River, 322 miles below Louisville. It is the entrepôt of a fertile country, and has a large trade by the rivers, the Louisville, Paducah, and South-western, and the Paducah and Memphis Railways. It contains county buildings, 4 banks, 3 shipyards, steam saw-mills, extensive manufacturing establishments, and 15 churches. Pop. (1880) 8376.

PADU'LA, a town of South Italy, in the province of Salerno, 52 miles south-east of the town of Salerno, in a mountainous district. Below P. are the ruins of the once famous and magnificent monastery, *La Certosa di S. Lorenzo*, despoiled by the French during the occupation of Calabria. Pop. (1861) 8556.

PÆ'AN (of doubtful etymology), the name given by the ancient Greeks to a kind of lyric poetry originally connected with the worship of Apollo. The oldest pæans, as we learn from Homer, appear to have been either hymns, addressed to that deity for the purpose of appeasing his wrath (*Iliad*, i. 473), or thanksgiving odes, sung after danger was over and glory won (*Iliad*, xxiii. 391). Nevertheless, at a later period, they were addressed to other deities also. Thus, according to Xenophon, the Lacedæmonians sung a pæan to Poseidon after an earthquake, and the Greek army in Asia one to Zeus.

PÆDO-BAPTISM. See BAPTISM, INFANT.

PÆ'ONY (*Pæonia*), a genus of plants of the natural order *Ranunculaceæ;* having large flowers, with five persistent, unequal, leafy, and somewhat leathery sepals, 5—10 petals, many stamens, and 2—5 germens, which are crowned with a fleshy recurved stigma. The leaves are compound, the leaflets often variously and irregularly divided. The fibres of the root are often thickened into tubers. The species are large herbaceous perennials, or rarely half-shrubby; natives of Europe, Asia, and the north-west of America. None of them are truly indigenous in Britain, although one (*P. corallina*) has found admittance into the English Flora. On account of the beauty of their flowers, some of them are much cultivated in gardens, particularly of the COMMON P. (*P. officinalis*), a native of the mountain-woods of the south of Europe, with carmine or blood-red flowers. A variety with double flowers is common.—The WHITE P. (*P. albiflora*) is another favorite species. It is a native of the central parts of Asia. Its flowers are fragrant.

The TREE P., CHINESE P., or MOUTAN (*P. Moutan*), is a half-shrubby plant, a native of China and Japan. In favorable circumstances, it attains a very large size, and a height of twelve feet or more. It has been long cultivated in China and Japan; and is now also a favorite ornamental plant in the south of Europe, and in the south of England and Ireland; but the late spring-frosts of most parts of Britain are injurious to it, although it can bear severe frost in winter, when vegetation is at a stand. It flowers in spring. The varieties in cultivation are numerous. It is propagated by cuttings, and also by grafting. Its germens are surrounded by a cup-shaped laciniated membrane.—The roots of most of the pæonies have a nauseous smell when fresh, and those of the common P. were in high repute among the ancients as an antispasmodic—hence the name Pæony, from *Paion*, a Greek name of Apollo, the god of medicine—but their medicinal properties are now utterly disregarded. The globose, shining black seeds of pæonies were formerly, in some countries, strung into necklaces, and hung around the necks of children, as *anodyne necklaces*, to facilitate dentition. The Daurians and Mongolians use the root of *P. albiflora* in their soups, and grind the seeds to mix with their tea.

PÆ'STUM, anciently a Greek city of Lucania, in Southern Italy, in the present province of Salerno on the *Sinus Pæstunus*, now the Gulf of Salerno, and not far from Mount Alburnus. It was founded by the Trœzenians and the Sybarites, some time between 650 and 610 B.C., and was originally called Poseidonia (of which *Pæstum* is believed to be a Latin corruption), in honor of Poseidon (Neptune). It was subdued by the Samnites of Lucania, and slowly declined in prosperity after it fell into the hands of the Romans, who established a colony here about 273 B.C. The Latin poets celebrate the beauty and fragrance of its flowers, and particularly of its roses, which bloomed twice a year. Wild roses, it is said, still grow among its ruins, which retain their ancient property, and flower regularly both in May and November. P. was burned by the Saracens in the 10th c., and there is now only a small village called Pesto, in a marshy, unhealthy, and desolate district; but the ancient greatness of the city is indicated by the ruins of temples and other buildings. These appear to have been first noticed in the early part of the 18th c., by a certain Count Gazola, in the service of the king of Naples; they were next described by Antonini, in the work on the topography of Lucania (1745), and have since been visited by travelers from all parts of Europe.

PAGA'NI, an uninteresting town of South Italy, province of Salerno. In the church of St. Michele is the tomb of Alfonzo de' Liguori, founder of the order of the Redemptionists, who died here, 1787. The body is preserved in a glass case. Pop. about 12,000.

PAGANINI, NICOLO, a famous violinist, son of a commission-broker at Genoa, where he was born in 1784. His musical talent showed itself in his childhood; in his ninth year, he had instructions from Costa at Genoa, and afterwards from Rolla at Parma, and from Ghiretti. In 1801, he began his professional tours in Italy; in 1828, he created a great sensation on appearing for the first time in the principal towns of Germany; and in 1831, his violin-playing created an equal *furor* in Paris and London. His mastery over the violin has never been equalled, but he was too much addicted to using it in mere feats of musical legerdemain, such as his celebrated performance on a single string. His execution on the guitar was also very remarkable; for four years he made that instrument his constant study. P. died at Nice in 1840, leaving a large fortune.

PA'GANISM, another name for Heathenism or Polytheism. The word is derived from the Latin *paganus*, a designation of the inhabitants of the country (*pagus*), in contradistinction to the inhabitants of towns, the more educated and civilized inhabitants of towns having been the first generally to embrace Christianity, whilst the old polytheism lingered more in remote rural districts.

PAGE (derivation variously assigned to Gr. *pais*, a boy and Lat. *pagus*, a village), a youth employed in the service of a royal or noble personage. The practice of employing youths of noble birth in personal attendance on the sovereign, existed in early times among the Persians, and was revived in the middle ages under feudal and chivalric usages. The young nobleman passed in courts and castles through the degree of page, preparatory to being admitted to the further degrees of esquire and knight. The practice of educating the higher nobility as pages at court, began to decline after the 15th c., till pages became what they are now, mere relics of feudal usages. Four pages of honor, who are personal attendants of the sovereign, form part of the state of the British court. They receive a salary of £200 a year each, and on attaining a suitable age, receive from her Majesty a commission in the Foot Guards.

PAGET, FAMILY OF. This noble family, though said to be of Norman extraction, do not trace their descent further back than the reign of Henry VII., in whose time, one William P. held the office of one of the sergeants-at-mace of the city of London. His son William, who was educated at St. Paul's School, and at Cambridge, was introduced into public life by Stephen Gardiner, Bishop of Winchester, early in the reign of Henry VIII., who sent him abroad to obtain the opinions of foreign doctors as to his contemplated divorce from Catharine of Aragon. From this time forth his rise was rapid, and he was constantly employed in diplomatic missions until the death of the king, who appointed him one of his executors. He now adhered to the party of the Protector Somerset, and was raised to the peerage in 1552, as Lord Paget of Beaudesert. He shared in the power, and also in the fall of the Protector, and was heavily fined by the Star Chamber, who also deprived him of the insignia of the Order of the Garter. His disgrace, however, was not of long continuance, and a change taking place in the councils of his opponents, he soon obtained his pardon. On the accession of Queen Mary, he was sworn a member of the privy council, and obtained several large grants of lands. He retired from public life on the accession of Elizabeth, who regarded him with much favor, though he was a strict Roman Catholic. The representative of the family adhered to the cause of Mary Queen of Scots, and suffered, in consequence, the confiscation of his property.

The fifth Lord P. so far departed from the traditionary policy of the family as to accept from the parliament the lord-lieutenancy of Buckinghamshire; but he returned to his allegiance

shortly afterwards, and held the command of a regiment under the royal standard at the battle of Edgehill. His grandson was advanced to the earldom of Uxbridge, but this title becoming extinct, the representation of the family devolved on a female, who carried the barony of Paget by marriage into the house of Bayly. The son of this marriage, however, having assumed the name of Paget, obtained a renewal of the earldom of Uxbridge, and the second earl, for his gallantry at Waterloo, was advanced to the marquisate of Anglesey. Of late years, the P. family have usually held three or four seats in every parliament, and they have constantly supported the liberal party.

PA'GING-MACHINE. Several machines have been made for paging books and numbering banknotes, cheques, railway-tickets, and other similar papers. The great object of these machines is to prevent the chance of error or fraud by making it impossible that a page, cheque, &c. can be abstracted or lost without detection. Messrs. Waterlow and Sons of London perfected an ingenious machine, by which pages of books, such as ledgers and other commercial books, and banknotes, &c., are numbered in regular succession. The numbers are engraved on metal rowels, usually of steel or brass. A series of these rowels are so arranged, that when the machine is worked, the numbers must be impressed on the paper in regular succession from 1 to 99,999; and it is impossible to produce a duplicate number until the whole series has been printed. The instrument is made to supply ink to the types, so that it may be locked in such a manner as to admit of being worked without the chance of its being tampered with.

An extremely ingenious modification of this machine has been perfected by M. Auguste Trouillet of Paris, under the name of 'Numérateur Mécaniqua,' which is not only more simple, but admits of wider application; for it not only pages books and numbers notes, tickets, &c., but can also be used for numbering bales and other packages of merchandise. The instrument has six rowels, on each of which is a set of engraved numbers, so arranged, that their revolutions produce in regular succession the required numbers, by the action of a lever which moves horizontally, and supplies the type with ink as it moves backwards and forwards.

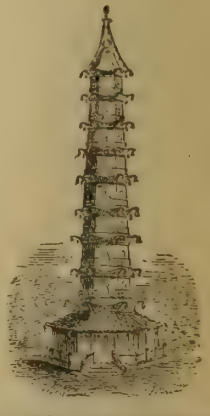
PA'GO, an island belonging to the Austrian crownland of Dalmatia, separated from Croatia by the Morlacca Canal, a channel from two to three miles in width. It is long and narrow, runs parallel to the Croatian coast, and has an area of 108 square miles. Pop. 5150, who are most industrious, and support themselves by vine-culture, the manufacture of salt and fishing.

PAGO'DA (according to some, a corruption of the Sanscrit word *bhagavata*, from *bhagavat*, sacred; but according to others, a corruption of *put-gada*, from the Persian *put*, idol, and *gada*, house) is the name of certain Hindu temples, which are amongst the most remarkable monuments of Hindu architecture. Though the word itself designates but the temple where the deity—especially S'iva, and his consort Durgâ or Pârvatî—was worshiped, a pagoda is in reality an aggregate of various monuments, which, in their totality, constitute the holy place sacred to the god. Sanctuaries, porches, colonnades, gateways, walls, tanks, &c., are generally combined for this purpose, according to a plan, which is more or less uniform. Several series of walls form an enclosure; between them are alleys, habitations for the priests, &c., and the interior is occupied by the temple itself, with buildings for the pilgrims, tanks, porticoes, and open colonnades. The walls have, at their openings, *gopuras*, or large pyramidal gateways, higher than themselves, and so constructed that the gopura of the outer wall is always higher than that of the succeeding inner wall, the pagoda itself being smaller than the smallest gopura. The extent of the enclosing walls is generally considerable; in most instances, they consist of hewn stones of colossal dimensions, placed upon one another without mortar or cement, but with such admirable accuracy, that their joints are scarcely visible. The gateways are pyramidal buildings of the most elaborate workmanship; they consist of several, sometimes as many as fifteen stories.

The pagodas themselves, too, are of a pyramidal shape, various layers of stones having been piled upon one another in successive recession; in some pagodas, however, the pyramidal form begins only with the higher stories, the broad basis extending to about a third of the height of the whole building. The sides of the different terraces are vertical; but the transition from one to the other is effected by a vault surmounted by a series of small cupolas, which hide the vault itself. A single cupola, hewn out of the stone, and surmounted by a globe, generally crowns the whole structure; but sometimes the latter also ends in fantastical spires of a fanlike shape or concave roofs. The pagodas are covered all over with the richest ornamentation. The pilasters and columns, which take a prominent rank in the ornamental portion of these temples, show the greatest variety of forms; some pagodas are also overlaid with strips of copper, having the appearance of gold. The most celebrated pagodas on the mainland of India are those of Mathura, Trichinopoli, Chalambron, Konjeveram, Jaggernaut, and Deogur, near Ellora.—That of Mathura consists of four stories, and is about 63 feet high; its base comprises about 40 square feet. Its first story is made of hewn stones, copper, and covered with gilt; the others with brick.

A great number of figures, especially representing deities, tigers, and elephants, cover the building.—The pagoda of Tanjore is the most beautiful monument of this kind in the south of India; its height is 200 feet, and the width of its basis is equal to two-thirds of its height.—The pagoda of Trichinopoli is erected on a hill, elevated about 300 feet over the plain; it differs in style from other pagodas dedicated to Brahminical worship, and exhibits great similarity with the Buddhistic monuments of Tibet.—The great pagoda of Chalambron, in Tanjore, is one of the most celebrated and one of the most sacred of India. It is dedicated to S'iva and Pârvatî, and filled with representations belonging to the mythical history of these gods. The buildings of which this pagoda is composed cover an oblong square, 360 feet long, and 210 feet wide.—At Konjeveram, there are two pagodas—the one dedicated to S'iva, and the other to Pârvatî.—The pagodas of Jaggernaut, on the north end of the coast of Coromandel, are three; they are erected likewise, in honor of S'iva, and are surrounded by a wall of black stones—whence they are called by Europeans the Black Pagodas—measuring 1122 feet in length, 696 feet in width, and 24 feet in height. The height of the principal of these three pagodas is said to be 344 feet; according to some, however, it does not exceed 120—123 feet.—The pagoda of Deogur, near Ellora, consists also of three pagodas, sacred to S'iva; they have no sculptures, however, except a trident, the weapon of S'iva, which is visible on the top of one of these temples.

The monuments of Mavalipura, on the coast of Coromandel, are generally called the Seven Pagodas; but as these monuments—which are rather a whole city than merely temples—are buildings cut out of the living rock, they belong more properly to the rock-cut monuments of India, than to the special class of Indian architecture comprised under the term pagoda.



Porcelain Tower of Nanking.

The term pagoda is, in a loose way, also applied to those Chinese buildings of a tower-form, which consists of several stories, each story containing a single room, and being surrounded by a gallery covered with a protruding roof. These buildings, however, differ materially from the Hindu pagodas, not only so far as their style and exterior appearance are concerned, but inasmuch as they are buildings intended for other than religious purposes. The Chinese call them *Ta*, and they are generally erected in commemoration of a celebrated personage, or some remarkable event; and for this reason, too, on some elevated spot, where they may be conspicuous, and add to the charms of the scenery. Some of these buildings have a height of 160 feet; the finest known specimen of them is the famous Porcelain Tower of Nanking (q. v.). The application of the name pagoda to a Chinese temple should be discountenanced, for, as a rule, a Chinese temple is an insignificant building, seldom more than two stories high, and built of wood; the exceptions are rare, and where they occur, as at Peking, such temples, however magnificent, have no architectural affinity with a Hindu pagoda.

PAGU'RUS AND PAGU'RIDÆ. See HERMIT CRAB.

PAHLANPU'R, a town of India, capital of the state of the same name, 260 miles east-south-east of Hyderabad. It is a walled town, is the seat of extensive trade and of several manufactures. Pop. estimated at 30,000, many of whom are artificers and shopkeepers. The state of which P. is capital lies between lat. 23° 57'—24° 41' N., and long. 71° 51'—72° 45' E. One-seventh of the population are Moslem, and the remainder Hindus. The state, whose revenue, 1870—1871, was £37,593, pays an annual tribute of £5000 to the Guicowar, and £600 per annum for the maintenance of a British political agent. The exact area of the state is not known; the state, however, contains 300 villages; pop. 216,000. The products are wheat, rice, sugar-cane, and cotton. In the north and west, the soil yields only one crop annually; but in the south and east, three crops are obtained in the year.

PAILA is, according to the Purân'as (q. v.), one of the disciples of Vyâsa (q. v.), the reputed arranger of the Vedas (q. v.), he was taught by the latter the R'igveda, and, on his part, communicated this knowledge to Bâshkali and Indrapramati. This tradition, therefore, implies that P. was one of the earliest compilers of the R'igveda.

PAIN is an undefinable sensation, of the nature of which all persons are conscious. It resides exclusively in the nervous system, but may originate from various sources. Irritation, or excessive excitement of the nervous system, may produce it; it frequently precedes and accompanies inflammation; while it sometimes occurs in, and seems to be favored by, a state of positive depression, as is seen in the intense pain which is often experienced in a limb benumbed with cold, in the pain which not unfrequently accompanies palsy, and in the well known fact, that neuralgia is the common result of general debility. Hence, pain must on no account be regarded as a certain indication of inflammation, although it rarely happens that pain is not felt at some period or other in inflammatory diseases. Moreover, the pain that belongs to inflammation, differs very much, according to the organ or tissue affected; the pain, for example, in inflammation of the lungs, differs altogether in character from that which occurs in inflammation of the bowels, and both these pains from that occurring in inflammation of the kidneys.

Pain differs not only in its character, which may be dull, sharp, aching, tearing, gnawing, stabbing, &c., but in its mode of occurrence; for example, it may be flying or persistent, intermittent, remittent, or continued. It is not always that the pain is felt in the spot where the cause of it exists. Thus, inflammation of the liver or daphragm may cause pain in the right shoulder, the irritation caused by stone in the bladder produces pain at the outlet of the urinary passage; disease of the hip-joint occasions pain in the knee, disease of the heart is often accompanied with pain in the left arm, and irritation of the stomach often gives rise to headache. Pain is differently felt by persons of different constitutions and temperaments, some persons being little sensitive to painful impressions of any kind, while others suffer greatly from slight causes. There even seems to be national differences in this respect; and before the introduction of chloroform, it was a matter of common observation that Irishmen were always more troublesome subjects for surgical operations than either Englishmen or Scotchmen; and the negro is probably less sensitive to pain than any of the white races.

Although in most cases we are to regard pain merely as a symptom to be removed only by means which remove the lesion which occasions it, there are cases in which, although it is only a symptom, it constitutes a chief element of disease, and one against which remedies must be specially directed. As examples of these cases, may be mentioned neuralgia, gastralgia, colic, dysmenorrhœa, and perforation of the intestines; and in a less degree, the stitch of pleurisy, which, if not relieved, impedes the respiration, and the pain of tenesmus, which often causes such efforts to empty the lower bowel, as seriously to disturb the functions of the intestine, and to exhaust the strength.

For the methods of relieving pain, the reader is referred to the articles on the different diseases in which it specially occurs (as COLIC, NEURALGIA, PLEURISY, &c.), and to those on CHLOROFORM, ETHER, INDIAN HEMP, MORPHIA, NARCOTICS, OPIUM, &c.

PAINE, THOMAS, an author famous for his connection with the American and French revolutions, and for his advocacy of infidel opinions, was born 29th January 1737, at Thetford, in the countyof Norfolk, in England. He was trained to the business of his father, who was a staymaker, but afterwards obtained a situation in the Customs, and the management of a tobacco-manufactory. His income, however, was small, and he fell into debt, and was dismissed in 1774, upon which he went to America, was favorably received by a bookseller in Philadelphia, and in 1776 published a pamphlet entitled *Common Sense*, written in a popular style, in which he maintained the cause of the colonies against the mother-country.

The success and influence of this publication were extraordinary, and it won him the friendship of Washington, Franklin, and other distinguished American leaders. He was rewarded by Congress with the appointment of Secretary to the Committee of Foreign Affiairs, visited France in the summer of 1787, where he made the acquaintance of Buffon, Malesherbes, La Rochefoucauld, and other eminent men; and in the autumn following, went to England, where in 1791, he published *The Rights of Man*, the most famous of all the replies to Burke's *Reflections upon the French Revolution*. The work has gone through innumerable editions, and has been translated into almost all the languages of Europe. His defence of the principles of the French Revolution against the magnificent assault of Burke and the outcry of the English aristocracy is vigorous, and by no means unsuccessful. But the value or at least the popularity of the work has been injured by its advocacy of extreme liberal opinions. His assaults on the British constitution exposed him to a government prosecution, and he fled to France, where he was admitted to citizenship; and in 1792, the department of Pas-de-Calais elected him a deputy to the National Convention, where he voted with the Girondists. At the trial of Louis XVI., says Madame de Staël, 'Thomas Paine alone proposed what would have done honor to France if it had been accepted—the offer to the king of an asylum in America;' by which he offended the Mountain party; and in 1793, Robespierre caused him to be ejected from the Convention, on the ground of his being a foreigner, and thrown into prison.

During his imprisonment, he wrote *The Age of Reason*, against Atheism, and against Christianity, and in favor of Deism. After an imprisonmeut of fourteen months, he was released, on the intercession of the American government, and restored to his seat in the Convention. He was chosen by Napoleon to introduce a popular form of government into Britain, after *he* should have invaded and conquered the island. But as Napoleon did not carry out his design, P. was deprived of an opportunity of playing the part of legislator for his conquered countrymen. He then retired into private life, and occupied himself with the study of finance. In 1802, he returned to the United States, and died there 8th June 1809. The most complete edition of his works is that by J. P. Mendum (Bost. 1856); the most noted of his numerous biographers is William Cobbett (1796).

PAINS AND PENALTIES. When a person has committed some crime of peculiar enormity, and for which no adequate punishment is provided by the ordinary law, the mode of proceeding is by introducing a bill of pains and penalties, the object of which, therefore, is to inflict a punishment of an extraordinary and anomalous kind. These bills are now seldom resorted to, and the last instance of an attempt to revive such a form of punishment was by the ministers of George IV. against Queen Caroline, an attempt which was signally defeated. When a bill of this kind is resolved upon, it is introduced, and passes through all the stages like any other bill in parliament, except that the party proceeded against is allowed to defend himself or herself by counsel and witnesses. The proceeding is substantially an indictment, though in form a bill.

PAINTER, in naval matters, is the rope by which a boat is fastened to a ship or pier.

PAINTERS' CREAM, a composition used by artists to cover oil-paintings in progress, when they leave off their work; it prevents drying, and the consequent showing of lines where new work is begun. It consists of six parts of fine nut oil, and one part of gum-mastic. The mastic is dissolved in the oil, and then is added a quarter part of acetate, or sugar of lead, finely triturated with a few drops of the oil. When well incorporated with the dissolved mastic, water must be added, and thoroughly mixed. until the whole has the consistency of cream. It is applied with a soft brush, and can easily be removed with water and a sponge.

PAINTING, the art of representing objects to the eye on a flat surface by means of lines and color, with a view to convey ideas and awaken emotions. See ART. As one of the fine arts, painting occupies a prominent place; some claim for it the first place, as combining the chief elements—namely, form, light and shade, and color. As compared, however, with music and poetry, it lacks the important element of movement, the representation being confined, in a great measure, to one aspect and one instant of time. In its ruder and more elementary forms, in which the primary design was to communicate ideas, painting is perhaps the oldest of the arts, older, at all events, than writing (see ALPHABET, HIEROGLYPHICS); and, as a vehicle of knowedge, it possesses this advantage over writing—that no *description*, however minute can convey so accurate and distinct an idea of an object as a pictorial representation, much less make so vivid an impression. Besides this, it is not limited, as writing is, by differences of language, but speaks alike to all nations and all ages.

The great antiquity of painting is proved by remains discovered in Egypt, and by reference to it in ancient writings. It has been ascertained that as early as the 19th c. B.C., the walls and temples of Thebes were decorated by painting and sculpture. Ezekiel, who prophesied about 598 years B.C., refers to paintings in Jerusalem after the manner of the Babylonians and Chaldæans. Though no specimens have come down to us, it is evident that paintings of the highest excellence were executed in Greece. This is proved by what is recorded of them, for the subjects of many of those mentioned required the putting forth in a high degree of all the qualities requisite for the production of the greatest historical works, such as form, grouping, expression, foreshortening. From the immense sums given for paintings, the care with which they were preserved in temples and other public buildings, and from the fact of the high state of sculpture of contemporary periods, as proved by well-known works now extant, it may be deduced that painting, which like sculpture, is based on design or drawing, must have occupied an equally high position. Even the imperfect specimens of painting discovered in Pompeii, where the style and influence of Greek art may be traced to some extent, lead to conclusions highly favorable to the high position of painting in classic times. The chief schools of painting in Greece were those of Sicyon, Corinth, Athens, and Rhodes. The first great artist of whose works there is any authentic description

and from details of which an idea may be formed of his attainments, is Polygnotus of Thasos (flor. 420 B.C.), who painted, among other works, those in the Pœcile, a celebrated portico at Athens, and the Lesche, or public hall at Delphi.

The works of Apollodorus of Athens (flor. 408 B.C.) are described and highly praised by Pliny. Zeuxis, the pupil of Apollodorus, Eupompus, Androcides, Parrhasius (q. v.) the Ephesian, and Timanthes of Sicyon, prosecuted painting with distinguished success, and by them it was carried down to the time of Philip the father of Alexander. Of the same period was Pamphilus, celebrated not only for his works, but as the master of the artist universally acknowledged as the greatest of the ancient painters, Apelles (q. v.), who was born probably at Colophon, and flourished in the latter half of the 4th c. B.C. He was highly esteemed by Alexander the Great, and executed many important works for that monarch. Protogenes of Rhodes was a contemporary, and may be styled the rival of Apelles, who greatly admired his works. His picture of Ialysus the hunter and the nymph Rhodos was preserved for many years in the Temple of Peace at Rome. Art in Greece had now reached its highest point; its course afterwards was downwards.

In Italy, art was followed at a very early period by the Etruscans, and, according to Pliny, painting, as well as sculpture, was successfully practised in Ardea and Lanuvium, cities of Latium, perhaps more ancient than Rome. The finest specimens of Etruscan art, however—as the paintings on tombs, and the remains of armor and fictile ware ornamented with figures, evince unmistakably the influence of, or rather are identical with Greek art. According to Pliny, it was introduced from Corinth about 650 B.C.

No great national school of painting ever flourished in Rome, for though the names of Romans who were painters are cited, the principal works of art that adorned the temples and palaces of Rome were obtained from Greece, and it is probable that many of the paintings executed there were by Greek artists. When the seat of empire was transferred to the East, such art as then remained was carried with it, and in a new phase was afterwards recognized as Byzantine art—a conventional style, in which certain typical forms were adopted and continually repeated. This mode has been preserved, and is practised in church-painting in Russia at this present time.

Much discussion has arisen in modern times as to the supposed technical modes or processes of painting employed by the ancients. It seems established that painting in fresco was much practised; but many of the most valuable pictures we read of were removable, and there are accounts of some carried from Greece to Rome. 'The Greeks preferred movable pictures, which could be taken away in case of fire' (*Wilkinson on Egyptian and Greek Paintings*), and Pliny says Apelles never painted on walls; besides fresco paintings on walls, therefore, there can be no doubt that the ancients painted on boards; indeed, the name *Tabula* or *Tabula picta* proves this, and it seems to be now generally acknowledged that these were executed in tempora—that is, with size, and probably fixed or protected by some kind of varnish, in the preparation of which oil was used; or in encaustic, a process in which wax was employed to fix and give brilliancy and depth to the colors, heat being applied in working with it.

Painting was revived in Europe in the 13th c.; previous to that period, Byzantine artists chiefly were employed. On the conquest of Constantinople by the Latins in 1204, the Byzantine school was broken up, and many Greek artists were transplanted to Italy, where art was now destined to flourish, so the works of the Italians who profited by their instructions, were necessarily, at the commencement, composed in the Byzantine style. The first Italian whose name is associated with the revival of Italian art is Guido of Siena; a work by him, a large Madonna, inscribed with his name and the date 1221, is still preserved in that city. The next is Giunto da Pisa (1236). But Giovanni Cimabue (q. v.) (1240—1300), is commonly styled the founder of the Italian school. Several works of considerable importance are ascribed to him; and though he followed the Byzantine arrangement, he ventured occasionally out of the path, introduced the study of nature in his drawing, and imparted a greater degree of softness to his painting than the Byzantine artists. The influence of Byzantine art was not confined to Italy; it operated in Germany, Bohemia, and France; but there also art began to assume a national character early in the 13th c., and paintings are still preserved at Cologne, dated 1224.

The Italian school of painting, or that style in which so many of the highest qualities of art have been so successfully carried out, received its chief impetus from Giotto (q. v.), the son of Bordone, born in 1276 at Vespignano, near Florence, where he died in 1336. It is said that he was originally a shepherd-boy, and being discovered by Cimabue drawing a sheep on a slate, was instructed by him in painting. His style is distinguished from that of earlier painters by the introduction of natural incidents and impressions, by greater richness and variety of composition, by the dramatic interest of his groups, and by total disregard of the typical forms and conventional style of his predecessors. His influence was not confined to Florence, but extended over the whole of Italy; and works by this artist may be traced from Padua to Naples. Giotto followed Pope Clement V. to Avignon, and is said to have executed many important pictures there, and in other cities in France. The most celebrated of his frescoes now extant are those of Assisi; some noted works by him in that class also remain at Padua, Florence, and Naples. Most of the small easel-pictures ascribed to him are of doubtful authenticity, but some preserved in the gallery at Florence are acknowledged to be genuine. His high powers as a sculptor and architect are also exemplified by works in that city.

Giotto had numerous scholars and imitators, and several of these have left works which show that while they profited by his instruction or example, they were also gifted with original talent. Among these may be noticed Taddeo Gaddi, the favorite pupil of Giotto (born 1300, living in 1352); Simone Memmi (1284—1344); and Andrea Orcagna (1329—1389), one of the artists employed in the decoration of the celebrated Campo Santo at Pisa. Painting in Italy continued to be impressed with the feeling and style of Giotto for upwards of a hundred years; but early in the fifteenth century, the frescoes executed by Masaccio (1401—1443) in the Brancacci Chapel in the Carmelite Church at Florence, clearly prove that it had entered on a new phase, and had come forth strengthened by an important element in which it formerly was deficient, viz., correct delineation of form, guided by the study of nature. These celebrated frescoes, twelve in number, were at one time all ascribed to Masaccio; but it seems now to be acknowledged by judges of art that two of these are by Masolino da Panicale (1378—1415), the master of Masaccio; and three, or probably four, and a small portion of one, by Filippino Lippi (1460—1505). The frescoes by Masaccio, however, are superior to those by Masolino and Lippi, and, indeed, for many of the highest qualities in art, have, as compositions, only been surpassed by Raphael in his celebrated cartoons.

In about a century from Masaccio's time, painting in Italy attained its highest development; but before referring to those artists who are acknowledged as having carried painting to the highest elevation it has attained since the period of the middle ages, it is right to note the names of some of the painters who aided in raising it to that position. The works of Fra Giovanni da Fiesole (1387—1455) are highly valued and esteemed by many critics as the purest in point of style and feeling, and so the best fitted for devotional purposes. Confining his efforts to simple and graceful action, and sweet and tender expression, he adhered to the traditional types, and ventured on none of the bold innovations which were introduced in his time, and carried so far by Masaccio. His example, as regards feeling and expression, influenced many succeeding artists, particularly Pietro Perugino, the master of Raphael (1446—1524), and Francesco Francia of Bologna (1450 or 1453—1517), by both of whom these qualities, united to greatly improved technical power, were brought to high excellence. Giovanni Bellini, the founder of the early Venetian school (1422—1512), has left many admirable works; he had numerous scholars, among them Titian and Giorgione. Domenico Corradi or Ghirlandajo, under whom Michael Angelo studied, successfully followed out that direction given to art by Masaccio, which involved individuality of character and expression in the figures. Andrea Mantegna, of the school of Padua (1430—1506), along with strong expression, gave an impetus to form, modelled on Greek or classic art.

Luca Signorelli of Cortona (about 1440—1521), successfully exemplified powerful action and bold foreshortening, particularly in his frescoes at Orvieto, which, with his other works, are supposed to have strongly influenced the style of Michael Angelo. Antonello da Messina (1447—1496) is said to have been a pupil of Jan Van Eyck, who imparted to him his secret in the preparation and use of oil-colors, the knowledge of which he spread among the Venetians. The above statement, however, as to the exact period at which oil-painting was first introduced, is one attended with much doubt. Painting in colors mixed with oil is mentioned by Italian writers before the period of Van Eyck; painting in tempera, or size, was continued in Italy, particularly in the Florentine and Roman schools, to the time of Raphael; and the transition from the one method to the other has been so gradual, that many judges of art have expressed inability to determine whether the pictures of Perugino, Francia, and Raphael are in oil or tempera, or in both. The practice of painting on canvas, in place of wooden boards or panels, was introdnced and carried on for a considerable time in Venice before it was adopted in other parts of Italy, and canvas is the material best suited for pictures in oil-colors, when they are not of small dimensions; so, on the whole, the conclusion seems to be, that though oil-painting was not unknown in Florence and the south of Italy, painting in tempera was longer practised there than in Venice.

At the time when the painters above referred to flourished, there were many able artists in Germany, whose works are deservedly

very highly prized. Among these, Jan Van Eyck (q. v.), (about 1390—1441), deserves special notice. To him is generally given the credit of being the first painter who used oil in place of size in his colors. His works are remarkable for brilliant and transparent coloring and high finish. He had numerous scholars; among these Justus of Ghent (flor. 1451), Hugo Vander Goes (died 1480)—supposed to be the painter of the celebrated wings of an altar-piece, now at Holyrood Palace, containing portraits of James III. and his queen—Roger of Bruges (1365—1418), Hans Hemling or Memling (died 1489), the best scholar of the Van Eyck school; Quintin Matsys (1450—1529), Jan Van Mabuse (1470—1532), Albert Dürer (q. v.), (1471—1528), Lucas Van Leyden (q. v.), (1494—1533). The career of the two last named extended to the best period of art, and for many high qualities their works strongly compete with those of the ablest of the Italians; while portraits by Hans Holbein (q. v.), (1497—1554), and Antonio More (1512—1588) rank with those of any school or period. The leading qualities in German art are invention, individuality of character, clearness of coloring, and high finish; but they are inferior to the Italians in embodying beauty; their representation of the nude is angular in form and deficient in the elegance and grace attained by the painters of Italy; and in their draperies they do not attain the simplicity and grandeur so remarkable in the works of their southern competitors.

Anything like an account of the artists by whom painting was carried to its highest pitch, of sufficient comprehensiveness to exhibit their peculiar æsthetic qualities, cannot be attempted in so short a notice as this; but that deficiency is in some degree supplied by, and reference is made to, the biographical notices of distinguished painters given in this work under their names. Keeping this reference in view, therefore, the next step is to note the relative positions generally assigned to the most distinguished painters of that period, with reference to the estimation in which their works are now held. Leonardo da Vinci (q. v.), (1452—1519), Michael Angelo Buonarotti (1474—1563), and Raphael or Raffaello Sanzio of Urbino (1483—1520), are universally acknowledged as the three greatest among the Italian artists; but two other names may be added as worthy to be put in an equally high place—those of Titian (q. v.), (1477—1576), and Antonio Allegri, surnamed Correggio (q. v.), (1494—1534). These five painters exhibit in their works, some of them the whole, others the greater portion of the various elements—which in the earlier periods of art had existed apart, and composed distinct styles—united, and more highly developed; while each of them has taken up one of these elements, and carried it not only further than his predecessors had done, but further than it was by his contemporaries, or by any subsequent artist. Thus we see in Leonardo's celebrated picture of the 'Last Supper,' that though he has adopted the traditional style of composition handed down from Giotto's time, and carried out the religious feeling and dignified expression aimed at by the older masters, the whole is deepened and elevated by the manner in which it is worked out—namely, by a mind and hand possessing mastery over all the elements that are combined in the production of the highest works of art.

Michael Angelo was a proficient in all the qualities that constitute a painter, but he carried several of them—viz., grandeur of design, anatomical knowledge, and power of drawing—far beyond all other artists of his own or of later times. Titian and Correggio, again, with great power over every art-element, have each carried one quality further than all other artists—the former, color; the latter, light and shade. Raphael is generally allowed the first place among painters, for, though each of the four artists just referred to carried one, or perhaps two, of the qualities of painting further than he did, he excelled them in every other element but the one for which each was particularly distinguished, and in several of the highest qualities of art he attained to greater excellence than any other artist; the expression of dignity of movement by broad masses and grand lines aimed at in the works of Masaccio, is successfully realized in the cartoons at Hampton Court; and the pictures in which Perugino and Francia so earnestly and successfully embodied female beauty, maternal affection, and infantine purity, are as much inferior to pictures of similar subjects by Raphael as they are above those executed during the decadence of Italian art. Besides the five leading masters just referred to, there were many other Italian artists of great talent, who may be ranged in three classes: 1, the contemporaries of those artists; 2, those influenced by their style; 3, their scholars. Among their contemporaries, the works of Fra Bartolommeo (1469—1517) and Andrea Vanucchi, called Andrea del Sarto (1488—1530), both Florentines, deservedly rank very high. Giorgio Barbarelli, called Giorgione (1478—1511), was, under Bellini, a fellow-pupil of, and is generally styled the rival of Titian; and his works, which are of great excellence, prove that he was worthy of that name.

In class 2, Correggio himself may rank as being influenced by Leonardo's style, but the great prominence of his other qualities makes his style original and independent. On Bernardino Luini about (1460, living in 1530), Leonardo's influence is direct; and as he was an able painter, his pictures are very valuable for embodying many of those qualities in art which Leonardo had so much improved. Sebastino del Piombo, a Venetian (1485—1547), studied under Giovanni Bellini and Giorgione; and after settling in Rome, became intimate with Michael Angelo, who employed him to paint some of his designs, with a view of benefiting by his admirable coloring. His pictures are greatly esteemed, as uniting rich color to grandeur of design. Class 3. All the five leading artists above referred to had pupils or scholars, particularly such of them as, like Raphael, were much engaged in extensive works in fresco, in the execution of which assistants are generally employed. A complete list of these, however, would occupy too much space here. Among the scholars of Michael Angelo, Daniele da Volterra (1509—1566) was the best; and among Raphael's scholars, the first place is generally accorded to Giulio Pippi or Romano (q. v.), (1492—1546). After the first quarter of the 16th c., painting in Italy, except in the Venetian school, showed symptoms of rapid decline; that school, however, continued its vitality longer than any other in Italy, having flourished with all the life of originality during the whole 16th century. This is attested by the productions of many able Venetian painters; but among those, the works of Jacopo Robusti, or Tintoretto (q. v.), (1512—1594), and Paolo Caliari, or Veronese (q. v.) (1528—1588), are by far the most important. The pictures of the former exhibit great vigor in composition, and much richness of color—the former quality evincing the influence of Michael Angelo; the latter, that of Titian.

Veronese ranks before even Tintoretto: his compositions are animated and full, and as a colorist he is a powerful rival to Titian, not aiming at the rich glow of that master's tints, but excelling every artist in producing the brilliancy and sparkling effect of mid-daylight on figures gorgeously attired, and seen against backgrounds enriched with landscape and architecture. The other great schools of Italy, however, as already said, had less vitality than the Venetian, and showed symptoms of decay at the end of the first quarter of the 16th century. Raphael left numerous scholars and assistants; many of these, after his death in 1520, quitted Rome. The pillage of that city by the French under Bourbon in 1527 had also the effect of dispersing them, and this naturally led to the style of Raphael, so far as they could acquire it, being transplanted into other parts of Italy; but Raphael's style was founded on his own peculiar feeling for the beautiful, and on his own peculiar grace; and all that his scholars had acquired or could convey was a mere imitation of his external forms, without the spirit and pure feeling of which these forms are the expression. The imitation of Michael Angelo became the great object with the Florentines; but his scholars and imitators being unable to comprehend his powerful spirit, and not possessing his technical powers and theoretical knowledge, their pictures are merely exaggerated compositions of academic figures. Nor were Correggio's scholars more successful in following his walk, for they exaggerated the peculiarities of his style, which in their hands became affected and insipid. Leonardo's scholars repeated his distinguishing qualities, modified by their own individual peculiarities. (Ruskin made it his work to teach 'the supremacy of five great painters, Turner, Tintoret, Luini, Botticelli, and Carpaccio, despised till he spoke of them.')

The German painters who succeeded Dürer, Van Leyden, and the other celebrated artists of their period, before referred to, endeavored to improve their national style by the study of Italian art, at first attempting to combine the two styles, and afterwards, to the close of the 16th c., devoting themselves exclusively to the study or imitation of the Italian painters. The works of these artists, the worst productions of any school, form a connecting link between those of the famous old German masters and the vigorous, varied, and attractive works of the painters of the Netherlands in the 17th century.

Towards the end of the 16th, and during the first half of the 17th c., a revival of art in Italy was attempted. This was sought for in two ways by two classes of artists; the larger body were known by the name of Eclectics, from their having endeavored to select and unite the best qualities of each of the great masters, combined with the study of nature; the other class were distinguished by the name of Naturalisti, and they aimed at forming an independent style, distinct from that of the earlier masters, based on the indiscriminate imitation of common life, treated in a bold and lively manner. In their development, both classes exercised an influence on each other, particularly the Naturalisti on the Eclectics. Eclectic schools arose in various parts of Italy, but the most celebrated was that at Bologna, founded by Lodovico Carracci (q. v.), (1555—1619), assisted by his two nephews, Agostino Carracci (1558—1602), and Annibale Carracci (1560—1609) the most eminent of the three. Many painters of mark were reared in this school; among those, Domenico Zampieri, called Domenichino (q. v.), (1581—1641), and Guido Reni (q. v.), (1575—1642), were by far the most eminent.

The art of the Eclectics has been greatly overrated. Till recently the leaders of that school were always placed on an equality with the best masters of the early part of the 16th c., and far above any of the painters of the 15th century. These notions have recently undergone a complete change; it is now acknowledged that the attempt of the Eclectics to combine the excellences of various great masters, involves misapprehension with regard to the conception and practice of art, for the greatness of the earlier masters was brought out in their individual and peculiar qualities, the uniting of which implies a contradiction. Michael Angelo Amerighi da Caravaggio (q. v.), (1569—1609) was the founder of the Naturalisti school; he resided principally at Rome, but at a later period went to Naples, Malta, and Sicily. The Naturalisti were in their greatest strength in Naples, where they perseveringly opposed the followers of the Carracci, their leader being Giuseppi Ribera (q. v.), a Spaniard, hence called Spagnoletto (1593—1656). With much of the force of Caravaggio, he united more delicacy and greater vivacity of color. The historical or Scriptural subjects of Salvator Rosa (q. v.), (1615—1673) are in the style of the school of the Naturalisti; but on account of his *genre* pieces and landscapes, Salvator is entitled to occupy the place of the originator of a style noted for certain qualities of poetic feeling. The influence of the school of the Naturalisti had more important results than that of the Eclectics, for it affected to some extent the leading masters of the Spanish school.

At Rome, contemporaneously with Domenichino, Guido, and other leading masters of the schools of the Eclectics and Naturalisti, the three following artists elevated landscape-painting to a high position—Nicholas Poussin (q. v.), a Frenchman (1594—1665); Claude Gelée, also a native of France (1600—1682), called Claude Lorraine (q. v.); and Gaspre Duchet, named Gaspar Poussin (q. v.), born in Rome, but the son of a Frenchman (1613—1675). Among the great masters who occasionally practised landscape-painting as a distinct branch of art, the earliest were Titian and Giorgione; the Carracci (particularly Annibale) carried out their style with considerable success; the landscapes of Domenichino are esteemed, and other scholars of the Carracci turned their attention in that direction. The reputation of N. Poussin is principally based on his figure-pictures, the subjects of which were mythological and Scriptural. Into these pictures he endeavored, with considerable success, to infuse the classical style; but his compositions were generally arranged with a large space of landscape background, which was in many cases not the least important portion of the picture; and these and the pictures he painted falling strictly under the class of landscapes, are distinguished for largeness of style and poetic feeling. Claude and Gaspar directed all their efforts to landscape, and attained to high eminence in that department of art.

The earlier specimens of painting in Spain resemble in style the works of the old German painters, who seem to have disposed of many of their pictures in that country, while Spanish art of the 16th c. was modelled on that of Italy, Titian and Raphael being the masters studied; but when works of the Spanish school are spoken of, those executed in the 17th c. are always understood to be referred to, as it was then that Spanish art became entirely national in feeling and style, and that is the period in which the best works of the school were produced. The two most distinguished Spanish painters are Don Diego Velasquez (q. v.), (1599—1660), and Bartholomé Esteban Murillo (q. v.), (1618—1682). The portraits of the former are characterized by truthful and dignified expression, great breadth and vigorous handling, and rank with the best works of that class of any school; while the Scripture subjects of the latter, which are noted for tender expression, rich color, and powerful light and shade, may be classed with similar works by Rubens and Van Dyck. Spagnoletto, a Spanish painter, has already been referred to as a leading artist of the school of the Naturalisti at Naples. Alonzo Cano (1601—1667), Francisco Zurbaran (1598—1662), and Claudio Coello (born between 1630 and 1640—1693), have a high reputation. No name of a Spanish painter of eminence occurs after the close of the 17th century.

Very soon after the period when the Eclectic and Naturalistic schools arose in Italy, a revival of art also occurred in the Netherlands. This was very different in its effect from the revival in Italy, the only results from which were academical imitation of the older masters, and coarse naturalism, either separately or combined in varied proportions; while the works of the artists of the Netherlands executed about the same period, though they do not exhibit the high qualities found in the compositions of the Italian masters of the best period, possess many new and attractive features—freedom, originality of treatment, attention to the peculiar character of individual life, and the daily intercourse of men with each other in all its variety, and the study of nature, brought out with truth and delicacy of execution. Two important schools of art were established by this movement—the Flemish and the Dutch. The Flemish school flourished in Brabant, where the Roman Catholic faith—then making strenuous efforts to oppose the Reformed religion—still retained and actively employed art in its service. The Dutch school flourished in Protestant and republican Holland, where the artist, having to trust to private encouragement, painted, for the most part, familiar subjects from everyday life; and in place of altar-pieces for churches, and large historical and allegorical pictures for palaces, produced the subjects then in demand—portraits, genre pictures, or works in which life and manners are depicted in various phases—landscapes with and without figures, sea-pieces, battle-pieces, compositions representing hunting, animals, game, &c.

The catalogue of the names of the able artists of these two schools is long; in the Flemish school, those who stand highest are Peter Paul Rubens (q. v.), (1577—1640), Anthony Van Dyck (q. v.), (1599—1641), David Teniers (q. v.) the Younger (1610—1690), F. Snyders (1579—1657). The following are the most eminent in the long list of artists of the Dutch school: Rembrandt (q. v.) (1608—1669), Vanderhelst (1613—1670), Albert Cuyp (q. v.), (1605—1691), Terburgh (1608—1681), A. V. Ostade (1610—1685), J. Ruysdael (q. v.), (1630 or 1636—1681), Hobbima (1629—1670), P. Potter (1625—1654), K. du Jarden (1635—1678), Jan Steen (q. v.), (1636—1689), G. Metzu (1615—1658), F. Mieris (1635—1681), W. Van de Velde (1633—1707), A. Van der Neer (1613—1684), P. Wouvermans (q. v.), (1620—1668).

Painting has been practised for a very long period in France; but there, as in Spain and in Britain, the marked preference shown in early times by the sovereigns of the country for the works of foreign artists, their undervaluing native talent, and their directing it into a channel supplied from a foreign source, had the effect of neutralizing it as the exponent of national feeling Francis I. is acknowledged to have been a patron of art; he had a desire to possess fine works, and he liberally rewarded able artists, but his patronage was almost entirely confined to foreigners.

Louis XIV. did what he could to place French art above that of every other nation; but he had no knowledge of it himself; he did not comprehend its nature and true intention, and imagined that pictures if painted by Frenchmen must necessarily be national, Nevertheless, his influence was, on the whole, highly beneficial to French national art. He always showed himself desirous to employ native rather than foreign talent, and he encouraged and enlarged the Academy of Fine Arts, which had been founded at the commencement of his reign, under the direction of Lebrun. Although in many respects the principles and the regulations of the Academy tended rather to the perpetuation of debased Italian, than to the development of genuine French art; yet the bringing together of a body of influential French artists, was the measure most likely to foster the feeling of nationality and to lead to the foundation of a national school of art. In the 16th c., François Clouet was distinguished as a portrait-painter; and Jean Cousin as a painter, sculptor, and architect. In the 17th c., among many names, those chiefly deserving notice are Simon Vouet, the brothers Le Nain, N. Poussin, Claude Lorraine, Mignard, S. Bourdon, Le Sueur, J. Courtois (called Borgognone), and Coypel. Among these, the works of the brothers Le Nain alone possess national feeling and character, and they are held in very considerable estimation; those of the others were executed under the influence of foreign art; and excepting Claude's splendid landscapes, Poussin's learned compositions, and some of Borgognone's battle-pieces, hold a low position.

The works of Anthony Watteau (1684—1721) are truly national, excellent in execution, and very highly valued, This artist may be classed as at the head of the school of the 18th c.—the period in which art in France became really national. Not only did most of the painters of his school—which lasted till the end of the century when classic art ruled for a time—form their style upon the works of Watteau, but his influence also affected the British school, which arose soon after that of France was developed. Lancret (1690—1742) was the most successful imitator of Watteau; Pater 1696—1736) followed in the same course; Chardin (1699—1779), though influenced by him, had an original style of his own, and his works now stand high. The pictures of Boucher (1704—1770) exhibit the defects of the French school of the 18th c., unredeemed by the delicacy and grace, and high technical execution and truth of Watteau, Chardin, and Greuze (1725—1805), the last of whom sustained the character of French national art, and carried it into the 19th c., when it was re-established, after the classic school of David, founded at the Revolution, and patronized under the empire of the first Napoleon, had in its turn been laid aside. David (q. v.), (1748—1825), the leader of this school, carried his admiration of classic art to the length of substituting the study of statues the works by which the art of the ancients is chiefly known, for that of nature. He had numerous able pupils, several of whom, tired with this constant repetition of conventional form, recurred to nature, extended their range of subjects, and infused new vigor into the French school.

Among many distinguished artists that have maintained the fame of the French School during the present century the follow-

ing names may be mentionned: Géricault, Prud'hon, Leopold Robert, Delaroche (q. v.), Horace Vernet (q. v.), Ary Scheffer (q. v.), Eugène Delacroix (q. v.), and Ingres (q. v.). A number of artists, chiefly pupils of the above, now sustain the high position of French art in every department; while in that of landscape illustrative of French scenery, a branch of art never much studied in past times, great progress has been made, and the rise of this flourishing branch of French art is acknowledged by the French themselves to be due to the works of the English painter Constable, exhibited in Paris in 1824.

The English school was the latest national school that arose in Europe, for although the modern schools of Germany and Belgium are of still later date, having arisen in the present century, still they can scarcely be classed as new schools, but rather as revivals of former national schools. In England, as in France, foreign artists chiefly were in early times employed by the court and the nobles. Henry VIII. competed with Francis I. for the services of the greatest of the Italian artists, and permanently secured those of Hans Holbein, one of the most distinguished of those of Germany. Charles I. liberally patronized Rubens and Van Dyck; and if he had reigned longer, would in all probability, like Louis XIV., have founded a national school. But referring to the separate notices in this work of the foreign artists under their names respectively who were employed in this country, and to the article MINIATURE PAINTING for notice of several eminent native artists in that branch of art, it is only necessary here to touch on the subject of painting in this country from the time it acquired a truly national character.

At the beginning of the 18th c., art in Britain was at the lowest ebb; the career of Sir Godfrey Kneller (q. v.), (1648—1725 or 1726), the last of the foreigners, was drawing to a close; Sir James Thornhill (1676—1734), an Englishman, followed out the decorative kind of art on which Verro, La Guerre, and others were so much employed; but after his death, that debased style finally went down. The time had now arrived for native artists, if there were any entitled to the name, to assert their independence; and accordingly in 1734—1735, as many as from thirty to forty artists combined together in London, and instituted an academy for studying the human figure. About the same time a similar movement was going on in Edinburgh, the contract or indenture for establishing a school of art, dated 18th October 1729, and signed by seventeen artists, besides amateurs, is in the possession of the Royal Scottish Academy. The effort above referred to, of artists combining to found a Life Academy, was mainly due to William Hogarth (1697—1764), who, on this account, and from his first having developed, in a very high degree of excellence in his works, the leading characteristics of the English school, is justly entitled to be considered its founder. This combination led to these important results—it showed the artists their strength, and enabled them, after a probation of thirty-four years, to found the Royal Academy, an institution managed by artists, and intended to support and encourage a national school of art.

The means by which the Royal Academy proposed to attain its purpose were the following: 1, by founding a school where artists may learn their profession; and 2, by instituting an exhibition where, independently of private patronage and support, artists may bring their works directly before the public. Hogarth died four years before the Royal Academy was organized; but he powerfully contributed to its establishment by his exertions in bringing the artists together in 1734, by supporting the modern exhibitions at Spring Gardens, and by ridiculing by his pencil and pen the passion of the cognoscenti of the day for crying up as superior to the modern the doubtful specimens of old art which were largely imported and disposed of at great prices in numerous salerooms established for the purpose in London. As regards technical execution, and indeed in style generally, the English artists were at first indebted to the French school, which, in the commencement of the 18th c., was in great vigor. Hogarth himself, in these respects, looked closely at the works of Watteau, engravings from which were well known in this country in his time; indeed, Watteau's pictures were so greatly admired here that he came over and spent the year 1720 painting in London. But Hogarth, though alive to the qualities in art produced by others, ranks among painters as one of the most original, for he greatly extended the dramatic element in painting, and imparted an originality and vigor to it never before attained; and his example has led to that element being one of the leading features of the English school, as is exemplified in the works of Wilkie (q. v.), Leslie (q. v.), Stuart Newton, Bonington, and others; and those of many distinguished artists of the present day.

In the department of portrait-painting, many of the works of the British school rank with those of Titian, Van Dyck, and Velasquez, such, for instance, as Reynolds's portraits of Nelly O'Brien and Lady Hamilton, Gainsborough's Mrs. Graham and Mrs. Siddons, and some of Raeburn's heads, &c. While in that of landscape, the position of the English school is acknowledged to be very high, its influence now strongly affecting the French school—this is proved by the works of R. Wilson, Gainsborough (q. v.), and Turner (q. v.), the last of whom, for wide range of subject, and rendering of atmospheric effect stands alone; Constable, whose powerful grasp of nature has excited the emulation of the French artists; Calcott (q. v.), Collins (q. v.), Nasmyth, J. Thomson, Muller, and others; and their successors, the artists of the day, who ably represent the English school. Animal-painting has also been elevated to a high position. And an important department, that of Water-color Painting (q. v.), originated in England, and has there attained higher excellence than elsewhere.

Painting is cultivated with success and receives much encouragement in America, but there the features that mark a national school have not yet had time for development. From the close connection between Britain and America, the art of the latter country was naturally influenced by and became assimilated to that of the former. America may, however, justly take credit for having contributed in no small degree to strengthen the British school of art, as several very able members of the Royal Academy were Americans. Benjamin West (1738—1820) was one of the original members, and elected President of the Royal Academy in 1806.

J. S. Copeley (1737—1815), elected R.A. in 1799; his 'Death of Chatham,' and 'Defence of St. Heliers, Jersey, against the French, and Death of Major Pierson at the moment of Victory,' are excellent works, and as such were conserved in the National Gallery, London. C. R. Leslie (1794—1859) was born in London of American parents; but in 1799, went to Philadelphia, where he was educated. Returning to London in 1811, he entered the schools of the Royal Academy; was elected academician in 1826, and professor of painting in 1848. G. S. Newton (1794—1835)—he was admitted a student of the Royal Academy in 1821, and elected academician in 1832. Washington Allston (1780—1843) was elected an associate in 1818, but afterwards returned to America, where he died. With the exception of the last named, the feeling evinced in the works of all these artists, influenced by study and continued residence, was essentially English; indeed few have equalled Leslie and Newton in their power of embodying the various incidents made national by English poets; and in none of their works can anything be set down as contributing in any degree to the foundation of a national American school. There is every reason to think, however, that such a school is being gradually evolved, and will soon be developed.

Already something like originality of a national kind is exhibited in landscape painting, in which some American artists are endeavoring to embody scenes embracing a vast extent of country, or of extraordinary magnitude—such as those met with in the Andes, at Niagara, or exhibited by floating icebergs; and American literature, having now assumed imposing proportions, and great historical events having recently taken place, illustrations of American poetry and pictures of stirring national events will be called forth; and able American artists will doubtless be found to embody them and create a school truly national.

A general survey of painting at the present time exhibits the following aspect and arrangement: 1. A school in Germany, which arose during the present century, ostensibly a revival of the old national, but truly modelled on the early Italian school, the religious element being prominent. Its principal works are mural, of large dimension, and mostly executed in fresco or on a kind of fresco lately invented, called silica or water-glass painting, from a vehicle of that kind being used. Invention, composition, grouping, and powerful and correct drawing, characterize the modern German works; but being of necessity executed from cartoons, they are deficient in that amount of individual expression, and natural color and effect, that can only be attained by a direct and continued reference to the object represented. 2. A Belgian school, which arose in the present century, and is also a revival of the earlier national schools. Some of the Belgian artists lean to the manner of the very early Flemish school, others to that of which Rubens was the head. The greater portion of the Belgian works are easel-pictures, and many of them rank high for individual expression, color, and technical execution.

3. A French school, exhibiting in active operation the various styles that have at different periods prevailed in that country, sometimes modified or adapted to the taste and feeling of the times. The works of the French school of the eighteenth century were utterly condemned by French artists at the close of that and commencement of the present century. They would tolerate nothing but what they called classic art. *L'Ecole classique* as it was styled, was in its turn supplanted by *l'Ecole romantique*. Now, however, all styles are tolerated, even those of foreign schools—for instance, the English school of landscape—and there can be no doubt that, by the extensive range of subject, invention, drawing, and other high qualities the French artists display in their works, they have now raised that school to a very high position. 4. A British school, which has been in existence as a national school nearly as long as that of France, undisturbed by the

convulsions that affected it. Vitality in art is maintained by close reference to nature, and this has all along been the leading characteristic of the English school; while the tendency of the artists at present is, taking advantage of the aid of science, which has lately discovered photography, to study nature with still greater earnestness and care. The high claims of the British school, long denied abroad, are now fully admitted. Formerly, foreigners never classed a British school among those of Europe, but now this is invariably done. One of the most popular writers on art in France, Théophile Gautier, in his work, *Les Beaux-Arts en Europe*, divides the art of the world into four strongly defined zones —viz., Great Britain, Belgium, Germany, and France—Britain being distinguished by 'individuality,' a potent element in art; Belgium, by 'skill;' Germany, by 'ideality;' and France, by 'eclecticism,' or a selection and combination of the qualities of all other schools.

Regarding technical modes or processes of painting, reference is made to the separate notices under FRESCO, ENCAUSTIC, MINIATURE PAINTING. The period when the method of mixing up colors with oil was introduced, and the artists to whom the invention is attributed, have been already alluded to. It is necessary, however, to enter on some details touching the mechanical processes in oil-painting, the branch of the art that occupies the most prominent position; and the practice of cleaning and restoring pictures.

The implements used by a painter in oil are charcoal, chalk, or lead pencils, for drawing the outline; hair-pencils or brushes of various sizes, made of hog's bristles or finer hair, such as sable; a knife or spatula to mix the colors, and a palette or small table of thin wood, to be held in the left hand, on which the colors and tints are placed and mixed; an easel or stand for supporting the the picture is also required, and a light rod for steadying or resting the hand on. Large pictures are always executed on canvas, stretched tightly on a frame, and primed or coated with paint. Small pictures are often painted on boards or panels, generally of hard wood, such as oak or mahogany, and similarly primed or prepared; but canvas, even for small works, seems at present to be generally preferred. Panels are apt to twist, or warp, or split, and in the event of the surface of a picture chipping or breaking off from the ground, the damage can be more easily remedied, and its progress stopped, when the picture is on canvas, by re-lining.

The color of the ground of the canvas or panel has been the subject of much diversity of opinion among artists in different countries and at various periods; and it is certainly a matter of great importance, as it affects the general color of the work, or makes it necessary for the artist to adopt a peculiar style of working. The color of the ground used by the early masters was white, or nearly pure white. This arose from tempera or size being the medium first used in painting, and a pure white ground prepared with size was necessary for that kind of work. This practice, except as regards the Venetian school, continued till the decline of Italian art. Dull red was the universal color adopted in the eclectric, Naturalisti, and late Italian schools, and this is one of the causes of the works of these schools being characterized by blackness and heaviness; and at the same time, it is certain that red grounds were also used by many of the best Venetian painters, in whose works these defects are never found, probably from having used an impasto or body of color sufficiently powerful to bear out on the ground. A dark ground affords a facility for working expeditiously, and that, probably, was the principal cause for its being adopted. The Dutch and Flemish painters generally used light grounds; some of them light-brown, nearly the color of oak. Van Dyck occasionally used gray, and sometimes, when he painted in Italy, dull-red grounds. In the British school, light grounds are preferred. Some artists use smooth canvas, others prefer it rough, and avail themselves of the texture to increase the richness of the surface of their work.

All these varieties in the materials are called for in consequence of the numerous styles or modes adopted by painters in oil colors. Every artist has his peculiar way of working, and in bringing out the color or effect, or special quality in his picture, by which the feeling or idea of the subject he conceives is expressed. No two artists—imitators and copiers are not referred to—produce their tints by mixing colors in the same proportions, nor, indeed, by using the same colors; and it is difficult to lay down general rules for the execution of works, seeing that depends very much on individual feeling and appreciation. The design or drawing is first outlined on the canvas, if it is light, with charcoal, or with white chalk when it is dark, and these lines are easily dusted off or rubbed out when corrections are made. It is then put in with black chalk or a lead pencil. Not many years ago it was the practice of painters, particularly landscape-painters—Nasmyth, for instance—to rub in the design with some brown color, such as a tint composed of burned sienna and black; but this practice is not much adopted now. Some artists make but a slight outline, and paint—or, as it is called technically rub—in the subject in a bold, rough manner, afterwards gradually finishing it up; others draw the design very carefully, and work the picture up in portions, finishing or nearly finishing one portion before commencing another. In arranging the colors, or as it is called, setting the palette, many artists use a great variety of colors, others produce rich tones with few colors; some mix up tints in various gradations, others place the colors on the palette, commencing at the outer edge with white, followed by yellows and burned sienna (a reddish brown), then reds, including lakes, such as pink, madder, next blue, and lastly black, and merely mix up the tint on the center of the palette with their brush, as they proceed.

In laying the colors on the canvas, the painter with his brush mixes or dilutes them with what is called a vehicle or medium. Here, again, the practice of artists is very varied; and this is a matter of importance, as the tone and quality of the picture, as regards texture or surface and transparency, is much affected by the medium employed, and the manner of using it. The durability of the work also depends very much on the medium and the artist's management of it. A medium composed of mastic varnish and drying or boiled linseed oil, named magilp, is that most generally used. This mixture coagulates or forms a jelly, and has the advantage, when placed on the palette, of not running off it, or mixing with the colors when the palette is not held level. Some painters prefer using raw linseed oil mixed with a dryer, such as litharge, or drying oil mixed with turpentine, or copal varnish and turpentine, or copal varnish and oil, with mastic varnish added, to make it coagulate. Other ingredients are often mixed with the medium, to give a thick consistency to the paint, such as fat or thickened nut oil, paste, &c.; and various preparations sold by artists' colormen are much used; for instance, Roberson's medium, and Siccatif de Harlem, a preparation imported from Paris. The mode of using the medium is of great consequence; some apply it very sparingly, others, particularly those who prefer magilp, or a medium that coagulates, employ it lavishly. By the first method, firmness and decision of touch may be exhibited, by the latter, richness and brilliancy of tone; the excess tends to produce, in the one case, a hard and dry surface, and the want of the protection that varnish mixed with the color gives against atmospheric action; the other induces a surface having a horny appearance, and a tendency to darken, or crack, or open up.

Arresting the decay of pictures, and repairing, or, as it is styled, restoring them, after they have suffered from age or bad usage are matters which engage much attention. There can be no doubt that many paintings of vast importance have been saved by the care and skill of those who have earnestly devoted themselves to that kind of work; but picture-cleaning is now a trade followed in numerous instances by ignorant pretenders and quacks, who hold out that they possess some means by which they can freshen a picture, and restore it to the state it was in when originally executed. Generally speaking, the great extent to which this business is carried on is owing to the credulity of those who dabble in collecting old pictures, one great incentive to which being the hope of picking up, or discovering, some picture of great value concealed under the dirt and discoloration acquired in a long course of years; but, nevertheless, there can be no doubt that many proprietors of works of art who collect from far higher motives, are remarkably prone to call in the picture-cleaner when his services are anything but necessary or beneficial.

The late Sir Edwin Landseer, R.A., when examined by the Select Committee of the House of Commons appointed to inquire into allegations of damage by cleaning, sustained by the pictures in the National Gallery of London (Report and Evidence ordered to be printed, 1858), stated in the following terms, his idea of this rage for picture-cleaning, or rather picture-destroying: 'The first thing, whenever a picture is sold, I think, is, that it goes to a picture-restorer, or a picture-liner, or a picture-cleaner, no matter what its condition is. It is exactly the same thing as when you buy a horse; your groom says he will be all right when he has a dose of physic through him, whether he wants it or not.' The mania for picture-cleaning is not confined to this country; it is extensively carried on with even more ruinous consequences abroad, particularly in Italy, where there is a large traffic in old, and few commissions for modern works, and where in many of the public galleries one or more picture-cleaners, for whom work must be found, are attached as permanent officers.

The process of picture-cleaning, or the removal of the old varnishes or other incrustations by which a painting may be obscured, is effected either by mechanical or chemical means. The first method is accomplished when the varnish on the surface is mastic, by rubbing with the fingers the surface of varnish when in a dry state, by which action it is brought off in a fine white powder; or by scraping or erasing the surface with sharp steel instruments when the surface of the picture is tolerably smooth.

The first of these processes is the best that can be employed; but when the surface is rough or unequal, the prominent pertions are apt to be over-rubbed; erasing or scraping is often practised

in Italy, but rarely in this country. The chemical means consist in the application of solvents, chiefly alkali, or alcohol, to dissolve the old varnish. The danger here is, that the action of these solvents is not always stopped with sufficient promptness and dexterity, and part of the surface of the picture is taken off; consequently it is by this latter process that most destruction is caused. For the various methods employed in picture-cleaning, the Report and Minutes of Evidence, already referred to, may be consulted, and *Lejeune's Guide*.

See *History of Painting, Ancient, Early Christian, and Mediæval*, from the German of Woltmann and Woermann, edited by Sidney Colvin (1880); *Classic Painting*, by Poynter and Head (1880); and the standard works of Vasari (Florence, 1568); Borghini (Florence, 1584); Rodolphi (Venice, 1648); Zanetti (Venice, 1771); Lanzi (1792), Bohn's edition of Roscoe's translation; Von Rumohr (Berlin, 1827); Kugler's *Hand-book of Painting, Italian Schools* (ed. by Eastlake, 1855), *German, Flemish, and Dutch Schools* (1846), *Spanish and French Schools* (1848); *History of Painting in Italy*, by Crowe and Cavalcaselle (1876); *Hand-book for Young Painters*, by C. R. Leslie, R.A. (1855); Ruskin's *Modern Painters* (1843—1860).

PAINTING (House), is one of the useful arts, combining much that is artistic with much that is absolutely necessary. The primary object of painting houses, or parts of them, either internally or externally, is to preserve them from decay—to cover the parts liable to suffer from exposure with a durable composition. That now used is made of ground white-lead mixed with linseed oil. This produces white paint, which forms the basis of all others. The various colors given to it are produced by the grinding of pigments (or *stainers*) along with the white-lead. The commonest of these are ochres (yellow and red earths), lampblack, Venetian red, umber, Prussian blue, chrome, vermilion, &c. Substances called driers are also mixed with the paint, such as spirits of turpentine, boiled oil, litharge and sugar of lead ground in oil. Paint may be laid on any material—stone, wood, iron, and plaster being the most usual in buildings. It has the effect of preserving these, by filling up the pores in them, and forming a coating on which the moisture of the atmosphere does not act. The paint is laid on in several *coats* or layers, each being allowed to dry before the next is applied. The usual number of coats for new wood or plaster varies from three to six. Five coats form a good and lasting protection from the weather. Plain painting is generally finished with a coat prepared with a mixture of oil of turpentine, which takes off the gloss from the paint, and leaves the surface quite *mat* or dead. This is called *flatting*.

A very common form of decoration in all ages has been to imitate the veins or colors of marbles, and the *grains* or marks of growth of various woods. In modern times, these arts form a separate branch of house-painting, some men being *grainers*, others *marblers*, &c. The mode in which these imitations are produced is by forming a *grounding* of several coats of plain paint—usually four—and applying the coloring coat over this. In marbling, the coloring matter is marked and veined with *feathers*, in place of brushes; and in graining, steel combs are used. When the surface is dry, it is protected with one or more coats of copal varnish.

Besides painting, the decorater uses paper-hangings for adorning the walls of houses. These are applied to the walls with paste. Size-coloring is also used; the coloring matter in this case being mixed with strong Size (q. v.) in place of oil; but this has the disadvantage of being easily acted on by moisture. It is often used for the ceilings of common rooms, and for the walls of kitchens and servants' apartments, being much cheaper than oil-paint. In ancient times, in Greece and Rome, wax was used for mixing the colors with; but although there are many very fine specimens of Roman paintings still preserved on the walls of the houses of Pompeii, the mode in which these decorations were applied is not now known.

PAINTS, PAINTERS' COLORS, or PIGMENTS. These names are applied to the prepared or unprepared compositions by which wood, stone, and other materials are coated with a preservative surface of oil, mixed with an earthy matter, to give it color and consistency; also to the materials used by artists to produce the colored surfaces of their pictures. The art of painting, in its primitive state, consisted merely in applying such natural, mineral, and vegetable colors as were spontaneously yielded, without any vehicle to render them permanent; consequently, they had to be renewed as often as they were rubbed or washed off from the surfaces to which they were applied. The paints now in use are nearly all mixed with a liquid vehicle, and are applied in the liquid state. The mixing materials are varied according to the requirements of the work. Thus, for some kinds of decorative work, and for water-color drawings, gum, glue, size, or other adhesive materials dissolved in water, are employed; whilst for the painting of buildings, &c., and for oil-paintings, oils of various kinds are used for mixing and thinning the colors. Thus, for painted work exposed to the weather, it is found that linseed oil boiled with the sulphates of lead (litharge) or zinc, or with acetate of lead (sugar of lead), is the best. The preparation of boiled oil is one requiring particular care, as it is desirable to have it bright and clear. Hence the proportions of the metallic salts are much varied by different manufacturers, and by some various other ingredients are added. The time of boiling, and the method of filtering, are also much varied.

For indoor work, plain linseed oil and oil (spirit) of turpentine are used; if a *glossy surface* is wished, the linseed oil must be in excess; if a *dull* or *flattened surface*, then the quantity of turpentine, or *turps*, as it is often technically called, must be increased; and it is usual to add a small quantity of ground litharge and sugar of lead, which are prepared for this purpose, and sold under the name of *Driers*. For artists' colors, very fine linseed or nut oil is used, unboiled, and in small quantity, and turpentine is employed to dilute them. Paints for very rough purposes, such as ship-work, stone walls, &c., are often mixed with whale oil boiled with white vitrol (acetate of zinc), litharge, and vinegar, and they are diluted with common linseed oil and turpentine.

Most of the paints used for ordinary purposes are composed first of the coloring matter, then of a quantity of white-lead, with which and the oil they are worked into a paste of the shade required, and afterwards thinned down with oil and turpentine when used. The white-lead which thus forms the basis of most paints, and by itself a color, is a carbonate and oxide of the metal, produced by exposing pieces of lead to the action of the steam of acetic acid in beds of fermenting tan. It is the principal white paint used, but is liable to discoloration from the gases contained in impure atmospheres. Other white pigments are prepared from the oxide of zinc, and the carbonate and sulphate of barytes.

Pale yellow is made with chromate of strontian, orange-yellow, with sulphuret of cadmium, whilst several varieties of this color are produced by chromate of lead, sulphuret of arsenic, or king's yellow, and various native earths in which silica and alumina are combined with oxide of iron. Amongst these are Yellow Ochre, Oxford, Roman, Stone, Orange, Indian, and American Ochres. *Reds* are either purely mineral, or they are *lakes*, i. e., organic colors precipitated on alumina bases. Of the latter, there are madder-lakes, prepared from madder-roots, and carmine-lakes, prepared from cochineal; of the former, vermilion (bisulphuret of mercury), Indian red (a native oxide of iron), Venetian red (also an oxide of iron), red lead (red oxide of lead or *minium*). A very beautiful red is used by artists called palladium red; it is formed of ammonio-perchloride of palladium. *Blues* consist of the artificial ultramarine, and for artists' purposes, of the real ultramarine, also the silicate of cobalt, and for water-colors, indigo and Prussian blue. *Greens* are either produced by mixtures of *yellows* and *blues*, or they are made directly from the phosphates, carbonates, acetates, and arsenites of copper, also from the sesquioxide of chromium, and from *terre verte*, a native mineral, consisting of iron, silica, potassa, and magnesia. The last two are the best for artists.

Browns are numerous, and various in their composition. Decomposed peat, burned madder, burned Prussian blue, burned terre verte, asphalt, manganese brown, catechu, umber (which is an oxide of iron with manganese), and mummy, or the asphalt mixed with other matters taken from Egyptian mummies, are amongst the best known and most used. *Blacks* are made of Lamp-black and Bone-black (q. v.), peroxide of manganese, and blue-black, which is made of the charcoal of burned vine twigs.

In all cases, the coloring materials of paints require to be very finely ground, and as many are very poisonous, great care is required in their preparation, and several forms of mill have been invented for the purpose. The principle upon which all are made is to secure the operator from the poisonous dust and exhalations, and to reduce the coloring material, if ground dry, to an impalpable powder, or if mixed with the oil, to a perfectly smooth paste.

PAISIELLO, Giovanni, an eminent musician, son of a veterinary surgeon at Taranto, was born in 1741, and received his musical education in the Conservatorio St. Onofrio at Naples. Of his earlier operas produced at Naples, the most celebrated was *Dal Finto al Vero*, composed in 1777. Some of his best works, particularly *Il Barbiere de Seviglia*, were written during an eight years' residence at St. Petersburg. At Vienna, he composed twelve symphonies for a large orchestra, and the opera buffa, *Il re Teodoro*. Between 1785 and 1799, he produced a number of operas for the Neapolitan theater, and was appointed by Ferdinand IV. his *maestro di cappella*. In consequence of having accepted under the revolutionary government the office of national director of music, he was suspended from his functions for two years after the restoration of royalty, but eventually restored to them. In 1802, he went to Paris to direct the music of the consular chapel; but the indifferent reception shortly after given to his opera of *Proserpine*, led him to return to Naples, where he died in 1816. His compositions are characterized by sweetness

and gracefulness of melody, and simplicity of structure. Besides no fewer than ninety operas, P. composed masses, requiems, cantatos, an oratorio, instrumental quartetts, harpsichord sonatas, concertos, and a highly-praised funeral march in honor of General Hoche.

PAI'SLEY, a municipal and parliamentary burgh, and an important manufacturing town of Scotland, in the county of Renfrew, on both banks of the White Cart, three miles above its junction with the Clyde, and seven miles west-south-west of Glasgow by railway. The progress of the town has been much hindered by the fact that it was bankrupt for nearly thirty years. A bill was passed in 1872, by which a settlement was effected, and the town property restored to the corporation. Since then, extensive improvements have been made. An abundant supply of water is brought from the Gleniffer Hills, and more recently from Rowbank.

By far the most interesting edifice is the abbey. It was founded by Walter, the High Steward of Scotland, about 1163, for a prior and 13 monks of the Cluniac order of reformed Benedictines, and was dedicated to St. James, St. Mirren, and St. Milburga. It was the burying-place of the Stewarts before the accession of that family to the throne, and was occasionally used by them afterwards as a place of sepulture. It was raised to the rank of an abbey in 1245. It was burned by the English in 1307, and was much destroyed in 1561. The building is in the First Pointed style. The nave, of six bays, which is still used as the Abbey Parish Church, was carefully and thoroughly restored by the removal of unsightly galleries and otherwise in 1862. The choir and transepts are in ruins. Near the Abbey is a monument to Wilson the ornithologist, who, like John Wilson (Christopher North) and Tannahill, were natives of Paisley.

Other edifices are the County Buildings and Prisons, a quadrangular pile in the castellated style; the Neilson Educational Institution, a noble bequest, built in the form of a Greek cross, and surmounted by a fine dome; the Infirmary; the School of Design; and the various banks. The Grammar School was founded by King James VI., and the present building was completed in 1864. In 1870 a Free Public Library and Museum was presented to the town, and is maintained by the community under the Free Libraries Act; and by a similar act of liberality, its amenity was increased by a pleasure-ground named the Fountain Gardens. In 1873 a native of Paisley bequeathed £20,000 for the erection of a town hall, which was completed in 1880; it is a handsome classical building near the Abbey. A large public park was presented to the town, and opened in 1877; and an observatory was presented in 1882. P. possesses a trust for the education of boys, the revenue of which amounts to £500.

In the beginning of the last century, the principal manufactures were coarse linens and chequered cloths. About the middle of that century, the weaving of linen and of silk gauze became the staple manufactures. In 1784 silk gauze was manufactured to the value of £350,000, and employed 5000 looms. Shawls, which used to be a principal and are still an important article of manufacture, began to be made here in the beginning of the present century. Within recent years the annual value of the shawl trade of P. was estimated at about £1,000,000 sterling, but it has now greatly declined. Cotton thread is manufactured on a most extensive scale; indeed P. may be considered the seat of the thread manufacture for the home and American markets. Different varieties of tartan cloths, handkerchiefs, carpets, &c. are made; soap, starch, and corn flour are largely manufactured; dyeing is carried on by several firms on an extensive scale; and power-loom factories, print-works, machine shops, bleach-fields, ship-building yards, &c. are in operation in the town and vicinity. At the St. James' Day Fair, horse-races, originated by act of the bailies of the burgh in 1608, are held. Pop. (1871) 48,257; (1881) 55,642.

PAKS, a market-town of Hungary, in the county of Tolna, 60 miles south-south-east of Pesth, on the Danube. The river is here very winding, and the eastern bank a desert and useless morass. The town is frequently subject to inundations. Pop. 11,100.

PALACE, this title is applied, with few exceptions, in this country to houses occupied by royal personages only. In Italy the name is given to all fine dwellings.

PALACKY, FRANTISEK, a Bohemian philologist, critic, and historian, was born 14th June 1798 at Hodslavitz, in Moravia, and studied at Presburg and Vienna, confining his attention chiefly to philological and historical investigations. In 1831 he was appointed by the states of Bohemia historiographer to that country, and was intrusted with the compilation of a general history of Bohemia. In furtherance of this work, he ransacked all the libraries and archives in Bohemia, and made long visits to Germany and Italy in search of materials. He took part in the political agitation of 1848, and was the leader of the Slav or national party as opposed to the German at the Diet of Kremsier, after the dissolution of which he returned to his literary labors. His great and justly celebrated work, *History of Bohemia* (In German and Bohemian, Prague, 1836—1867, 5 vols.), was received with enthusiasm by the whole Bohemian nation. Besides an early treatise on æsthetics, P. published many volumes of documents pertaining to Bohemian history, and a series of monographs on the same subject; a work on the most ancient monuments of the Czech tongue; an account of a literary tour to Italy in 1837; and in 1872 his 'Political Testament.'

'Father P.,' as he was fondly called by his Czech fellow-countrymen, was beloved by them as the first to give access to the real history of Bohemia; and though himself a Protestant, was regarded by Catholics with perfect confidence. Throughout life a zealous contender for the crown rights of Bohemia, he persistently but vainly opposed the reconstruction of Austria on a German-Hungarian basis; and when in 1861 he was elected into the Austrian House of Lords, he declined to attend. He died in May 1876.

PA'LADIN, a term originally derived from the Counts Palatine, or of the Palace (see PALATINE), who were the highest dignitaries in the Byzantine court, and thence used generally for a lord or chieftain, and by the Italian romantic poets for a knight-errant.

PALÆA'STER (Gr. ancient star-fish), a genus of star-fish, peculiar to the Silurian period, which in general appearance resemble the living brittle stars, but when more minutely examined, present so many anomalies, that they cannot be referred to any existing family. Five or six species have been described.

PALÆO'GRAPHY (Gr. *palaios*, old, and *graphé*, writing), the science of ancient writings. It comprehends not merely the art of reading them, but such a critical knowledge of all their circumstances as will serve to determine their age, if they happen to be undated, and their genuineness, in the absence of any formal authentication. For these purposes, the palæographer needs to be acquainted with the various substances, such as bark, leaves, skins, paper, &c., which have been used for writing; with the various manners of writing which have prevailed, and the changes which they have undergone; with the various forms of authenticating writings, such as seals, signets, cachets, signatures, superscriptions, subscriptions, attestations, &c., which have been employed at different times; with the various phases through which the grammar, vocabulary, and orthography of the language of the writing with which he is dealing, has passed; and with more or less, as the case may be, of the history, laws, institutions, literature, and art of the age and country to which the writing professes to belong.

Palæography may be said to have been founded by the learned French Benedictine, Jean Mabillon, whose *De Re Diplomatica*, first published in 1681 in 1 vol. fol., reprinted in 1709, and again in 1789, in 2 vols. fol., is still, perhaps, the most masterly work on the subject. Along with the *Nouveau Traité de Diplomatique* (Par. 1750—1765, 6 vols. 4to) of the Benedictines of St. Maur, and the *Eléments de Paléographie* (Par. 1838, 2 vols. 4to) by M. Natalis de Wailly, it is the great authority for French palæography. English palæography is perhaps less favorably represented in Astle's *Origin and Progress of Writing* (Lond. 1803), than Scottish palæography in Anderson's and Ruddiman's *Diplomata Scotiæ* (Edin. 1739). Muratori treats of Italian palæography in the third volume of his great work, the *Antiquitates Italicæ Medii Ævi*; and among later works on the same subject may be mentioned the *Diplomatica Pontificia* (Rome, 1841) of Marino Marini. The palæography of Greece is illustrated in the *Palæographia Græca* (Par. 1708) of Montfaucon. Spanish palæography may be studied in the *Bibliotheca de la Polygraphia Espanola* (Mad. 1788) of Don C. Rodriguez.

Of works on German palæography, it may be enough to name Eckard's *Introductio in Rem Diplomaticam* (Jen. 1742), Heumann's *Commentarii de Re Diplomatica* (Norimb. 1745), Walther's *Lexicon Diplomaticum* (Gott. 1745), and Kopp's *Palæographia Critica* (Manh. 1817). Hebrew palæography has been elaborated by Gesenius in his *Geschichte der Hebräischen Sprache und Schrift*, and other works. The great work on palæography generally—one of the most sumptuous works of its class ever published—is the *Paléographie Universelle* (Par. 1839—1845, in 5 vols. fol.) of M. J. B. Silvestre. See BLACK LETTER, CONTRACTIONS, PALIMPSEST, PAPYRI.

PALÆO'LOGUS, the name of an illustrious Byzantine family, which first appears in history about the 11th c., and attained to imperial dignity in the person of MICHAEL VIII. in 1260. This emperor successfully undertook many expeditions to Greece and the Archipelago, and used his utmost endeavors to heal the schism between the Roman and Greek Churches, though with exceedingly little success. His successor on the throne was his son ANDRONICUS II. (1282—1329), under whose reign the Turks commenced in earnest a series of assaults on the Byzantine dominions. Andronicus attempted to oppose them with a force composed of mercenaries, but his success was very doubtful, as these

troops, with perfect impartiality, attacked both his enemies and his subjects. To pay them he was compelled to levy such imposts as went far to destroy Byzantine commerce.

He associated his son, MICHAEL IX., with himself in the government, and was dethroned by his grandson, ANDRONICUS III. (1328—1341), an able warrior and wise ruler, who repeatedly defeated the Bulgarians, Tartars of the Golden Horde, and the Servians, and diminished the oppressive imposts of the previous reign. He was, however, unsuccessful against the Catalans in Greece, and the Turks during his reign ravaged Thrace as far as the Balkan. He was greatly esteemed by his subjects, and well merited the title of 'Father of his Country,' which they bestowed upon him. His son, JOHN VI. (1355—1391), a weak and voluptuous prince, attempted in vain both by force and bribery to stop the progress of the Turks; at last the pope, moved by his urgent entreatise, which were backed by a promise to submit the Greek Church to his (the pope's) supremacy, urged the Hungarians and Servians to arm in defence of the Greek emperor, but the result was only an additional triumph to Sultan Amurath. The imbecile emperor was several times deposed, and on his final reinstatement by the sultan, acknowledged himself as his vassal for the capital and a small tract along the Propontis and Black Sea. Indeed, so degraded had the Byzantines become, that they obeyed the Sultan Bajazet's summons to aid him in reducing Philadelphia, the last Greek stronghold in Asia Minor. His son, ANDRONICUS IV. (1355—1373), who had been associated with him in the government, died in exile.

MANUEL II. (1391—1425) pursued the same tactics as his father John VI., and with the same result. The allied army of the Hungarians, Germans, and French, which he had summoned to his aid against the Turks, was totally routed at Nicopolis by Bajazet, and Constantinople itself closely besieged. The invasion of Asia Minor by Timûr, however, compelled the sultan to withdraw his whole force, and his subsequent defeat and capture at Angora in 1402, and the contests among his sons for the supremacy, gave the Greek empire a breathing space. Having aided Mohammed I. in his contests with his brothers, Manuel was, by the grateful sultan, presented with some districts in Greece, Thessalonica, and on the Euxine. JOHN VII. (1425—1449), on being pressed by the Turks, again held out to the pope the old bait of the union of the Greek and Western Churches under his sway, and even presented himself at the council at Florence, where, in July 1439, the union of the churches was agreed to. But on his return to Constantinople, the opposition of the Greek ecclesiastics to the union, supported by the people, rendered the agreement of Florence a dead letter. The pope, however, saw that it was for his interest to fulfil his part of the agreement, and accordingly stirred up Wladislas of Hungary to attack the Turks (see JAGELLONS), but this act only hastened the downfall of the Palæologi.

John's brother, CONSTANTINE XIII. (1449—1453), a heroic scion of a degenerate race, accepted the crown after much hesitation, knowing his total inability to withstand the Turks, and even then took the precaution of obtaining the sultan's consent before he exercised the imperial authority; but some rebellions in Caramania which now occurred, baffling Sultan Mohammed II.'s efforts to quell them, the emperor was willingly persuaded by his rash advisers that the time had now arrived for rendering himself independent of the Turks. The attempt, however, only brought swifter destruction on the wretched remnant of the Byzantine empire, for Mohammed invested the capital by sea and land, and after a siege, which lasted from 6th April to 29th May 1453, Constantinople was taken by storm, and the last of the Palæologi fell fighting bravely in the breach. A branch of this family ruled Montferrat in Italy from 1306, but became extinct in 1533. The Palæologi were connected by marriage with the ruling families of Hungary, Servia, and the last of the family married Ivan, Czar of Russia—a fact which the Czars of Russia have persisted till lately in bringing forward as a claim in favor of their pretensions to the possession of European Turkey. It is said that direct descendants of the Palæologi exist to the present day in France. (For further information, see the separate articles on some of the emperors, and BYZANTINE EMPIRE.)

PALÆONI'SCUS (Gr. ancient sea-fish), a genus of ganoid fish, with a fusiform body, covered with rhomboid scales, a heterocercal tail, and moderately-sized fins, each furnished with an anterior spine. The single dorsal fin is opposite to the interval between the anal and ventral fins. Twenty-eight species have been described from the Carboniferous and Permian measures.



Palæoniscus.

PALÆONTO'LOGY (Gr. science of fossil animals) is that division of Geology (q. v.) whose province it is to inquire into the evidence of organic life on the globe during the different bygone geological periods, whether this evidence arises from the actual remains of the different plants and animals, or from recognizable records of their existence, such as footprints, Coprolites, (q. v.), &c.

The metamorphic action which has so remarkably altered the oldest sedimentary rocks, is sufficient to have obliterated all traces of organic remains contained in them. Fossils are consequently extremely rare in these older palæozoic strata, and indeed it is only after long search, and within a recent time, that undoubted remains have been found in the Laurentian rocks. We were unable to record their existence in the article LAURENTIAN SYSTEM; but in the article LIMESTONE, we referred to the existence of beds of limestone as requiring the presence of animal life for their production. It is true that in 1852 an organic form resembling a coral was found in the limestone of the Ottawa, but much doubt was always entertained regarding this solitary discovery.

In 1863, however, there was detected an organism in the serpentine limestone of Grenville, of true Laurentian age, which Dr, Dawson describes as that of a Foraminifer, growing in large sessile patches, after the manner of *Carpentaria*, but of much greater dimensions, and presenting minute points which reveal a structure resembling that of other foraminiferal forms, as for example, *Calcarina* and *Nummulina*. Large portions of the limestone appear to be made up of these organisms, mixed with other fragments, which suggest comparisons with crinoids and other calcareous fossils, but which have not yet been distinctly determined. Some of the limestones are more or less colored by carbonaceous matter, exhibiting evidences of organic structure, probably vegetable. In this single Foraminifer, and the supposed coral, we have all that is positively known of the earliest inhabitants of our globe, with which we are yet acquainted. That these are but the smallest fraction of the fauna of the period in which they lived, is evident from the undetermined fragments associated with them, as well as from the extensive deposits of limestone of the same age. And that contemporaneous with them, there existed equally numerous representatives of the vegetable kingdom, cannot be doubted, when it is remembered that the animal can obtain its food only through the vegetable, and not directly from inorganic materials. Besides, their remains apparently exist in the limestone at Grenville, a rock which, from its very nature, rarely contains vegetable fossils.

The Cambrian rocks, though of immense thickness, have hitherto yielded indications of only a very few animals, but these have a special interest, as they are the oldest fossil remains yet detected in Britain. They consist of an impression which Salter considers to be portion of a trilobite, named by him *Palæopyge*, of the burrows and tracks of sea-worms, and of two species of radiated zoophytes called *Oldhamia*—animals which in this case also can be nothing more than the most fragmentary representations of the fauna of the period. No indications of vegetable life have yet been noticed in the Cambrian rocks, for we cannot consider the superficial marking on some of these strata as having anything to do with fuci.

Undoubted representations of the four invertebrate sub-kingdoms early make their appearance in the Silurian strata, and the occurrence before the close of the period of several fish, adds to them the remaining sub-kingdom—the vertebrata. If we except the silicious frustules of Diatomaceæ which are said to have been detected in these rocks, no satisfactory traces of plants have yet been observed, although extensive layers of anthracitic shales are common. Of the lower forms of the animal kingdom, some sponge-like bodies have been found, and corals are remarkably abundant, chiefly belonging to the order *Rugosa*, a palæozoic type, the members of which have horizontal tabulæ, and vertical plates or septa, either four in number, or a multiple of four. Graptolites, another family of zoophytes, flourished in the dark mud of the Silurian seas, and did not survive the period.

All the great divisions of the Mollusca are represented by numerous genera, several of which are not very different from some living forms. A few true star-fishes have left their records on the rocks, but the most striking feature in the Echinodermata of the period is the Cystideans, or armless sea-lilies, which, like the Graptolites, did not pass beyond the Silurian seas. Tubes, tracks, and burrows of annelids have been observed; and numerous Crustacea, belonging, with the exception of one or two shrimp-like species, to the characteristic palæozoic Trilobite, of which the number of individuals is as remarkable as the variety of species and genera. It is only in the upper portion of the group (the Ludlow beds) that the fish remains have been found. These have been referred to six different genera, and are chiefly loricate ganoids, of which *Cephalaspis* is the best known.

The rocks of the Old Red Sandstone period supply the earliest satisfactory remains of plants. The Ferns, Sigillariæ, Lycopodites, and Calamites, so abundant in the Coal Measures, make

their appearance among the newer of these beds, and even fragments of dicotyledonous wood have been observed. The various sections of the invertebrata are well represented, but the remarkable characteristic in the animal life of the period is the abundance of strange forms of heterocercal-tailed fish, whose buckler-shields, hard scales, or bony spines occur in the greatest abundance in some beds. The reptiles and reptile tracks in the Red Sandstone of Moray, originally referred here, are now universally considered as belonging to the New Red measures.

The striking feature in the rocks of the Carboniferous period is the great abundance of plants, the remains of which occur throughout the whole series, the coal-beds being composed entirely of them, the shales being largely charged with them, the sand-stones containing a few, and even the limestones not being entirely without them. These plants were specially fitted for preservation, the bulk of them being vascular cryptogams, a class which Lindley and Hutton have shown by experiment to be capable of long preservation under water. They are chiefly ferns; some are supposed to have been arborescent lycopods, while others (*Sigillaria*, *Calamites*, and *Asterophyllites*) are so different from anything now known, that their position cannot be definitely determined, though it is most probably among the higher cryptogams. Several genera of conifers have been established from fossilized fragments of wood; and some singular impressions, which look like the flowering stems of dicotyledonous plants, have been found. The limestones are chiefly composed of crinoids, corals, and brachiopodous shells. The corals attain a great size, and the crinoids are extremely abundant, their remains making sometimes beds of limestone 1000 feet thick, and hundreds of square miles in extent. Many new genera of shells make their appearance. The trilobites, which were so abundant in the earlier rocks, are reduced to one or two genera, and finally disappear with this period.

Fish with polished bony scales are found; and others, like the Port Jackson skark, with pavements of flat teeth over their mouth and gullet, fitting them to crush and grind the shell-protected animals on which they fed. Strange fish-like reptiles existed in the seas, and air-breathing species have been found on the continent and in America. The wing-cases, and parts of the bodies of insects, have also been found.

The Permian period is remarkable for the paucity of its organic remains, but this may arise from our comparative ignorance of its strata. The plants and animals are on the whole similar to those found in the Carboniferous measures, and a great proportion of them belong to the same genera. Many ancient forms do not pass this period, as the *Sigillaria* among plants, and the *Producta* among animals.

The red sandstones of the Triassic period are remarkably destitute of organic remains—the iron, which has given to them this color, seems to have been fatal to animal life. In beds, however, on the continent, in which the iron is absent, fossils abound. These fossils present a singular contrast to those met with in the older rocks. The Palæozoic forms have been gradually dying out, and the few that were still found in the Permian strata do not survive that period, while in their place there appear in the Trias many genera which approach more nearly to the living forms. Between the organisms of the Permian and Triassic periods there exist a more striking difference than is to be found between those of any previous periods. Looking at this life-character, the rocks from the Permian downwards have been grouped together under the title Palæozoic; while from the Trias upwards the whole of the strata have received the name of Neozoic.

The extensive genera of Ammonites and Belemnites make their first appearance in the Trias. Several new forms of Cestracion fish occur, and the reptiles increase in number and variety; among them is the huge batrachian Labyrinthodon, and the singular fresh-water tortoise, Dicynodon. The bird-tracks on the sandstones of Connecticut are by some referred to this age. Small teeth of mammalia, believed to be those of an insectivorous animal, like the Myrmecobius of Australia, have been found in the Keuper beds of Germany and Somerset.

In the Oolitic series we have an abundance of organic remains, in striking contrast to the scanty traces in the Permian and Triassic periods. Many new genera of ferns take the place of the Palæozoic forms, and a considerable variety of Conifers make their appearance, some of which have close affinities with living species, one, indeed, being referred to a still existing genus. The same approximation to living types is to be found in the animal kingdom. Several of the foraminifers are referred to living genera. Among the corals, the representatives of two living families make their appearance. No new genera are found among the Brachiopoda; but the Conchifera and Gasteropoda show a great addition of new genera, some of which are still represented by living species, while not many new genera were added to the Cephalopoda, though they were individually very abundant. In some places the Lias shale consists of extensive pavements of Belemnites and Ammonites. The Crinoids give place to the increasing variety of sea-urchins and star-fishes. Numbers of insects have been found.

The Cestracionts continue to be represented in the Oolitic seas, but with them are associated several true sharks and rays; and the homocercal-tailed fish become numerous. Labyrinthodont reptiles abound: the huge Megalosaur and its companions occupied the land; while the seas were tenanted with the remarkable Ichthyosaur and Plesiosaur, and the air with the immense bat-like Pterodactyle. Seven genera of Mammalia have been found, all believed to be small carnivorous or insectivorous marsupials, except the Stereognathus, which Owen considers to have been a placental mammal, probably hoofed and herbivorous.

In the Cretaceous beds, which are chiefly deep-sea deposits, the remains of plants and land animals are comparatively rare. The Wealden beds, however, which had a fresh-water origin, contain the remains of several small marsupials, some huge carnivorous and herbivorous reptiles, a few fresh-water shells, and some fragments of drift-wood. The true chalk is remarkably abundant in the remains of foraminifers—indeed, in some places, it is composed almost entirely of the shells of these minute creatures. Of the mollusca, the Brachiopoda are in some beds very abundant; the Conchifera introduce several new forms, the most striking of which is the genus Hippurites, which with its allies did not survive this period; the cephalopodous genera which appeared in the Oolite, continue to abound in the chalk, many new forms being introduced; while others disappear with the period, like the Belemnites and Ammonites. Sea-urchins become still more numerous.

In some of the beds the remains of fish are abundant, and while cartilaginous species still exist, the bony fishes become more numerous; and among them the family to which the salmon and cod belong makes its appearance. Reptiles are common in the Wealden, and the flying Pterodactyles attained a greater size, and were probably more numerous than in the former period. The remains of a single bird has been obtained from the greensand, but with this exception, birds as well as mammals have left no traces that have yet been found in the Cretaceous beds, though doubtless they existed.

In the Tertiary strata, the genera are either those still living, or forms very closely allied to them, which can be separated only by the careful examination of the accurate scientific observer. The plants of the Eocene beds are represented by dicotyledonous leaves, and palm and other fruits. Foraminifers are remarkably abundant, whole mountain masses being formed of the large genus Nummulites. Brachiopoda are rare, but Conchifera, Gasteropoda, and Cephalopoda increase in number; the new forms being generically almost identical with those now living. The principal living orders of fish, reptiles, and birds are represented in the Eocene strata. A considerable variety of pachydermatous mammals, suited apparently to live on marshy grounds and the borders of lakes, have been found in France and England, and associated with them are some carnivorous animals, whose remains are, however, much rarer. An opossum has been found at Colchester. The fragments belonging to the supposed monkey are portions of a small pachyderm, *Hyracotherium* (q. v.).

Little need be said of the invertebrata of the Miocene period, beyond remarking their growing identity in genera with the living forms. Among the mammals, the Quadrumana make their first appearance. The true elephant and the allied mastodon are represented by several species; a huge carnivorous whale has been discovered, and several Carnivora and deer, with a huge edentate animal, have been described. Owen thus speaks of these animals: 'Our knowledge of the progression of Mammalian life during the Miocene period, teaches us that one or two of the generic forms most frequent in the older Tertiary strata still lingered on the earth, but that the rest of the Eocene Mammalia had been superseded by new forms, some of which present characters intermediate between those of Eocene and those of Pliocene genera.'

In pasing upwards through the Tertiary strata, the organic remains became more and more identical with living forms, so that when we reach the Pliocene and Pleistocene periods, the great proportion of the invertebrata are the same species which are found occupying the present seas. Among the higher orders of animals, the life of a species is much shorter than in the lower, and consequently, though the vertebrata approach so nearly to existing forms as for the most part to be placed in the same genera, yet the species differ from any of the living representatives of the different genera.

The Suffolk 'Crags,' which are the only British representatives of the Pliocene period, contain the relics of a marine testacea, that differs little from the present tenants of the European seas, between 60 and 70 per cent. being the same species. The ear-bones of one or more species of Cetacea have been found, and at Antwerp, the remains of a dolphin have been discovered in beds of this age.

The various local deposits which together form the Pleistocene strata, the latest of the geological periods, contain a great variety of organic remains. In the submarine forests, and in beds of

peat, the stumps of trees are associated with the remains of underwood and herbaceous plants of species still living. Nearly all the mollusca and other marine invertebrata still survive. It is among the vertebrata that the most remarkable forms appear—forms which in the main differ little from the existing race of animals except in their enormous size. Elephants and rhinoceroses, fitted for a cold climate by their covering of long coarse hair and wool, roamed over the northern regions of both the Old and the New World, and were associated with animals belonging to genera which still exist in the same region, as bears, deer, wolves, foxes, badgers, otters, wolverines, weasels, and beavers, besides others whose representatives are now found further south, as the hippopotamus, tapir, and hyena. Contemporary with these, there lived in South America a group of animals which were types in everything but in size of the peculiar existing fauna of that continent. Among these were gigantic sloth-like animals, fitted to root up and push down the trees, instead of climbing to strip them of their foliage, like the sloth. The armadillo was represented by the huge Glyptodon, whose body was protected by a strong tesselated coat of mail. The species of fossil tapirs and peccaries are more numerous than their living representatives.

The lamas were preceded by the large Macrauchenia, and the opossums and platyrhine monkeys were also prefigured by related species. Besides these, there have been found the remains of two mastodons and a horse, none of which are represented by any indigenous living animal in South America. The peculiar group of animals confined to Australia were prefigured by huge marsupials, some having close analogies to the living kangaroos and wombats, while others were related to the carnivorous native tiger. The gigantic wingless birds of New Zealand correspond in type with the anomalous apteryx, now existing only on these islands.

Associated with the remains of elephants, mastodons, cave-bears, and cave-hyenas, there have been found, in England and France, numerous specimens of flint implements, which are undoubtedly the result of human workmanship, and show at least that man was contemporaneous with these extinct animals. If more certain evidence were needed of this, it has been obtained in the discovery of flint implements, bone implements fashioned and carved by means of the flint knives, the horns of a reindeer, two kinds of extinct deer, Bos primigenius, and other animals, associated with numerous bones of man, included in the breccia of the cave of Bruniquel in France. Owen considers the evidence of the contemporaneity of the various remains as conclusive. The several human skulls which have been obtained show, according to the same authority, no characters whatever indicative of an inferior or transitional type. There are no certain data to give probability to the guesses which have been made as to the number of years which have elapsed since these deposits in which the relics of man occur were formed. The whole inquiry, is so recent, and the accumulation of facts is almost every day going on, that it would be premature to speak dogmatically on the subject.

PALÆOPY'GÉ (Gr. ancient rump), a genus fossil Crustacea, founded on a single impression from the surface of a bed in the Longmynd, of Cambrian age. Salter believes it to be the cephalic shield of a trilobite, but it may be only an accidental marking. If it be the impression of an organism, it is so distorted and imperfect that little can be made of it; its peculiar interest arises from its being associated with the earliest forms of life that have been observed on the globe.

PALÆOSAU'RUS (Gr. ancient lizard), a genus of fossil saurian reptiles peculiar to the Permian period. The remains of two species occur in the dolomitic conglomerate at Redland, near Bristol. The teeth were more or less compressed, and were furnished with serrated cutting margins. The vertebræ were biconcave, and had a remarkable depression in the center of each vertebræ, into which the spinal canal was sunk. The leg-bones show that the Palæosaurs were fitted for moving on the land. Owen thus exhibits their affinities: 'In their thecodont type of dentition, biconcave vertebræ, double-jointed ribs, and proportionate size of the bones of the extremities, they are allied to the Teleosaurus, but with these they combine a Dinosaurian femur, a lacertian form of tooth, and a crocodilian structure of pectoral and probably pelvic arch.'

PALÆOTHE'RIUM (Gr. ancient wild beast), a genus of pachydermatous mammalia whose remains occur in the Eocene beds of England and the continent. At least ten species have been described, ranging in size from that of a sheep to that of a horse. The upper Eocene gypseous quarries of Montmatre supplied the first scanty materials, which Cuvier, by a series of careful and instructive inductions, built up into an animal, whose fidelity to nature was afterwards verified by the discovery of a complete series of fossils. In general appearance the Palæotherium resembled the modern tapir, and especially in having the snout terminating in a short proboscis. It had three toes on each foot, each terminated by a hoof.—The formula of the teeth is the same as that of the Hyracothere, viz.,



Palæotherium.

$$\text{I.}\ \frac{3-3}{3-3},\ \text{C.}\ \frac{1-1}{1-1},\ \text{P.M.}\ \frac{4-4}{4-4},\ \text{M.}\ \frac{3-3}{3-3} = 44;$$

but the structure of the molar approaches nearer to the molars of the rhinoceros. It is supposed that animals of this genus dwelt on the margins of lakes and rivers, and that their habits were similar to those of the tapir.

PALÆOZO'IC (Gr. ancient life), the name given to the lowest division of fossiliferous rocks, because they contain the earliest forms of life. They were formerly, and are still generally, known as the Primary rocks. The strata included under these titles are the Laurentian, Cambrian, Silurian, Old Red Sandstone, Carboniferous, and Permian systems. Phillips, for the sake of uniformity, introduced Mesozoic as equivalent to Secondary, and Neozoic to Tertiary rocks.

PALÆ'STRA, a building for gymnastic sports.

PALAFOX Y MELZI, Don Jose De, Duke of Saragossa, a Spanish patriot, was born in 1780 of a distinguished Aragonese family, and received an excellent education. He accompanied Ferdinand VII. to Bayonne, and on seeing him made a prisoner there, fled to Saragossa, where he exerted himself to prevent the invasion of Aragon by the French. His defence of Saragossa (q. v.) 27th July 1808—21st February 1809, which only yielded to the French after a second investment, is one of the most brilliant and heroic incidents in modern history, and has conferred lasting glory on P. and the whole city. The ancient fame of the Spaniards for obstinate valor in the defence of walled cities was rivalled, if not surpassed, and Saragossa could proudly claim to vie with Numantia. P., sick and exhausted, was taken prisoner and conveyed by the ungenerous French to the dungeons of Vincennes, where he was treated with great hardship. Released in 1813, he returned to Spain, and was appointed in the following year captain-general of Aragon. P. was no great politician, but he loved liberty and hated anarchy, and on more than one occasion he supported the former and crushed the latter. After being created Duke of Saragossa, and Grandee of Spain of the first class in 1836, he kept himself apart from politics. He died at Madrid, 16th February 1847.

PALAIS ROYAL, a heterogeneous mass of buildings on the eastern side of the Rue Richelieu in Paris, composed of a palace, theaters, public gardens, bazaars, shops, cafés, and restaurants. The old palace was built between 1624 and 1636 on the site of the Hôtel Rambouillet by Cardinal Richelieu, who at his death bequeathed it to Louis XIII. Henrietta of France, widow of Charles I., and Anne of Austria, the queen mother, afterwards lived in it for a time with her young son, Louis XIV. It subsequently became the town residence of the Orleans branch of the Bourbons, and during the minority of Louis XV. it acquired a scandalous notoriety as the scene of the wild orgies in which the regent, Duke of Orleans, and his dissolute partisans were wont to indulge; while in the time of his son, Philippe Egalité, it became the focus of revolutionary intrigue, and the rendezvous for political demagogues of every shade of opinion. This prince, partly to repair his impoverished fortune, and partly to persuade the sans-culottes of Paris of the sincerity of his professed sympathy with their striving for equality, converted part of his gardens into a place of public resort, and the pavilions of the great court into bazaars, which were divided into shops and stalls. On the downfall of Egalité, the P. R. was taken possession of by the republican government, and used for the sittings of the tribunes during the Reign of Terror.

On the restoration of the Bourbons, it reverted to the Orleans family, and was occupied by Louis Philippe till his election to the throne of France in 1830, when it was incorporated in the general domains of the state, and ceased to be an appanage of the House of Orleans. The palace was sacked by the mob during the Revolution of 1848, when many of its best paintings and most precious works of art were destroyed. After having been temporarily appropriated to various public purposes, it was thoroughly repaired and magnificently furnished, and given by the late emperor, in 1855, to his uncle Jerome Bonaparte, whose son Prince Napoleon, resided there until 1871. The main entrance, with its elegant façade, is in the Rue St. Honoré; and on passing through the first court, the second or Cour Royale is reached, to the left of which stands the Théâtre Français, while immediately facing it is the celebrated Galerie Vitrée, or Glass Gallery, which contains on the ground floor some of the most brilliant shops of Paris, while the upper stories are chiefly occupied by cafés and restaurants. The garden, which is surrounded by this and other galleries, measures 700 feet by 300. The Red Republicans set fire

to the palace in March 1871 (see PARIS), when all the apartments occupied by Prince Napoleon were destroyed. The firemen and those who aided them, while forming into line to pass buckets of water, were fired upon by the insurgents; but kept to their work, and succeeded in checking the flames before they spread to the galleries and shops, which may almost be said to have remained intact.

In the autumn of 1873 that part of the palace injured by the insurgents was restored. The garden with its avenues and parterres, fountains and grass plots, still constitutes one of the liveliest and most frequented spots in the whole city; and although much of their glory has faded, its cafés still maintain, in great measure, the world-wide reputation they long ago acquired.

PALANQUI'N, or PALKI, the vehicle commonly used in Hindustan by travelers, is a wooden box, about 8 feet long, 4 feet wide, and 4 feet high, with wooden shutters which can be opened or shut at pleasure, and constructed like Venetian blinds for the purpose of admitting fresh air while at the same time they exclude the scorching rays of the sun, and the heavy showers of rain so common in that country. The furniture of the interior consists of a cocoa mattress, well stuffed and covered with morocco leather, on which the traveler reclines; two small bolsters are placed under his head, and one under his thighs, to render his position as comfortable as possible. At the upper end is a shelf and drawer, and at the sides are nettings of larger dimensions than the ordinary nettings in carriages, for containing those articles which may be necessary to the traveler during his journey. At each end of the palanquin, on the outside, two iron rings are fixed, and the *hammals*, or palanquin-bearers, of whom there are four, two at each end, support the palanquin by a pole passing through these rings. Traveling in this mode is continued both by day and night. (See DAWK.) The palanquin is also used at the present day in Brazil, with the prominent exception of Rio Janeiro.

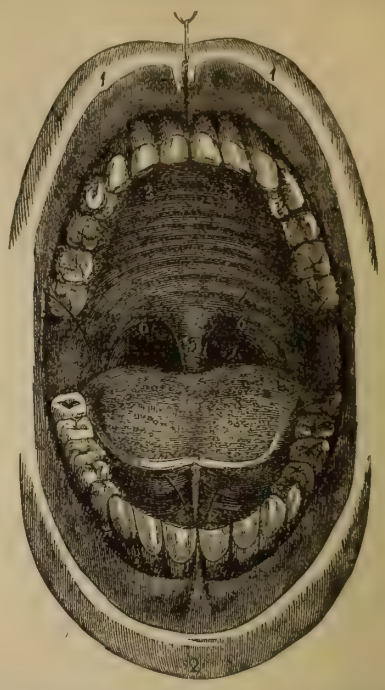
Similar modes of traveling have been at various times in use in Western Europe, but only for short distances. The Roman 'litter,' the French 'chaise a porteurs,' and the 'sedan-chair' were the forms of vehicle most in use, and the two latter were in general use in towns till they were superseded by hackney coaches. The Roman 'litter' was one of the criteria of its owner's wealth, the rich man generally exhibiting the prosperous condition of his affairs by the multitude of the bearers and other attendants accompanying him

PALA'PTERYX (Gr. ancient apteryx), a genus of fossil birds whose remains are found in the river-silt deposits of New Zealand, associated with the gigantic Dinornis, and which, like it, resembled in the form of the sternum, and the structure of the pelvis and legs, the living wingless apteryx. Two species have been described.

PA'LATE, THE, forms the roof of the mouth, and consists of two portions, the hard palate in front and the soft palate behind. The framework of the *hard palate* is formed by the palate process of the superior maxillary bone, and by the horizontal process of the palate bone, and is bounded in front and at the sides by the alvolar arches and gums, and posteriorly it is continuous with the soft palate. It is covered by a dense structure formed by the periosteum and mucous membrane of the mouth, which are closely adherent. Along the middle line is a linear ridge or raphe, on either side of which the mucous membrane is thick, pale, and corrugated, while behind it is thin, of a darker tint, and smooth. This membrane is covered with scaly epithelium, and is furnished with numerous follicles (the palatal glands). The *soft palate* is a movable fold of mucous membrane enclosing muscular fibres, and suspended from the posterior border of the hard palate so to form an incomplete septum between the mouth and the pharynx; its sides being blended with the pharynx, while its lower border is free. When occupying its usual position (that is to say, when the muscular fibres contained in it are relaxed), its anterior surface is concave; and when its muscles are called into action, as in swallowing a morsel of food, it is raised and made tense, and the food is thus prevented from passing into the posterior nares, and is at the same time directed obliquely backwards and downwards into the pharynx.

Hanging from the middle of its lower border is a small conical pendulous process, the *uvula;* and passing outwards from the uvula on each side are two curved folds of mucous membrane containing muscular fibres, and called the *arches or pillars of the soft palate.* The *anterior pillar* is continued downwards to the side of the base of the tongue, and is formed by the projection of the palato-glossus muscle. The *posterior pillar* is larger than the anterior, and runs downwards and backwards to the side of the pharynx. The anterior and posterior pillars are closely united above, but are separated below by an angular interval, in which the *tonsil* of either side is lodged. The tonsils (*amygdalæ*) are glandular organs of a rounded form, which vary considerably in size in different individuals. They are composed of an assemblage of mucous follicles, which secrete a thick grayish matter, and open on the surface of the gland by numerous (12 to 15) orifices.

The space left between the arches of the palate on the two sides



The Mouth widely opened so as to show the Palate:
1, 1, the upper, and 2, the lower lip; 3, 3, the hard palate; 4, 4, the soft palate; 5, the uvula; 6, 6, the arches of the soft palate; 7, 7, the tonsils; 8, the tongue.

is called the *isthmus of the fauces.* It is bounded above by the free margin of the palate, below by the tongue, and on each side by the pillars of the soft palate and tonsils.

As the upper lip may be fissured through imperfect development (in which case it presents the condition known as hare-lip), so also may there be more or less decided fissure of the palate. In the slightest form of this affection, the uvula merely is fissured, while in extreme cases the cleft extends through both the soft and hard palate as far forward as the lips, and is then often combined with hare-lip. When the fissure is considerable, it materially interferes with the acts of sucking and swallowing, and the infant runs a great risk of being starved; and if the child grows up, its articulation is painfully indistinct. When the fissure is confined to the soft palate, repeated cauterization of the angle of the fissure has been found sufficient to effect a cure by means of the contraction that follows each burn. As a general rule, however, the child is allowed to reach the age of puberty when the operation of *staphyloraphy* (or suture of the soft parts) is performed—an operation always difficult, and not always successful. For the method of performing it, the reader is referred to the *Practical Surgery* of Mr. Fergusson, who has introduced several most important modifications into the old operation.

Acute inflammation of the tonsils, popularly known as QUINSY, is treated of in a separate article.

Chronic enlargement of the tonsils is very frequent in scrofulous children, and is not rare in scrofulous persons of more advanced age, and may give rise to very considerable inconvenience and distress. It may occasion difficulty in swallowing, confused and inarticulate speech, deafness in various degrees from closure of the eustachian tubes (now often termed *throat deafness*), and noisy and laborious respiration, especially during sleep; and it may even cause death by suffocation, induced by the entanglement of viscid mucus between the enlarged glands. Iodide of iron (especially in the form of Blancard's Pills) and cod-liver oil are the medicines upon whose action most reliance should be placed in these cases, while a strong solution of nitrate of silver (a scruple of the salt to an ounce of distilled water), or some preparation of iodine, should be applied once a day to the affected parts. If these measures fail, the tonsils must be more or less removed by the surgeon, either by the knife or scissors, or by a small *guillotine* specially invented for the purpose.

Enlargement or relaxation of the uvula is not uncommon and gives rise to a constant tickling cough, and to expectoration, by the irritation of the larynx which it occasions. If it will not yield to astringent or stimulating gargles, or to the stronger local applications directed for enlarged tonsils, its extremity must be seized with the forceps, and it must be divided through the middle with a pair of long scissors.

PALA'TINATE, a name applied to two German states, which were united previously to the year 1620. They were distinguished as the Upper and Lower Palatinate. The Upper or Bavaria P., now forming a circle of the kingdom of Bavaria, was a duchy, and was bounded by Baireuth, Bohemia, Neuburg, Bavaria, and the district of Nürnberg. Area, 2730 square miles; pop. (1807) 283,800. Amberg was the chief city, and the seat of government. The Lower P., or the Palatinate on the Rhine, embraced an area of from 3045 to 3150 square miles; and consisted of the electoral P., the principality of Simmern, the duchy of Zweibrücken, the half of the county of Sponheim, and the principalities of Beldenz and Lautern. For the area and population of the modern provinces of the Upper and Lower P., see article BAVARIA.

The counts of the electoral or Rhenish P. were established in the hereditary possession of the territory of that name, and of the lands attached to it, as early as the 11th century. After the death of Herman III., the Emperor Friedrich I. assigned the P. to Conrad of Swabia. After Conrad's death, his son-in-law, Duke Henry of Brunswick, came, in 1196, into the possession of these lands, but he, having been outlawed in 1215 by Friedrich II., was succeeded by his son, Otto III., Duke of Bavaria. Ludwig II., or the Strong, succeeded the preceding in the P. in 1253, and was in turn succeeded in 1294 by Rudolf I., who, however, was banished by his brother, the Emperor Ludwig, because he had taken part with Friedrich of Austria. The country was ruled by his three sons.

Ruprecht III., who died in 1410, was a German emperor. Of his four sons, Ludwig III. received the electoral or Rhenish P.; Johann, the Upper P.; Stephan, Zweibrücken; and Otto, Mosbach. The second and fourth lines soon died out, as well as also that of Ludwig III., which came to a close in 1559, upon which the possessions of that prince, together with the electorate, passed to Friedrich III. of the Simmern line. He was succeeded by Ludwig IV. in 1576, by Friedrich IV. in 1583, and by Friedrich V. in 1610, who, after he accepted the Bohemian crown, was driven from his possessions by the emperor in 1619, and his office of elector was transferred to Maximilian, Duke of Bavaria. Karl Ludwig, son of Friedrich V., received the Lower P. at the peace of Westphalia, and in his favor a new or eighth electorship was created. With his son Karl, the Simmern line terminated in 1685, upon which the P. fell into the hands of Philipp Wilhelm, count palatine of Neuburg.

The House of Neuburg was descended from Ludwig the Black, count palatine in Zweibrücken, second son of Stephan, count palatine in Simmern. Wolfgang, a descendant of Ludwig's, was the founder of all the other lines of counts palatine. Of his three sons, Johann founded the line of Neu-Zweibrücken, Karl the Birkenfeld line, Philipp Ludwig the Neuburg line. Philipp Ludwig had three sons, Wolfgang Wilhelm, August, and Johann Friedrich. The first founded the Neuburg line, the second the Sulzbach line, the third died childless. The son of Wolfgang Wilhelm died in 1690. His son, Johann Wilhem, became heir to the Beldenz line in 1694. He was succeeded by his brother, Karl Philipp, who in turn was succeeded in 1742 by Karl Theodor, from the Sulzbach line, who united the Bavarian territories with the Palatinate. Duke Maximilian of Zweibrücken next succeeded in 1799, who at the peace of Luneville (1801) was compelled to cede a portion of the Rhenish P. to France, a part to Baden, a part to Hesse-Darmstadt, and a part to Nassau. Treaties of Paris of 1814 and 1815 re-assigned the Palatinate lands beyond the Rhine to Germany, Bavaria receiving the largest share, and the remainder being divided between Hesse-Darmstadt and Prussia.

PA'LATINE (from Lat. *palatium*, a palace). A *Comes Palatinus*, or Count Palatine, was under the Merovingian kings of France, a high judicial officer, who had supreme authority in all causes that came under the immediate cognizance of the sovereign. After the time of Charlemagne, a similar title was given to any powerful feudal lord, to whom a province, generally near the frontier, was made over with *jura regalia*, or judical powers, similar to what the counts palatine had received in the palace, and the district so governed was called a *palatinate* or *county palatine*. There were three counties palatine in England—Lancaster, Chester, and Durham—which were, no doubt, made separate regalities on account of their respective proximity to the frontier of Wales and to that turbulent Northumbrian province which could neither be accounted a portion of England nor of Scotland. In virtue of their regal rights, the counts palatine had their courts of law, appointed their judges and law officers, and could pardon treasons, murders, and felonies; all writs and judicial process proceeded in their names, and the king's writs were of no avail within the bounds of the palatinate. Lancaster seems to have been made a county palatine by Edward III. Henry, first Duke, and John, second Duke of Lancaster, were both invested by him with the dignity of count palatine.

Henry VI. was hereditarily Duke and Count Palatine of Lancaster, and on his attainder, soon after Edward IV.'s accession, the duchy and county were forfeited to the crown, and confirmed on Edward IV.—afterwards on Henry VII. and his heirs for ever. The Queen is now Duchess and Countess Palatine of Lancaster. There is still a chancellor of the duchy and county palatine, whose duties are few and unimportant, but the administration of justice has gradually been assimilated to that of the rest of England. See LANCASTER. Chester is supposed to have become a county palatine when made over with regal jurisdiction by William the Conqueror to Hugues d'Avranches. In the reign of Henry III. it was annexed to the crown by letters patent, and since that time the earldom palatine of Chester has been vested in the eldest son of the sovereign, or in the crown, whenever there is no Prince of Wales. Durham seems to have first become a palatinate when William the Conquerer constituted Bishop Walcher Bishop and Duke of Durham, with power (according to William of Malmesbury) to restrain the rebellious people with the sword, and to reform their morals with his eloquence.

The Palatinate jurisdiction continued united with the bishopric till 1836, when it was separated by act of parliament, and vested in William IV. and his successors as a franchise distinct from the crown, together with all forfeitures, mines, and *jura regalia*. It has since been more completely incorporated with the crown. Pembroke was at one time a county palatine, but ceased to be so in Henry VIII.'s time. The Archbishop of York also exercised the powers of a palatine in the county of Hexham in Northumberland, of which he was deprived in the reign of Elizabeth In very early times there were a number of similar privileges in Scotland, the most important of which was that of the Earls Palatine of Strathearn. In Germany, the *Pfalzgraf*, or count palatine, exercised a jurisdiction much more extensive than the simple *Graf* or count. A considerable district in Germany was long under the jurisdiction of a count palatine, who was one of the electors of the empire. See PALATINATE.

PALATINE HILL (*Mons Palatinus*), the central hill of the famous seven on which ancient Rome was built, and, according to tradition, the seat of the earliest Roman settlements. In point of historical interest, it ranks next to the Capitol and the Forum. Its summit is about 160 feet above the sea. The form of the hill is irregularly quadrangular. Its north-western slope, towards the Capitoline Hill and the Tiber, was called *Germalus* or *Cermalus*. The origin of the name is uncertain, although several derivations are given connecting it with legendary stories. Romulus is said to have founded the city upon this hill, and on Germalus grew the sacred fig-tree (near to the Lupercal) under which he and his brother, Remus, were found sucking the she-wolf. Upon the P. H. were the temple of Jupiter *Stator*, the temple of Cybele, the sacred square enclosure called *Roma Quadrata*, and other sacred places and edifices, besides many of the finest houses in Rome. Augustus and Tiberius had their residences here, whence Tacitus termed it *ipsa imperii arx* (the very citadel of government); and at last Nero included it entirely within the precints of his *aureæ domus*, which Vespasian subsequently restricted to the hill. From the time of Alexander Severus it ceased to be the residence of the emperors, but the name *palace* (*palatium*), derived from it, was given to the abodes of sovereigns and great princes, and has been adopted into modern languages. Recent excavations have brought to light numerous remains of the palatial and other structures with which the P. H. was once covered; and these are now among the most interesting sights of the eternal city.

PALAWA'N, or PARAGOA, one of the Philippine Islands (q. v.).

PALAY (*Cryptostegia grandiflora*), a climbing plant of the natural order *Asclepiadaceæ* (q. v.), common in many parts of India, particularly on the eastern coast of Hindustan. It yields a very fine strong white fibre, resembling flax, and which can be spun into the finest yarn. The fibre is obtained from the stalk; the milky juice contains caoutchouc. P. is one of the most interesting plants which have recently been recommended to notice in India.

PALA'ZZOLO ACREI'DE, a town of Sicily, in the province of Syracuse, 29 miles south-south-west of Catania, is situated on the brow of a hill, just where it overhangs a deep valley. Near P. are the remains of the ancient *Acræ*, founded by a colony from Syracuse, on the site of a Phœnician settlement, 664 B.C. The most curious remains are to be found in some low cliffs beneath the town to the south, where is a series of arched niches, containing figures carved in high relief in the rock. The style of art appears to be archaic Greek, with somewhat of an Egyptian character. Pop. 9954.

PALE, in Heraldry, one of the figures known as ordinaries, consisting of a perpendicular band in the middle of the shield, of which it is said to occupy one third (No. 1). Several charges of any kind are said to be 'in pale' when they stand over each other perpendicularly, as do the three lions of England. A shield divided through the middle by a perpendicular line is said

to be 'parted per pale.' The Pallet is the diminutive of the pale, and is most generally not borne singly. No. 2, Or three pallets gules, were the arms of Raymond, Count of Provence. When the field is divided into an even number of parts by per-



pendicular lines, it is called 'paly of' so many pieces, as in No. 3, Paly of six argents and gules, the arms of the family of Ruthven. When divided by lines perpendicular and bendways crossing, it is called paly bendy, as in No 4. An Endorse is a further diminutive of the pallet, and a pale placed between two endorses is said to be endorsed (No. 5).

PALE, in Irish history (see IRELAND, HISTORY), means that portion of the kingdom over which the English rule and English law was acknowledged. There is so much vagueness in the meaning of the term, that a few words of explanation appear necessary. The vagueness arises from the great fluctuations which the English authority underwent in Ireland at various periods, and from the consequent fluctuation of the actual territorial limits of the Pale. The designation dates from the reign of John, who distributed the portion of Ireland then nominally subject to England into twelve counties palatine, Dublin, Meath, Kildare, Louth, Carlow, Kilkenny, Wexford, Waterford, Cork, Kerry, Tipperary, and Limerick. To this entire district, in a general way, was afterwards given the designation of the Pale. But as it may be said that the term is commonly applied by the writers of each age to the actual English territory of the period, and as this varied very much, care must be taken to allude to the age of which the name Pale is used. Thus, very soon after the important date of the Statute of Kilkenny, at the close of the reign of Edward III., the English law extended only to the four counties of Dublin, Carlow, Meath, and Louth. In the reign of Henry VI., the limits were still further restricted. In a general way, however, the Pale may be considered as comprising the counties of Dublin, Meath, Carlow, Kilkenny, and Louth. This, although not quite exact, will be sufficient for most purposes.

PA'LEA (Lat. chaff), a term employed in Botany to designate the bracts of the *florets* in Grasses (q. v.), called *corolla* by the older botanists; also to designate the small bracts or scales which are attached to the receptacle of the head of flowers in many of the *Compositæ* (q. v.). Any part of a plant covered with chaffy scales is described as *paleaceous*.

PALEMBA'NG. formerly an independent kingdom on the east coast of Sumatra, now a Netherlands residency, is bounded on the N. by Djambi, N.W. by Bencoolen, S. by the Lampong districts, and S.E. by the Strait of Banca, has an area of 61,900 square miles; and a population amounting, in 1873, to 577,085 souls. Much of the land is low-lying swamp, covered with a wilderness of impenetrable bush; but in the south it rises into mountains, of which Oeloe Moesi (Ulu Musi) is 6180 feet. Gold-dust, iron-ore, sulphur with arsenic, lignite, and common coal are found; also clays suited for making coarse pottery, &c. Springs of pure oil occur near the coal-fields of Bali Boekit (Bukit), and of mineral water in various places. Rice, cotton, sugar, pepper, tobacco, and, in the interior, cocoa-nuts, are grown; the forests producing gutta-percha, gum-elastic, ratans, wax, benzoin, satin-wood, &c. The rivers abound with fish; and the elephant, rhinoceros, tiger, panther, and leopard roam the woods, as well as the deer, wild swine, and goats, with many varietes of the monkey.

In the dry season the thermometer ranges from 80° to 92° F., and in the rainy season 76° to 80°. The climate is not unhealthy, except in the neighborhood of the swamps. The natives are descended from Javanese, who in the 16th c., or earlier, settled in P., and ruled over the whole land. The race, however, has become mixed with other Malays, and the language has lost its purity. In the north-west interior is a tribe called the Koeboes (Kubus), of whose origin nothing is known, but who are probably the remainder of the aborigines. They do not follow after agriculture, go about almost naked, and live chiefly by fishing and hunting. No idea of a Supreme Being seems to be possessed by them, though they believe in existence after death.

PALEMBANG, the capital of the kingdom and residency, is 52 miles from the Soensang (Sunsang), or principal mouth of the river Moesi (Musi), in 2° 59′ S. lat., and 104° 44′ E. long. The city is built on both banks of the Moesi, and other streams which fall into it, and is five miles in length by half a mile in breadth. The river is upwards of 1000 feet broad, and from 40 to 50 feet in depth, so that the largest vessels can sail up to the harbor. The native houses are raised on posts, and neatly constructed of planks or bamboos; the Chinese, Arabians, and Europeans, chiefly living in floating houses called rakits, of which there are upwards of 500, and holding communication with one another and with the natives by boats. The fort is built on the left bank of the river, and behind it are an institution for the blind and a splendid mosque. There is a school, where 30 European children are educated, a government elementary school for natives, and several good Chinese schools. Many of the natives can read and write, and in 1856 a native printing-press was erected by Kemas Mohamed Asahel.

P. is visited annually by upwards of 30,000 boats of various sizes, bringing produce from the interior, consisting chiefly of rice, benzoin, gum-elastic, gutta-percha, raw cotton, rattans, tobacco, pepper, wax, dragon's blood, resin; and gold-dust from the boundaries of the kingdom of Djambi, now included in the Residency. These are obtained chiefly in exchange for salt, cotton manufactures, earthenware, iron and copper wares, and provisions. The foreign trade is large, and chiefly carried on with Java, Banca, Singapore, China, and Siam. The imports into P., which considerably exceed the export thence, have an average annual value of near £300,000. The natives of P. are good ivory carvers, gold and silver smiths, jewellers, cutlers, japanners, painters, boat-builders, bookbinders, &c., and expert at all the ordinary handicrafts. The women, in addition to cotton fabrics, spinning, and dyeing, weave silk stuffs embroidered with gold. Pop. 44,000, of whom 100 are Europeans, 3000 Chinese, and 2000 Arabians.

PALE'NCIA (the ancient *Pullantia*), a city of Spain, in Old Castile, capital of the modern province of the same name, stands in a treeless, but well-watered and fruitful plain, on the Carrion, 30 miles north-east of Valladolid. It is a bishop's see, and is surrounded by old walls, 36 feet high and 9 feet thick, around which are pleasant promenades. The cathedral, a light and elegant Gothic edifice, was built 1321—1504. The first university founded in Castile was built here in the 10th c., but was removed to Salamanca in 1239. Nearly one-third of the population is employed in the manufacture of blankets and coarse woollen cloths. The position of the town on the Carrion, and on the Castilian Canal, is favorable to the development of commerce. The vine is cultivated, and there is a good trade in wool. Pop. (1877) 14,505.

PALE'NQUÉ, RUINS OF, are on the Rio Chacamas, a branch of the river Usumasinta, in the state of Chiapas, Mexico, 8 miles south-east of the village of Santo Domingo de Palenque, lat. 17° 30′ N., long. 92° 25′ W. The ruins extend over a large area covered with a dense tropical forest, and are of difficult exploration. They consist of vast artificial terraces, or terraced truncated pyramids, of cut stone, surmounted by edifices of peculiar and solid architecture, also of cut stone, covered with figures in relief, or figures and hieroglyphics in stucco, with remains of brilliant colors. Most of the buildings are of one story, but a few are two, three, and some may have been four stories. The principal structure, known as the Palace, is 228 feet long, 180 feet deep, and 25 feet high, standing on a terraced truncated pyramid of corresponding dimensions. It was faced with cut stone, cemented with mortar of lime and sand, and the front covered with stucco and painted. A corridor runs around the building, opening into four interior courts, which open into many smaller rooms. On slabs of stone are carved numerous colossal figures, and the remains of statues more resemble Grecian than Egyptian or Hindu art. Other spacious and elaborately ornamented buildings appear to have been temples of religion. These ruins were in the same condition when Cortez conquered Mexico, as now, over-grown with a forest, and their site forgotten. They were only discovered 1750.

Three explorations were made by the Spanish gavernment, but they were little known until visited by Messrs J. L. Stephens and F. Catherwood, and their account published with plans and drawings. See Stephen's *Incidents of Travel in Central America*, &c., and Catherwood's *Views of Ancient Monuments of Central America*, &c. There are in Mexico dim traditions of the existence, at a remote period, of the capital of a theocratic state, the center of a long since extinguished civilization, of which the only traces are these wonderful ruins and unexplained hieroglyphics.

PALE'RMO, an archiepiscopal city, important seaport, and the capital of the island of Sicily; capital also of the province of the same name, and along with Naples, Rome, Milan, and Turin, one of the five most populous cities in the kingdom of Italy, is situated on the north coast of the island, 135 miles by water west of Messina. Lat. 38° 6′ N., long. 13° 20′ E. It stands in a highly-cultivated and fertile plain called *La Conca d'Oro* (The Golden Shell), commands a beautiful view of the Gulf of Palermo on which it stands, and is backed toward the interior by ridges of mountains.

In shape the town is an oblong parallelogram, the direction of its length being from south-west to north-east It is divided into four quadrangular parts by two great streets, the beautiful Via Vittorio Emanuele, formerly the *Via Toledo*, or *Cassaro*, and the


PLAN OF
JERUSALEM
at the time of
ITS DESTRUCTION A. D. 71
First & Oldest Wall
Second Wall
Third Wall
Circumvallation by the Romans
PALESTINE
Geographical Miles, 60 = One Degree
English Miles, 69 = One Degree
Longitude East from Greenwich
MEDITERRANEAN SEA
SALT OR DEAD SEA or Sea of the Plain
JORDAN
JERUSALEM
SAMARIA
GALILEE
NAPHTALI
DAN
ASHER
ZEBULUN
ISSACHAR
MANASSEH
EPHRAIM
GAD
REUBEN
BENJAMIN
JUDAH
SIMEON
Part of DAN
BASHAN
GILEAD
MOAB
AMMON
AMALEKITES
Desert of Shur
Wilderness of Beer-sheba
Wilderness of Judah
Wilderness of Paran
Wilderness of Zin
Valley of Salt
Mount Hor
Kadesh Barnea
Zephath or Hormah
Ziklag
Elusa
Beer-sheba
Gaza
Ashkelon
Ashdod
Joppa
Lydda
Jericho
Bethlehem
Hebron
Tyre
Sidon
Zarephath or Sarepta
Ornithopolis
Beirout
Abila
Damascus
Bahr el Merj
Phaneas
Ashteroth Karnaim
Edrei
Kenath
Bozrah
Beth-gamul
Mt. Hauran
Mt. Carmel
Mt. Hermon
Mt. Gerizim
Mt. Ebal
Mt. Olives
Caesarea
Apollonia
Joppa
Calamon
Aphek
Megiddo
Shechem
Tirzah
Samaria
Jezreel
Plain of Jezreel
Waters of Merom
Sea of Galilee or Tiberias or the Sea of Galilee
Lake of Gennesaret
Jordan
Jabbok
Arnon
Pella
Gerasa
Gamala
Abila
Arbela
Mizpeh
Ramoth Gilead
Jazer
Heshbon
Medeba
Dibon
Aroer
Rabbath Ammon
Rabbath-moab
Kir or Moab
Kerioth
Jericho
Jericho
Bethel
Ai
Gilgal
Shiloh
Ophrah
Jacob's Well
Antipatris
Lydda
Ashdod
Gaza
Ascalon
Gath
Timnah
Eltekeh
Ekron
Jabneh
Azotus
Gibeon
Gibeah
Ramah
Mizpeh
Beth-horon
Beth-horon
Gezer
Makkedah
Libnah
Lachish
Eglon
Debir
Hebron
Engedi
Zoar
Zoar
Zoar

Strada Nuova or *Macgueda*, which cross each other at right angles in the middle of the city. It is upwards of four miles in circumference, is surrounded by walls pierced by 12 gates and flanked with bastions, and is defended by several batteries. The houses are balconied, flat roofed, and have glass doors instead of windows. The streets, besides the two main thoroughfares already mentioned, are generally well laid out, and there are several fine promenades, of which the famous Marina, extending along the shore, on the line of the ancient fortifications, and bordered by the palaces of the nobles, is the most magnificent. P. contains 60 parish churches; 8 abbeys; 71 monasteries and convents, to which belong from 20,000 to 30,000 monks and nuns; and, besides these, 19 oratories. Under the churches is counted the cathedral—the church of St. Rosalie.

At the intersection of the two principal streets there is a large octagonal space or *Piazza*, lined with palaces, and adorned with statues and marble fountains. The royal palace is a huge pile of buildings, with a splendid chapel, built in 1129, and contains many pillars of rare workmanship and rich mosaics with Arabic inscriptions. The cathedral is a fine edifice, originally Gothic, but to which incongruous Greek additions have been made, is adorned with marble columns and statues, and contains monuments of the Emperor Frederick II. and of King Roger, the founder of the Norman monarchy in Sicily. Among the principal public institutions of P. are the university, an academy of art and sciences, a medical academy, an institution for arts and antiquities, a beautiful and extensive public garden, public libraries, theaters, &c. P. is an archbishop's see, the residence of the governor of the island, and the seat of the supreme courts. Manufactures of silks, cottons, oil-cloth, leather, gloves, &c., are carried on. The harbor is formed by a mole, 1300 feet in length, on which there is a light-house and battery. Vessels of 700,000 tons enter and clear the port annually, and the imports amount in value to near £1,000,000, and the exports to about the same sum. Pop. (1871) of P. with suburbs, 186,406; (1881) 205,712.

The environs of P. are interesting as well as picturesque, and embrace many pleasant villas and noble mansions. North-west of the city is Monte Pellegrino, the Eircte of the ancients, an abrupt rocky mass, in which there is a grotto or cave, in which Santa Rosalia, a young Norman princess, lived a life of religious retirement. In P., Santa Rosalia is esteemed more highly than even Santa Maria; the festival in her honor lasts from the 9th to the 13th July, and is the most important festival held on the island. During its celebration the city is illuminated, the streets are gay and brilliant, and there is an immense influx of strangers from the vicinity. But the chief feature of the festival is the procession to the cave. An immense silver image of the saint is borne thither on a wagon, 70 feet long, 30 feet broad, and 80 feet high. Its form resembles that of a Roman gallery, with seats for a choir. The wagon is drawn by 56 mules, covered with the gayest trappings, and driven by 28 postillions.

P., the ancient *Panormus*, was originally a Phœnician colony, but had become a dependency of Carthage before the name occurs in history. With the exception of a short time about 276 B.C., when it fell into the hands of the Greeks, it continued to be the head-quarters of the Carthaginian power in Sicily, until it was taken by the Romans during the first Punic War (254 B.C.), when it became one of the principal naval stations of the Romans. The name Panormus is derived from the excellent anchorage (Gr. *hormos*) in the bay; but the Phœnician name found on coins is *Machanath*, meaning 'a camp.' The Vandals, and afterwards the Arabs, made it the capital of the island, and after the Norman Conquest it continued to be the seat of the king of Sicily. It still remained the royal residence under the Aragonese kings; but the court was removed after Sicily became united to the then kingdom of Naples. See SICILY.

PA'LESTINE (*Palæstina, Philistia*), or the HOLY LAND, a country of South-Western Asia, comprising the southern portion of Syria, and bounded on the W. by the Mediterranean, E. by the valley of the Jordan, N. by the mountain-ranges of the Lebanon and the glen of the Litâny (Leontes), and S. by the Desert of Sinai; lat. 31° 15′—33° 20′ N., long. 34° 30′—35° 30′ E. Within these narrow limits, not more than 145 miles in length by 45 in average breadth—an area less than that of the principality of Wales—is comprised the 'Land of Israel' or 'Canaan,' the arena of the greatest events in the world's history. The principal physical features of P. are, (1) a central plateau or table-land, with a mean height of 1600 feet, covered with an agglomeration of hills, which extend from the roots of the Lebanon to the southern extremity of the country; (2) the Jordan valley and its lakes; and (3) the maritime plain, and the plains of Esdraëlon and Jericho. On the east, the descent from the central plateau is steep and rugged, from Lake Huleh to the Dead Sea. On the west, it is more gentle, but still well marked, towards the plains of Philistia and Sharon. The ascertained altitudes on this plateau, proceeding from south to north, are Hebron, 3029; Jerusalem, 2610; Mount of Olives, 2724; Mount Gerizim, 2700; Mount Tabor, 1900; Safed, 2775 feet above the sea. Nearly on the parallel of the Sea of Galilee, the range of Carmel extends from the central plateau north-west to the Mediterranean, where it terminates abruptly in a promontory surmounted by a convent. It rises from 600 feet in the west, to 1600 feet in the east, and is composed of a soft white limestone, with many caverns.

Beyond the boundary of P. on the north, but visible from the greater part of the country, Mount Hermon rises to 9381 feet, and is always snow-clad. From the formation of the central plateau, the drainage is nearly always east and west, to the Jordan and the Mediterranean. The streams of the plateau are insignificant, and generally dry in summer.

The geological formation of the country consists of jurassic and cretaceous limestone, often covered with chalk, and rich in flints, with occasional interruptions of tertiary, basaltic, and trappean deposits. The upper strata consists of limestone of a white or pale-brown color, containing few fossils, but abounding in caverns, which form one of the peculiarities of the country. The general features of the landscape exhibit soft rounded hills, separated by narrow glens or valleys of denudation; the strata are occasionally level, but more frequently violently contorted, as seen on the route from Jerusalem to Jericho, where the fissures are often 1000 feet deep, and only 30 or 40 feet wide. Ironstone occurs in small quantities; rock-salt, asphaltum, and sulphur abound near the Dead Sea, where, as also near the Sea of Galilee, there are many hot springs. Volcanic agency is evident in the obtruded lava of former ages, and in frequent earthquakes of modern times.

The vast crevasse through which the Jordan flows, and which cleaves the land from north to south, is one of the most remarkable fissures on the surface of the globe; it is from 5 to 12 miles wide, and of the extraordinary depth of 2630 feet at the bottom of the Dead Sea. Through this the river descends at the rate of 11 feet in a mile, with a course so tortuous that it travels 132 miles in a direct distance of 64, between the Sea of Galilee and the Dead Sea. It is the only perennial river of P., except the Kishon, which is permanent only in its lower course, and the Litâny on its northern border. See JORDAN. The only lakes of P. are in the valley of the Jordan. See GENNESARET, SEA OF, and DEAD SEA.

The plain of Philistia extends from the coast to the first rising ground of Judah, about 15 miles in average width; the soil is a rich brown loam, almost without a stone. It is in many parts perfectly level; in others undulating, with mounds or hillocks. The towns of Gaza and Ashdod, near the sea, are surrounded by groves of olives, sycamores, and palms. This plain is still, as it always was, a vast corn-field, an ocean of wheat, without a break or fence; its marvelous fertility has produced the same succession of crops, year after year, for forty centuries without artificial aid. The plain of Sharon is about 10 miles wide in the south, narrowing towards the north, till it is terminatod by the buttress of Carmel. Its undulating surface is crossed by several streams; the soil is rich, and capable of producing enormous crops; but only a small portion of it near Jaffa is cultivated, and it is rapidly being encroached on by the sea sand, which, between Jaffa and Cæsarea, extends to a width of 3 miles and a height of 300 feet.

The famous ancient cities of this region, Cæsarea, Diospolis, and Antipatris, have vanished. Jaffa (Joppa) alone remains, supported by travelers and pilgrims from the west on the way to Jerusalem. The great plain of Esdraëlon, or Jezreel, extends across the center of the country from the Mediterranean to the Jordan, separating the mountain-ranges of Carmel and Samaria from those of Galilee. Its surface drained by the Kishon, which flows west to the Mediterranean at Haifa. The plain is surrounded by the hills of Gilboa and Little Hermon; the isolated Mount Tabor rises on its north-east side. It is extremely fertile in grain where cultivated, and covered with gigantic thistles where neglected. It is richest in the central part, which slopes east to the Jordan—the battle-field where Gideon triumphed, and Saul and Jonathan were overthrown. It is the home of wandering Bedouins, who camp in its fields, and gallop over its green-sward in search of plunder. Many places of deep historical interest are connected with this plain. Shunem, Nain, Endor, Jezreel, Gilboa, Bethshan, Nazareth, and Tabor are all in its vicinity. The plain of Jericho is a vast level expanse, covered with the richest soil, now quite neglected. Around the site of Jericho, 'the city of palm-trees,' there is not now a single palm; but a recent experiment proved its capability of producing in abundance all the crops for which it was formerly famous. The climate of P. is very varied; January is the coldest and July the hottest month.

The mean annual temperature of the year at Jerusalem is 65° Fahr., resembling that of Madeira, the Bermudas, and California. The extreme heat of the summer months is modified by sea-breezes from the north-west. In the plain of Jericho and the Jordan valley it is extremely hot and relaxing. The *sirocco*, a south-east wind, is often oppressive in early summer. Snow falls

in the uplands in January and February, and thin ice is often found at Jerusalem, where the annual rainfall is 61 inches. Heavy dews fall in summer, and the nights are cold. Violent thunderstorms occur in winter. In the south, Judah and part of Benjamin, is a dry parched land; the bare limestone rock is covered here and there with a scanty soil, and the vast remains of terraces show how assiduously it must have been cultivated in ancient times to support the teeming population indicated by the ruins of cities with which every eminence is crowned. To the north of Judea the country is more open, the plains are wider, the soil richer, and the produce more varied, till at Nablous the running streams and exuberant vegetation recall to the traveler the scenery of the Tyrol. Even in its desolation, P. is a land flowing with milk and honey. There is no evidence of its climate having changed or deteriorated, nor any reason to suppose that it would fail to support as great a population as ever it did, provided the same means as formerly were used for its cultivation. It has the same bright sun and unclouded sky, as well as the early and latter rain, which, however, is diminished in quantity, owing to the destruction of trees.

The botany of P. is rich and varied, resembling that of Asia Minor. Among its trees are the pine, oak, elder, and hawthorn in the northern and higher districts, and the olive, fig, carob and sycamore elsewhere. The cultivated fruits are the vine, apple, pear, apricot, quince, plum, orange, lime, banana, almond, and prickly pear. Wheat, barley, peas, potatoes, and European vegetables, cotton, millet, rice, maize, and sugar-cane are among its products. The date now ripens its fruit only in the south and on the sea-board. The brilliant flowers which in spring enamel the surface and tinge the entire landscape, comprise the adonis, ranunculus, mallow, poppy, pink, anemone, and geranium. In the Jordan valley, 900 or 1000 feet below the sea-level, the vegetation is tropical in its character, resembling that of Arabia; the nubk (*Spina Christi*), the oleander, and the small yellow 'apples of Sodom' are conspicuous. The most valuable products of the vegetable kingdom are derived from the vine, fig, olive, and mulberry trees. Wine for home use is made in all the central and southern districts; the best is made at Hebron from the grapes of Eshcol. Olive oil is a valuable export.

The wild animals of P. comprise the Syrian bear in Lebanon, the panther, jackal, fox, hyena, wolf, wild boar, gazelle, and fallow-deer; the lion is now unknown. The domestic animals are the Arabian camel, ass, mule, horse, buffalo, ox, and broad-tailed sheep. Among the birds are the eagle, vulture, kite, owl, nightingale, jay, and kingfisher—the latter of brilliant plumage—the cuckoo, heron, stork, crow, partridge, and sparrow. Fish swarm in the Sea of Galilee, and bats and lizards abound.

The divisions of P. in Old Testament times were into 9½ tribes in the west, and 2½ tribes in the east of the Jordan. In New Testament times, on the west of the Jordan, the provinces of Galilee in the north, Samaria in the middle, and Judea in the south; on the east of the Jordan, Perea and Decapolis. The boundaries of the tribes and provinces are very uncertain. Under Turkish rule, P. is comprised in the vilayet of Syria. The present population, probably not exceeding 700,000, consists mainly of a race of mixed descent, sprung from Syrians, Arabs, and Greeks; they speak Arabic, and are mostly Moslems, some of them nomadic. There are a number of Greek Christians of Syrian descent; a few official Turks, some Maronites, Roman Catholics, and Armenians. The Jews, a few thousands in number, are mostly from Spain and Germany, and are found only in Jerusalem, Hebron, Tiberias, and Safed. A colony of some 750 Germans established themselves some years ago about Carmel and Jaffa. The country is oppressed by Turkish avarice, and overrun by the predatory Arabs. The Palestine exploration societies, English and American, organized in 1865, have done good work in the identification of Biblical and classical sites. See SYRIA.

PALESTRI'NA, an Italian city 22 miles E.S.E. of Rome, on the slope of an offset of the Apennines. Besides several interesting churches, the town contains a castle, once the chief stronghold of the Colonna, to whom the town belonged; and the palace and garden of the Barberini family. The view across the Campagna and towards the Alban Hills is magnificent. Pop. 6000, who manufacture coarse woollen goods.

P. is built almost entirely upon the site and the gigantic substructions of the Temple of Fortune, one of the great edifices of the former city of Prænestе. This city was one of the most ancient as well as powerful and important cities of Latium. It covered the hill (2400 feet above sea-level) on the slope of which the modern town stands, and was overlooked by a citadel of great strength. The site of this citadel on the summit of the hill is now occupied by a castle of the middle ages, called *Castel S. Pietro;* but remains of the ancient walls are still visible. We first hear of Prænestе as a member of the Latin League; but in 499 B.C. it quitted the confederacy, and joined the cause of the Romans. In 380 B.C., the Prænestines, having rejoined their ancient allies, opened a war with Rome; but were completely routed on the banks of the Allia by T. Quintius Cincinnatus, and beaten back to their own gates. They took a prominent part in the famous Latin War, 340 B.C.

Having given shelter to the younger Marius in the year 82 B.C., this city was besieged by the forces of Sulla, and on its being taken all the inhabitants were put to the sword. A military colony was then established in their place, and soon the city began to flourish anew. Its elevated and healthy situation, at no great distance from the capital, made it a favorite place of resort for the Romans during summer. Augustus frequented it; Horace often found this city a pleasant retreat; and here Hadrian built an extensive villa. The Temple of Fortune is described by Cicero as an edifice of great antiquity as well as splendor, and its oracle was much consulted. The town became the stronghold of the family of Colonna in the middle ages; but was given to the Barberini family by Urban VIII.

PALESTRINA, GIOVANNI PIERLUIGI DA, a distinguished musical composer of the 16th century. He derived his surname from the town of Palestrina, in the Roman States, where he was born in 1524. At the age of sixteen, he went to Rome, and studied music under Claude Goudimel, afterwards one of the victims of the St. Bartholomew massacre. In 1551 he was made *maestro di capella* of the Julian Chapel, and in 1554 he published a collection of Masses, so highly approved of by Pope Julius III., to whom they were dedicated, that he appointed their author one of the singers of the pontifical chapel. Being a married man, he lost that office on the accession to the pontificate of Paul IV., in whose eyes celibacy was a necessary qualification for its duties. In 1555 he was made choir-master of St. Maria Maggiore, and held that position till 1571, when he was restored to his office at St. Peter's.

In 1563, the council of Trent having undertaken to reform music of the church, and condemned the profane words and music introduced into masses, some compositions of P. were pointed out as models, and their author was intrusted with the task of remodelling this part of religious worship. He composed three masses on the reformed plan; one of them, known as the Mass of Pope Marcellus (to whose memory it is dedicated), may be considered to have saved music to the church by establishing a type infinitely beyond anything that had preceded it, and, amid all the changes which music has since gone through, continues to attract admiration. During the remaining years of his life, the number and the quality of the works of P. are equally remarkable. His published works consist of 13 books of Masses, 6 books of Motets, 1 book of Lamentations, 1 book of Hymns, 1 book of Offertories, 1 book of Magnificats, 1 book of Litanies, 1 book of Spirit Madrigals, and 3 books of Madrigals. P. must be considered the first musician who reconciled musical science with musical art, and his works form a most important epoch in the history of music. Equally estimable in private life, and talented as a musician, P. struggled through a life of poverty during eight pontificates; his appointments were meager, and his publications not remunerative. He died in 1594. A memoir of his life and writings has been written by the Abbé Baïni.

PALE'STRO, a village of Piedmont, 8 miles south-east of Vercelli, famous as the scene of a battle between the Sardinians and Austrians in May 1859. On the 30th of that month the Piedmontese drove the Austrians from this village, and on the 31st defended it with great bravery against an Austrian attack. The Piedmontese in the battle of the 31st were assisted by 3000 French Zouaves, and on that occasion the Austrians lost 2100 men killed and wounded, 950 prisoners, and 6 pieces of canon. On June 1st the allies entered Novara.

PA'LETTE. See PAINTING.

PALEY, DR. WILLIAM, a celebrated English divine, was born at Peterborough in 1743. His father was a Yorkshireman, and not long after P. was born returned to his native parish of Giggleswick, one of the wildest and most sequestered districts in the West Riding, to become master of the grammar-school there. Young P. was brought up among the shrewd, hard-headed peasantry of Yorkshire; and it is probable that he either naturally possessed, or insensibly acquired their moral and mental characteristics. At all events, he soon become conspicuous in the family for his good sense; and when he left to enter Christ's College, Cambridge, as a sizar, in his sixteenth year, his father said: 'He has by far the clearest head I ever met with.' At Cambridge, P. led for the first two years a gay, idle, and dissipated life, but thereafter became a severe student, and took his bachelor degree in 1763 with highest honors. He then taught for three years in an Academy at Greenwich.

In 1765 he obtained the first prize for a prose Latin dissertation—the subject being 'A Comparison between the Stoic and Epicurean Philosophy with respect to the Influence of each on the Morals of a People,' in which he characteristically argued in favor

of the latter. Next year he was elected a Fellow and Tutor of Christ's, and also took the degree of M. A. In 1767 he was ordained a priest. His career as a college tutor, which lasted about 1 years, was eminently successful; and it appears to have been during this period that he systematized his principles in moral and political philosophy. In 1776, P. married, and was of course obliged to give up his fellowship, but was compensated by a presentation to the livings of Mosgrove and Appleby in Westmoreland and of Dalston in Cumberland. Four years later he was collated to a prebendal stall in the cathedral church of Carlisle, in 1782 he became archdeacon, and in 1785 chancellor of the diose. The last of these years witnessed the publication of his *Elements of Moral and Political Philosophy*. In this work he propounds his ethical theory, which is commonly called utilitarianism, but is really a mixture of utility and theology. He begins by renouncing the favorite doctrine of the Moral Sense, against which he adduces a series of strong objections. He then takes up the question of the source of obligation, and resolves it into the will of God, enforced by future punishment, admitting candidly that virtue is prudence directed to the next world. The will of God, in so far as it is not rendered explicit by revelation, is to be interpreted by the tendency of actions to promote human happiness; the benevolence of the Deity being supposed.

Objection has frequently been taken to the principles on which P. rests his system, but the lucidity and appositeness of his illustrations are beyond all praise. If his treatise cannot be regarded as a profoundly philosophical work, it is at anyrate one of the clearest and most sensible ever written, even by an Englishman; and if it failed to sound the depths of 'moral obligation,' it at least brushed off into oblivion the shallow and muddy mysticism that had long enveloped the philosophy of politics. P.'s plain sarcastic view of the 'divine right of kings,' which he puts on a level with the 'divine right of constables,' gave extreme offence to George III., but was nevertheless much admired by not a few of his majesty's subjects, and is now held by everybody to be beyond question. In 1790 appeared his most original and valuable work—the *Horæ Paulinæ, or the Truth of the Scripture History of St. Paul evinced by a Comparison of the Epistles which bear his name with the Acts of the Apostles, and with one another*. The aim of this admirable work is to prove, by a great variety of 'undesigned coincidences,' the improbability, if not impossibility, of the usual infidel hypothesis of his time—viz., that the New Testament is a 'cunningly-devised fable.' It was dedicated to his friend John Law, then Bishop of Killala in Ireland, to whose favor he had been indebted for most of his preferments. P.'s next important work was entitled *A View of the Evidences of Christianity*, published in 1794. It is not equal in originality to its predecessor, but the use which the author has made of the labors of such eminent scholars as Lardner and Bishop Douglas is generally reckoned most dexterous and effective.

Later and keener criticism is indeed anything but satisfied with P.'s 'Evidences;' but in P.'s own day he was held to have achieved a splendid triumph over sceptics, and was handsomely rewarded. The Bishop of London appointed him a prebend of St. Pancras; shortly after he was promoted to the subdeanery of Lincoln (worth £700 per annum); Cambridge conferred on him the degree of D.D.; and the Bishop of Durham the rich rectory of Bishop Wearmouth (worth £1200 per annum), in consequence of which he honorably resigned his livings in the diocese of Carlisle. After 1800 he became subject to a painful disease of the kidneys, but notwithstanding he continued to write, and in 1802 published perhaps the most widely popular of all his works, *Natural Theology, or Evidences of the Existence and Attributes of the Deity*, which, however, is based, and to a large extent borrowed from the *Religious Philosopher*, the work of a Dutch philosopher named Nieuwentyt, an English translation of which appeared in 1718—1719. The plagiarisms are most palpable, but have been accounted for on the supposition that the *Natural Theology* was 'made up' from his loose papers and notes written when P. was a college tutor, and that he had forgotten the sources from which he derived them. It is also but fair to state that he has taken nothing which he has not greatly improved; *nihil tetigit, quod non ornavit*. A somewhat noted edition of this work, enriched, or at least expanded by annotations and dissertations, is that by Lord Brougham and Sir Charles Bell (1836—1839). P. died May 25, 1805. He had a family of four sons and three daughters. A complete edition of his works was published in 1838 by one of his sons, the Rev. Edmund Paley. The best biography is that by Meadley (1809).

PALGRAVE, Sir Francis, a distinguished antiquary and historian, was born in London in July 1788, of Jewish parentage, being the son of Mr. Meyer Cohen, a member of the Stock Exchange. He was educated at home under a Dr. Montucci, and even when a child showed extraordinary genius. When only eight years old, he made a translation into French of the *Battle of the Frogs and Mice* from the Latin version of Beauclerc, which was printed by his father in 1797. In 1803 he was articled as a clerk to a legal firm, and at the expiration of his articles, continued with the same firm as managing clerk until 1822, when he took chambers in the Temple, and was employed under the Record Commission. He had previously made himself known as a literary antiquarian, by the publication in 1818, of some Anglo-Norman Chansons, which he edited with much care. On the occasion of his marriage in 1823, he changed his name of Cohen to P., that being the maiden name of his wife's mother. He was called to the bar in 1827, and had considerable practice for some years in pedigree cases before the House of Lords. In 1831 he published a *History of England*, which formed a part of the *Family Library;* and in 1832 appeared his *Rise and Progress of the English Commonwealth;* also *Observations on the Principles, &c., of New Municipal Corporations*. In that year he received the honor of knighthood, and was subsequently one of the Municipal Corporation Commissioners. In 1835, the Commissioners issued their Report, which was signed, however, by only sixteen of the members—Sir F. P. being one of the four dissentients. In the same year he published a 'Protest' against the Commissioners' Report, in which he called in question several of its statements, views, and arguments.

In 1838, on the reconstruction of the Record Service, Sir F. P. was appointed deputy-keeper of Her Majesty's Records, and held that office during the rest of his life. Besides the works already mentioned, Sir F. P. edited for the government the following: *Calendars of the Treasury of the Exchequer, Parliamentary Writs, Curia Regis Records*, and *Documents Illustrative of the History of Scotland*. In his private capacity, he produced the *Merchant and the Friar*, an imaginary history of Marco Polo and Friar Bacon; also a *Hand-book for travellers in Northern Italy*, and a *History of England and Normandy*. Of this last work a volume appeared in 1851, and a second in 1857; and the third and fourth volumes were published within three years after their author's death. Sir F. P. also wrote numerous articles for the *Edinburgh and Quarterly Reviews*, principally of an antiquarian character, but some of them purely literary or artistic. His great merit, in his historic writings, consists in the extensive use made by him of original documents, by aid of which he not only himself very much enlarged our acquaintance with the history and social aspects of the middle ages, but pointed out to others the advantage to be derived from a careful study of the original sources of information now known to abound among our public records. Sir F. P. died at Hampstead, on the 6th of July 1861.

PALI (a corruption of the Sanscrit *Prâkrit*, q. v.) is the name of the sacred language of the Buddhists. Its origin must be sought for in one or several of the popular dialects of ancient India, which are comprised under the general name of Prâkrit, and stand in a similar relation to Sanscrit as the Romance languages, in their earlier period, to Latin. It has been formerly assumed that P. arose from the special Prâkrit dialect called Mâgadhî, or the language spoken in Magadha; but, according to the view expressed by Lassen in his *Indische Alterthumskunde*, an hypothesis of this kind is not tenable, since the peculiarities of this dialect are not compatible with those of the P. language. The same distinguished scholar holds that the Prâkrit dialects, called the S'aurasenî and Mâhârâsht'rî, have a closer relation to the P. than any other, and that the origin of the latter must therefore be traced to the country of Western Hindustan, between the Jumna river and the Vindhya mountain; though he observes, at the same time, that the P. is older than these dialects, and that the latter are therefore more remote from Sanscrit than the former. Whether the oldest works of the Buddhist religion were written in P. may be matter of doubt. It is more probable, on the contrary, that the language in which the founder of the Buddhist religion conveyed his doctrine to the people was not yet that special language, but a mixture of classical and popular Sanscrit, such as it still appears in the Buddhistic Sûtras. At a later period, however, P. became the classical language in which the Buddhists wrote their sacred, metaphysical, and profane works.

The most important historical work written in this language is the *Mahâvans'a* (q. v.); other P. works, which have lately become known in Europe, and deserve especial mention, are the *Dhammapada*, on the Buddhist doctrine, and five *Jâtakas*, containing a fairy tale, a comical story, and three fables—both works edited and translated by V. Fausböll (Copen. 1855 and 1861). P. ceased to be a living language of India when Buddhism was rooted out of it; it was carried by the fugitive Buddhists to other countries, especially Ceylon, Burmah, and Siam; but in these countries, too, it had to give way before the native tongues, in which the later Buddhist literature was composed.

PA'LIMPSEST (Gr. *palimpsestos*, 'rubbed a second time'), the name given to parchment, papyrus, or other writing material, from which, after it had been written upon, the first writing was wholly or in part removed for the purpose of the page being written upon a second time. When the MS. had been written with

one species of ink employed by the ancients, which was merely a fatty pigment, composed chiefly of lampblack, and only coloring the surface, but not producing a chemical change, there was little difficulty in obliterating the writing. It was accomplished by the use of a sponge, and if necessary, of a scraper and polishing tool; and, where proper pains were taken, the erasure of the first writing was complete. But when the ink was mineral, its effect reached beyond the surface. In that case a scraping-tool or pumice-stone was indispensable; if these were hastily or insufficiently applied, the erasure was necessarily imperfect; and thus it often happens in ancient MSS. that, from the want of proper care on the part of the copyist in preparing the parchment for re-writing, that original writing may still be read without the slightest difficulty.

The practice of re-preparing used parchment for second use existed among the Romans. The material thus re-prepared was of course reserved for the meaner uses. We meet frequent allusions in the classical writers, as Plutarch, Cicero (*Ad Familiares*, vii. 18), Catullus (xxii. 115) and others, to the palimpsest, in the sense of a blotter or first draft-book, on which the rough outline or first copy of a document was written, preparatory to the accurate transcript which was intended for actual use; and it appears equally certain that in many cases whole books were written upon re-prepared parchment or papyrus, not only among the Greeks and Romans, but also among the ancient Egyptians.

Of palimpsests of the classic period, however, it is hardly necessary to say no specimen has ever been discovered. It is to the necessities of the medieval period that literature owes the unquestionably important advantages which have arisen from the revival of the ancient practice of re-preparing already used material for writing. Under the early emperors, the intercourse with Egypt and the east secured a tolerably cheap and abundant supply of Papyrus (q. v.), which rendered it unnecessary to recur to the expedient of the palimpsest; and this became still more the case in the 5th and 6th centuries, when the tax on papyrus was abolished. But after the separation of east and west, and still more after the Mohammedan conquest of Egypt, the supply of papyrus almost completely ceased; and from the 7th c. in the west, and the 10th or 11th in the east, the palimpsest is found in comparatively frequent use; and its frequency in the 15th c. may be estimated from the fact that some of the earliest books were printed on palimpsest.

Some writers have ascribed the prevalence of its use to the indifference, and even to the hostility of the monks and clergy to classical literature, and have attributed to their reckless destruction of classic MSS., in order to provide material for their own service-books and legendaries, the deficiencies in the remains of ancient learning which scholars have now to deplore. That some part of the loss may have so arisen, it is impossible to doubt, although it is equally certain that we owe to the medieval monks and clergy whatever of ancient literature has been preserved to our day. But the condition in which the existing palimpsests are uniformly found—for the most part mere fragments of the ancient writers whose works they originally contained—goes far in itself to show that the MSS. which were broken up by the mediæval copyists, for the purpose of being re-written, were almost always already imperfect or otherwise damaged; nor is there anything in the condition of any single palimpsest which has reached our day to justify the belief, that when it was taken up for the purpose of rescription, the original work which it contained was in a state at all approaching to completeness. Fortunately, however, there are many of the relics of ancient learning of which even the mutilated members have an independent value; and this is especially true of Biblical MSS., particularly under the critical aspect, and in a still broader sense, of all the remains of the ancient historians.

It will easily be understood, therefore, that the chief, if not the sole interest of palimpsest MSS. lies in the ancient writing which they had contained, and that their value to literature mainly depends on the degree of legibleness which the ancient writing still retains. It is difficult to make this fully intelligible to the reader without an actual inspection, but the facsimile which is annexed will furnish a sufficient idea. The particular passage selected for the illustration is from page 62 of the Vatican MS., from which Mai deciphered the fragments of the *De Republica*. The darker letters are those of the modern MS.; the faint lines are, as may be supposed, those of the original codex. Although so much more faint than the modern writing, they can be read with facility on account of their greater size. We shall transcribe both texts in ordinary characters. The original was as follows :

EST
IGITUR INQUIT
AFRICANUS RESP.

(The ordinary contraction for *Respublica*.)

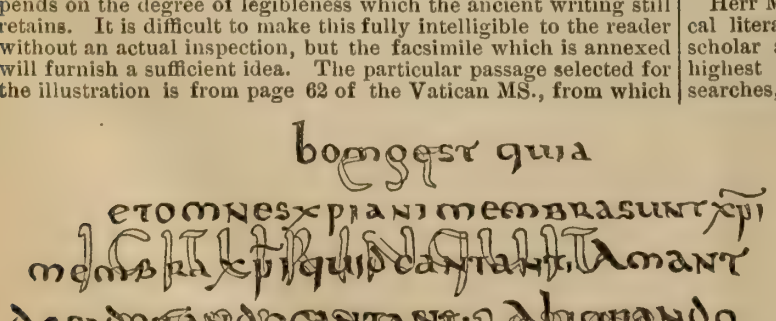
The corresponding lines of the modern MS., which is from St Augustine's commentary on the Psalms, are—

homo est quia
et omnes Χριϊανι (Christian membra sunt Χρι. (Christi)
membra Χρι. quid cantant. Amant
Desiderando cantant. Aliquando

In this specimen, as very commonly occurs, the original writing is much larger than the modern; the modern lines and letters do not cover those of the old MS., but they follow the same order. In other specimens the new writing is transverse; in some, the old page is turned upside down. Sometimes, where the old page is divided into columns, the new writing is carried over them all in a single line; sometimes the old page is doubled, so as to form two pages in the new MS. Sometimes it is cut into two, or even three pages. The most perplexing case of all for the decipherer is that in which the new letters are of the same size, and are written upon the same lines with those of the original MS. Examples of this are rare, and even when they occur, the difference between the form of the ancient characters, which are ordinarily uncial, and that of the modern, is in itself a great aid to the decipherer. Some variety, also, is found in the language of the palimpsests. In those which are found in the western libraries, the new writing is almost invariably Latin, while the original is sometimes Greek, and sometimes Latin. In the palimpsests discovered in the east, the original is commonly Greek, the new writing being sometimes Greek, sometimes Syriac, sometimes Armenian; and one palimpsest, the material of which is papyrus, is found in which the original was the enchorial Egyptian language, while the modern writing is Greek.

The possibility of turning palimpsest MSS. to account as a means of extending our store of ancient literature, was suggested as far back as the days of Montfaucon; but the idea was not turned to practical account till the latter part of the 18th century. The first palimpsest editor was a German scholar, Dr. Paul Bruns, who having discovered that one of the Vatican MSS. was a palimpsest, the effaced matter of which was a fragment of the 91st book of Livy's *Roman History*, printed it at Hamburg in 1773. In the field of discovery thus opened by Bruns but little progress was made until the following c., when Dr. Barrett of Trinity College, Dublin, published his palimpsest Fragments of St. Matthew, and when palimpsest literature at once rose into interest and importance in the hands of the celebrated Angelo Mai (q. v.). A detailed account of Mai's successes will be given hereafter, when we shall enumerate the principal publications in this curious department of letters; and under his own name will be found the history of his personal labors. The great historian Niebuhr about the same time applied himself to the subject, and was followed by Blume, Pertz, Gaupp, and other German scholars, whose labors, however, were for the most part confined to the department of ancient Roman law. More recently, the discoveries of Dr. Tischendorf in Biblical literature, and those of Dr. Cureton as well in sacred as in profane literature, have contributed still more to add importance to the palimpsest MSS. which have been supposed to exist in the monasteries of the Levant.

Herr Mone has had similar success in the department of liturgical literature, and Dr. Frederick Augustus Pertz, son of the scholar already mentioned, may be said to have carried to its highest point the interest which attaches to these curious researches, by editing from a *thrice written palimpsest* a very considerable series of fragments of the Roman annalist, Gaius Granius Licinianus.



It remains to enumerate briefly the most important palimpsest publications which have hitherto appeared, distributed according to the language of the effaced original

I. Greek Palimpsests.—Among these, the first place of course belongs to the Greek Biblical palimpsests, the earliest of which was (1) *Fragments of the Gospel of St. Matthew*, in facsimile as well as in *ordinary* type, printed from a palimpsest MS. of Trinity College, Dublin, by the Rev. I. Barrett, D.D. (4to, Dublin, 1801). The original writing appears to be of the 6th century.

Dr. Barrett's transcript of the text has not proved in all respects correct, but the original has since been carefully re-examined, and the ancient writing fully brought out. It is chiefly, however, to a collection of Syriac MSS. brought from the east that we are indebted for the more recent palimpsest restorations of the ancient Biblical readings. In this line the chief discoverer has been Dr. Constantine Tischendorf. From his pen we have (2) the celebrated *Codex Ephremi* or *Codex Regius* of the Royal Library at Paris. This MS. had been early observed to be palimpsest, and the original Greek text was collated in part by Wetstein and by Küster. It was still more carefully examined by M. Hase in 1835; and finally, in 1840, by Dr. Tischendorf, by whom the New Testament was printed in 1843, and the fragments of the Old in 1845. The modern writing of this palimpsest consisted of the works of St. Ephrem the Syrian.

(3) *Fragmenta Sacra Palimpsesta* (4to, Leipsic, 1855), containing fragments of the Books of numbers, Deuteronomy, Joshua, Judges, Kings, Isaiah, together with 48 pages of fragments of the New Testament, the Gospels, the Acts, and the Epistles of St. Paul to the Corinthians and to Titus. The modern writing of these palimpsests was partly Greek, partly Armenian and Arabic. (4) *Fragmenta Evangelii Lucæ et Libri Genesis* (4to, Leipsic, 1857). The Fragments of St. Luke's Gospel amount to 95 pages. The volume also contains fragments of St. John's Gospel and of Ezekiel and the Third Book of Kings. The modern writing is partly Syriac, partly Coptic. Along with these Biblical palimpsests (5) may be classed another, the original of which, however, contains not only some Greek fragments, but also portions of the ancient Gothic version of the Bible by Ulphilas. The MS. from which this is taken is known from its place in the Wolfenbüttel Library as the *Codex Guelpherbytanus*. It was first noticed it 1755 by Knittel, by whom a portion of the Gothic version was published in 1762. These fragments were reprinted in 1772, and again in 1805. The modern writing of the MS. consisted of the *Origenes* of Isidorus Hispalensis. A large addition to the text of Ulphilas was made in 1817 by Mai and Castiglione, from palimpsests discovered in the Ambrosian Library at Milan; and the whole have since been combined into one edition by Dr. Gabelentz and finally by Dr. Massmann (4to, Stuttgart, 1855). We may also mention under the same head some interesting Greek liturgical remains edited by F. I. Mone (Frankfort, 1850), from a palimpsest discovered at Carlsruhe.

In Greek classical literature, also, we owe something to the labors of palimpsest editors. From one of the Syriac MSS. already referred to, Dr. Cureton has edited large fragments of the *Iliad* of Homer, amounting in all to nearly 4000 lines; and although all these, it need hardly be said, were known before, yet the text is of the utmost value as a source of criticism, being certainly of much greater antiquity than the very earliest known MSS. of the *Iliad*. A still larger and more original contribution to Greek classical literature was made by Mai in the 5th volume of his *Scriptorum Veterum Nova Collectio* (Rome, 1831—1838). From a very large palimpsest discovered in the Vatican Library he has printed in this volume copious fragments of almost all the Greek writers on Roman history—from the lost books of Polybius no less than 100 4to pages; 130 pages of Diodorus Siculus; 64 of Dionysius of Halicarnassus; 100 of Dion Cassius; together with considerable fragments of Appian, Iamblichus, Dexippus, Eunapius, and others. This is, perhaps, after the *De Republica* of Cicero, the most important accession to the existing store of classic learning which the palimpsests have hitherto supplied.

II. Latin Palimpsests.—(1.) The earliest fragment of Latin literature, printed from a palimpsest original is the portion of the 91st book of *Livy* already referred to, published at Hamburg and also at Rome in 1773. It was re-edited in a more complete form by Niebuhr in 1820. (2.) Of the Latin palimpsests edited by Mai, the earliest were some fragments of lost Orations of Cicero from two different palimpsests in the Ambrosian Library at Milan, in the latter of which, the second writing consisted of the acts of the council of Chalcedon. These Orations were published in two successive volumes in 1814. (3.) Eight Orations of Symmachus (1815). (4.) The Comedies of Plautus, including a fragment of the lost play entitled *Vidularia* (1815). (5.) The works of M. Corn. Fronto, together with the Epistles of Antoninus Pius, Lucius Verus, M. Aurelius, and others (1815). (6.) The celebrated Dialogue of Cicero, *De Republica*, from a palimpsest of the Vatican, the modern writing of which is the commentary of St. Augustine on the Psalms. There is none of Mai's publications which presents his critical abilities in so favorable a light as this precious volume which appeared at Rome in 1821. (7.) Soon after the *De Republica* he published another volume from palimpsest sources, the most important of whose contents were some fragments of ancient Roman law, which prepared the way for the more distinguished success of Niebuhr; who, in a palimpsest of the library of Verona, recognized a portion of (8) the *Institutiones* of Gaius, and procured an accurate transcript for the press, which was printed at Berlin in 1820.

The latest considerable Latin publication in this department is (9) *Gai Granii Liciniani Annalium quæ supersunt* (Berlin, 1857), edited from a palimpsest of the British Museum by the younger Pertz. This palimpsest, as was already stated, is a thrice written codex, the earliest and original contents being the *Annales* of Gaius Granius. The second writing was also in Latin, and the work is a grammatical treatise, of which the chapters *De Verbo* and *De Adverbio* are still legible. The most modern writing is Syriac, written in the cursive character. Gaius Granius is a writer named by Macrobius, of whom nothing else is known.

It will be gathered from the above that the ancient works recovered by means of palimpsest MSS. are all fragmentary, and one is naturally led to rate at a low value the result thereby obtained. But it must be remembered that in some of the departments to which these fragments belong, every scrap, no matter how trifling, has an independent value. So it is, for example, in Biblical remains—a single text may present a valuable reading, the merest fragment may throw light on an important critical question. In history, in like manner, a small fragment may disclose an interesting fact, or supply a significant commentary upon facts otherwise ascertained. And as regards critical uses especially, it must not be forgotten that the obliterated text of the palimpsest MSS., for the most part, far exceeds in antiquity the very oldest known codices which we possess, and is, probably, second only in age to the papyri of Herculaneum.

The method of treating palimpsest MSS., with a view to deciphering their contents, has been fully described by different editors. Mai, after having washed the palimpsest with an infusion of galls, exposed it to the light and air, and, generally speaking, found this sufficient for his purpose. Peyron washed the parchment in water, afterwards in dilute muriatic acid, and finally in prussiate of potash. A mixture, compounded on this principle, is called from its inventor, M. Gioberti, *Tinctura Giobertina*. Sometimes the same treatment does not succeed equally well on both sides of the parchment; the inner surface, from its softer texture, sometimes requiring a more active preparation. When the ink contained animal substances, as milk, or the blood of the cuttle-fish, Dr. Mone plunged the parchment in a close vessel filled with oil, which he heated to a temperature of 400° R. In the prefaces of Mai's volumes will be found many amusing and interesting facts illustrating the difficulties which attend this curious branch of literary labor.

PA'LINDROME (Gr. *palin*, backwards, and *dromos*, a running), the name given to a kind of verse very common in Latin, the peculiarity of which is that it may be read the same backwards as forwards. A few examples will suffice.

Si bene te tua laus taxat sua lautè tenebis.
Et necat eger amor non Roma rege tacente,
Roma reges una non anus eger amor.

A Roman lawyer gets the credit of the following:

Si nummi immunis,

which Camden translates:

'Give me my fee, and I warrant you free.'

It is said that in the reign of Queen Elizabeth a certain lady of rank, having been compelled to retire from the court on account of some *fama*, the truth of which she denied, took for her motto:

Ablata at alba.
'Retired but pure.'

The English language has few palindromes, but one at least is inimitable. It represents our first parent politely introducing himself to Eve in these words:

'Madam, I'm Adam.'

Compare Henry B. Wheatley's book on *Anagrams* (1862).

PALINGENE'SIA (Gr. *palin*, again, and *genesis*, birth) is a term that appears to have originated among the Stoics, who employed it to denote the act of the Demiurgus, or Creator, by which, having absorbed all being into himself, he reproduced it in a new creation. The occurrence of the word in the New Testament (Titus iii. 5, where it is used to denote regeneration) has given it a place in Christian theology, and divines have variously used it to express the resurrection of men, the new birth of the individual soul, and the restoration of the world to that perfect state that it lost by the Fall—'the new heavens and the new earth wherein dwelleth righteousness.' Savans have also applied the term to designate both the great geological changes which the earth has undergone, and the transformations in the insect kingdom, such as of caterpillars into butterflies, &c.

PA'LINODE, in the law of Scotland, is a peculiar practice by which, in actions for damages on account of slander or defamation raised in the Commissary Court, and even in the Sheriff Court, the pursuer may conclude not only for damages but for

palinode, i. e., a solemn recantation. On a recent case, the question arose whether this ancient practice still existed as part of the law of Scotland, and it was held that it did. In actions, however, in the Court of Session, damages only are given as the remedy.

PA'LISADE, a paling of strong timber, used in Fortification. For the mode in which the palisade is employed see FORTIFICATION, under the head *Stockade*.

PALISANDER WOOD, the continental name for Rosewood (q. v.). By some of the French cabinet-makers the name *bois de Palisandre* is also applied to violet wood and to a kind of striped ebony.

PALISSY, BERNARD, a French potter, famous for his glass paintings and beautiful figured pottery, was born near Agen, now in the department of Lot et Garonne, France, about 1510, and at an early age was apprenticed to a potter. He devoted himself to chemical researches for the improvement of his art, and made many journeys through France and Germany for the same purpose; at the same time carrying on the business of a land-surveyor. An enamelled cup of 'Faience,' which he saw by chance, inspired him with the resolution to discover the mode of producing white enamel. Neglecting all other labors, he devoted himself to investigations and experiments for the long period of 16 years. He had by this time exhausted all his resources, and for want of money to buy fuel was reduced to the necessity of burning his household furniture piece by piece; his neighbors laughed at him, his wife overwhelmed him with reproaches, and his starving family surrounded him crying for food; but in spite of all these discouragements he persisted in the search, and was in the end rewarded by success. A few vessels adorned with figures of animals, colored to represent nature, sold for high prices, and enabled him to complete his investigations, after which he became famous; and though a Huguenot, was protected and encouraged by the king and the nobility, who employed him to embellish their mansions with specimens of his art. He was lodged in or near the Tuileries, and was specially exempted by Queen Catharine from the massacre of St. Bartholomow, more from a regard to her own benefit than from kindness.

In March 1575 he commenced a course of lectures on natural history and physics, and was the first in France to substitute positive facts and rigorous demonstrations for the fanciful interpretations of philosophers. In the course of these lectures, he gave (1584) the first right notions of the origin of springs, and the formation of stones and fossil shells, and strongly advocated the importance of marl as a fertilizing agent. These, along with his theories regarding the best means of purifying water, have been fully supported by recent discovery and investigation. In 1588 he was arrested and thrown into the Bastile as a heretic, but died in 1590 before his sentence was pronounced.

P. left a collection of objects of natural history, the first that had been formed in France. His works are at the present day almost beyond price, and his ornaments and arabesques are amongst the most beautiful of the 'renaissance.' As a sincere, earnest, and courageous man, he was no less eminent than as an artist. See Morley's *Palissy the Potter*.

PALIU'RUS, a genus of trees and shrubs of the natural order *Rhamnaceæ*, nearly allied to *Zizyphus* (see JUJUBE), but very different in the fruit, which is dry, orbicular, and girded with a broad membranous wing. *P. aculeatus* is often called CHRIST'S



Christ's Thorn (*Paliurus aculeatus*):
a, ripe fruit.

THORN, and by the Germans, JEWS' THORN (*Judendorn*), from an imagination that it supplied the crown of thorns with which our Saviour was crowned. It is a deciduous shrub or low tree, with slender, pliant branches and ovate 3-nerved leaves, each of which has two sharp spines at the base, one straight and the other re-curved. It is a native of the countries around the Mediterranean, of India, and many parts of Asia. It is often used for hedges in Italy and other countries; its sharp spines and pliant branches admirably adapting it for this purpose.

The fruit has a singular appearance, being flat and thin, attached by the middle to the foot-stalk, the middle being raised like the crown of a hat, whilst the expansion resembles the brim. The seeds are sold by the druggists of the east, and are used medicinally, but their qualities are doubtful. This shrub is not uncommon in shrubberies in England, being very ornamental when in flower, but the fruit does not ripen.

PALK STRAIT, or PALK'S PASSAGE, the northern portion of the passage between the south coast of Hindustan and the island of Ceylon. This passage is continued southward by the Gulf of Manaar (q. v.). It is from 40 to 80 miles in width, and is 80 miles in length. It is so shallow—in some places being no more than two fathoms in depth—that it cannot be navigated in safety by large vessels. In P. S. there are several pearl fisheries.

PALL (Lat. *pallium*, also *palla*, a cloak), the name given in English to two very different portions of the vesture employed in the religious use of the Roman and some other churches. One of these is the *funeral pall*, an ample covering of black velvet or other stuff, which is cast over the coffin while being borne to burial. The ends of the pall are held during the funeral procession by the most distinguished among the friends of the deceased, generally selected from among those unconnected by blood. In its second and most strictly liturgical use, the word pall is applied to one of the coverings used at the altar in the celebration of the mass. Primitively, as appears from Optatus and other early writers, the altar was covered with a large linen cloth—called by the Latins *pallium*, and by the Greeks *eileton*—the extremities of which were folded back so as to cover the bread and wine prepared for the celebration of the eucharist. In later times a separate covering was employed for the sacramental chalice, to which latter the name pall is now reserved in the use of the Roman Church.

The modern Roman pall is a square piece of linen cloth—sometimes limber, sometimes made stiff by inserting pasteboard—sufficiently large to cover the mouth of the chalice. The upper surface is often of silk embroidered, or of cloth of gold. The surface in contact with the chalice must always be of linen.



Pall.

PALL, in Heraldry, the upper part of a saltire conjoined to the lower part of a pale. It appears much in the arms of ecclesiastical sees.

PALL-MALL. See MALL.

PALLADIO, ANDREA, a famous Italian architect, was born at Vicenza, 30th November 1518. After having studied with the greatest care the writings of Vitruvius, and the monuments of antiquity at Rome, he settled in his native city, and first acquired a reputation by his restoration of the Basilica of Vicenza. Pope Paul III. then invited him to Rome, designing to intrust him with the execution of the works then going on at St. Peter's, but his holiness dying before the arrival of P., the latter had to return home. He was employed for many years in the construction of numerous buildings in Vicenza and the neighborhood, in all of which he displayed the most exquisite taste combined with the most ingenious and imaginative ornamentation. His style, known as the Palladian, is a composite, and is characterized by great splendor of execution and justness of proportion, and it exercised an immense influence on the architecture of Northern Italy. His principal works are the Rotonda Capra, outside Vicenza; the Palazzo Chiericado and the Palazzo Tiene, in the city; the Palazzo Barbara, at Maser in the Trevigiano, the Teatro Olympico at Vicenza (his last work), the Palazzo at Montagnana for Francesco Pisana; the churches of San Giorgio Maggiore and Il Santissimo Redemptore at Venice, the atrium and cloister at the convent Della Carità, and the façade of San Francesco della Vigna in the same city. P. died at Vicenza, August 6, 1580. He wrote a work on architecture, which is highly prized. The best edition is that published at Vicenza in 4 vols., 1776.

PALLA'DIUM (symb. Pd, eq. 53—new system, 106—spe. grav. 11·8) is one of the so-called noble metals, which in its color and ductility closely resembles platinum. It is not fusible in an ordinary wind-furnace, but melts at a somewhat lower temperature than the last-named metal; and when heated beyond its fusing-point, it volatilizes in the form of a green vapor. It undergoes no change in the open air at ordinary temperatures; but at a low red heat, it becomes covered with a purple film, owing to superficial oxidation. It is soluble in nitric and iodic acids, and in aqua regia. It combines readily with gold, which it has the property of rendering brittle and white. (When it forms 20 per cent.

of the mass, the alloy is perfectly white.) When alloyed with twice its weight of silver, it forms a ductile compound, which has been employed for the construction of small weights; but for this purpose aluminium is superior. Professor Miller states that it 'has been applied in a few cases to the construction of graduated scales for astronomical instruments, for which, by its whiteness, hardness, and unalterability in the air, it is well adapted;' its scarcity must, however, prevent its general use for this purpose.

It was discovered in 1803 by Wollaston in the ore of platinum, of which it seldom forms so much as 1 per cent. Another source of this metal is the native alloy which it forms with gold in certain mines in Brazil, and which is termed *ouro poudre;* and it is from this alloy that the metal is chiefly obtained.

Palladium forms with oxygen a protoxide, PdO, which is the base of the salts of the metal; a binoxide, PdO_2; and according to some chemists, a suboxide, Pd_2O. On exposure to sufficient heat, these compounds give off their oxygen, and yield the metal. The salt of the protoxide are of a brown or red color.

PALLADIUM, among the ancient Greeks and Romans, an image of Pallas, who was generally identified with Athene, upon the careful keeping of which in a sanctuary the public welfare was believed to depend. The Palladium of Troy is particularly celebrated. According to the current myth, it was thrown down from heaven by Zeus, and fell on the plain of Troy, where it was picked up by Ilus, the founder of that city, as a favorable omen. In the course of time, the belief spread that the loss of it would be followed by the fall of the city; it was therefore stolen by Odysseus and Diomedes. Several cities afterwards boasted of possessing it, particularly Argos and Athens. Other accounts, however, affirm that it was not stolen by the Greek chiefs, but carried to Italy by Æneas; and the Romans said that it was preserved in the temple of Vesta, but so secretly, that even the Pontifex Maximus might not behold it. All images of this name were somewhat coarsely hewn out of wood.

PALLA'DIUS, Rutilius Taurus Æmilianus, a Roman author, who probably lived in the 4th c. A.D., under Valentinian and Theodosius. He wrote a work, *De Re Rustica* (On Agriculture), in 14 books, the last of which is a poem of 85 elegiac couplets. It is, from a literary and grammatical point of view, full of faults; but as it was a complete calendar of Roman agriculture, it was very useful for its time, and was much read and followed during the middle ages. P. has borrowed largely from his predecessors. The best edition is that by J. G. Schneider in his *Scriptores Rei Rusticæ Veteres Latini* (4 vols., Leip. 1794).

PA'LLAS. See Minerva.

PALLAS, Peter Simon, an eminent traveler and naturalist, was born 22d September 1741, at Berlin, where his father was a physician. He studied medicine, natural history, and other branches of science, at the universities of Berlin, Göttingen, and Leyden, and was employed in classifying many valuable collections of objects of natural history, both in Holland and England. He gained a high reputation by the publication of his *Elenchus Zoophytorum* (Hague, 1766), a work still much valued; *Miscellanea Zoologica* (Hague, 1766), and *Spicilegia Zoologica* (2 vols., Berlin, 1767—1804). The Empress Catharine invited him in 1768, to St. Petersburg, where he was well received, and had honors conferred on him, and he was subsequently appointed naturalist to a scientific expedition bound for Siberia, there to observe the transit of Venus. P. spent six years on this journey (1768—1774), exploring in succession the Ural Mountains, the Kirghis Steppes, great part of the Altaian range, and the country around Lake Baikal as far as Kiachta, great part of Siberia, and the steppes of the Volga, returning to St. Petersburg in 1774, with an extraordinary treasure of specimens in natural history, which form the nucleus of the Museum of the Academy of St. Petersburg. His travels (*Reisen durch verschiedene Provinzen des Russ. Reichs*) were published at St. Petersburg (1771—1776), in three volumes, and were followed by his *Sammlung historischer Nachrichten über die Mongol Völkerschaften* (2 vols., St. Petersb. 1776—1802), and his *Neue nordische Beiträge zur physikalischen und geographischen Erd. und Völkerbeschreibung, Naturgeschichte und Oekonomie* (6 vols., St. Petersb. 1781—1793). Without positively neglecting any branch of natural history, he now devoted himself more particularly to botany; and his magnificent *Flora Rossica* (St. Petersb. 1784—1788), a work which, however, he was not able to complete, and his *Species Astragalorum* (14 parts, Leip. 1800—1804), were among the results of his studies. He published also *Icones Insectorum præcipue Rossiæ Sibiriæque Peculiarium* (Erlangen, 1781, 1783, and 1806); and contributed to a glossary of all the languages of the Russian empire, which was published at St. Petersburg.

As he wished to live in the Crimea, the Empress Catharine presented him with an estate in the finest part of that peninsula, where he resided generally from 1796. His *Travels in the South of Russia* were published in 1799 (2 vols., Leip., with volume of plates). After the death of his wife, he went to Berlin, where he died, 8th September 1811. A large and valuable work of his, on the Fauna of Russia, has not yet been published.

PALLAVICINO, Pietro Sforza, an Italian historian, son of the Marquis Alessandro Pallavicino of Parma, was born at Rome, 20th November 1607. Much to the disgust of his father, he took priest's orders, and held several important ecclesiastical appointments during the pontificate of Urban VIII. In 1637, he became a member of the Jesuit Society, and was created a cardinal in 1657 by Pope Alexander VII. He died at Rome, 5th June 1667. P. was a fine scholar, and often presided in the famous Roman academy of the *Umoristi*. The best known of all his writings is his *Istoria del Concilio de Trento* (Rome, 1656—1657), intended as a reply to the still more celebrated and liberal, although, by Catholics, deeply suspected, work of Paul Sarpi. Among his other works may be mentioned *Vindicationes Soc. Jes.* (Rome, 1649); *Arte della Perfezione Cristiana—I Fasti Sacri* (The unpublished MS. is in the library of Parma); *Ermengilda*, a tragedy (Rome, 1644); *Gli Avvertimenti Grammaticali* (Rome, 1661); *Trattato dello Stilo e del Dialogo* (Rome, 1662), and *Lettere* (Rome, 1668).

PA'LLI, a town of Rajputana, in Judpore, stands on the right bank of a branch of the Luni River, in lat. 25° 48′ N., long. 73° 24′ E. It is an entrepôt for the opium sent from Malwa to Bombay, and is the seat of extensive commerce. It imports European manufactured goods extensively, and is estimated to contain about 50,000 inhabitants.

PALLIOBRANCHIA'TA. See Branchiopoda.

PA'LLIUM, the name given in the Roman Catholic Church to one of the ecclesiastical ornaments worn by the pope, by patriarchs, and by Archbishops. Its use is held by Roman Catholics to descend from a very early period. It is worn by the pope at all times, as a symbol of his reputed universal and abiding jurisdiction. By archbishops it cannot be worn until it has been solemnly asked for and granted by the pope, and even then only during the solemn service of the great church festivals, and on occasions of the ordination of bishops or of priests, and other similar acts of the archiepiscopal order. The pallium is a narrow annular band of white woollen web, about three inches wide, upon which black crosses are embroidered, which encircles the neck of the archbishop, and from which two narrow bands of the same material depend, one falling over the breast, the other over the back of the wearer. Its material is the subject of much care and ceremonial. It is made wholly or in part from the wool of two lambs, which are blessed annually on the festival, and in the church of St. Agnes. During the night of the vigil of the feast of St. Peter and St. Paul, the *pallia* made of this wool are placed on the altar above the tomb of these apostles, and on the feast of St. Peter and St. Paul are delivered by the pope to the subdeacon, whose duty it is to keep them in charge. Within three months of his consecration, every new archbishop is obliged to apply to the pope, in person or by proxy, for the pallium; nor is it lawful for him, until he shall have received it, to exercise any act of what is properly archiepiscopal, as contradistinguished from episcopal jurisdiction. Thus, he cannot, for example call a *provincial* synod. The pallium cannot be transferred from one archbishop to another, but must be received direct from the pope. On the archbishop's death, his pallium is interred with him. Its use is held to symbolize the office of the 'good shepherd' bearing the lost sheep on his shoulders, and is connected by some writers with the vesture of the Jewish high-priest in Exod. xxviii. 4. In the medieval church, the granting of the pallium to archbishops was one of the chief occasions of the tribute which was paid by the national churches to the support of the great central office and dignity of the papacy. In some sees, as, for instance, those of the great prince-bishops of the Rhine, the tribute was as much as 20,000 florins. Roman Catholics, however, maintain that this tribute was not a *payment* for the pallium, but an *offering* to the holy see, made on occasion of the grant of that emblem of jurisdiction.

PALM, a measure of length, originally taken from the width of the hand, measured across the joints of the four fingers. In Greece, it was known as *palaiste*, and was reckoned at three inches, or 1-6 of a cubit, which was their standard unit. The Romans adopted two measures of this name—the one was the Greek *palaiste*, and was called *palmus minor;* the other, which was not introduced till later times, was called *palmus major*, or *palma*, and was taken from the *length* of the hand, being therefore usually estimated at three times the length of the other. At the present day, this measure varies in a most arbitrary manner, being different in each country, and occasionally varying in the same. The English palm, when used at all, which is seldom, is considered to be the fourth part of an English foot, or 3 inches.

The following is a list of the most common measures to which the name palm is given:

		Value in Eng. inches.
Greek *palaiste*	=	3·03375
Roman *palmus*, or lesser palm	=	2·9124
" *palma*, or greater palm	=	8·7372
English palm (¼ of a foot)	=	3·0000
Hamburg palm (⅛ of a foot)	=	3·7633
Amsterdam 'round' palm	=	4·1200
" 'diameter' palm	=	11·9687
Belgian palm, Lombard palm, } properly the *decimètre*	=	3·9371
Spanish palm, or *palmo major*	=	8·3450
" " or *palmo minor*	=	2·7817
Portuguese palm, or *palmo de Craveira*	=	8·6616

In Germany and the Low Countries, the palm is generally confined to wood-measurement, while in Portugal it is used to be the standard of linear measure.

PALM, JOHANN PHILIPP, a bookseller of Nuremberg, who has acquired an historic celebrity as the victim of Napoleonic justice in Germany. He was born at Schorndorf in 1766, and succeeded his father-in-law, Stein, as a bookseller in Nuremberg, the old name of the firm being retained. In the spring of 1806, a pamphlet, entitled *Deutschland in seiner tiefsten Erniedrigung* (Germany in its Deepest Humiliation), which contained some bitter truth concerning Napoleon, and concerning the conduct of the French troops in Bavaria, was sent by this firm to a bookseller in Augsburg in the ordinary course of trade, and, as P. to the last moment of his life averred, without any regard, on his part, to its contents. Napoleon's police traced it to the shop in Nuremberg, and an investigation was ordered, from which nothing resulted. Palm was in Munich, and perhaps escaped imprisonment there because his name was not the same with that of the firm; but supposing all safe, he returned to Nuremberg, and was there taken prisoner, and examined before Marshal Bernadotte, whose adjutant represented his arrestment as the consequence of direct orders from Paris. An extraordinary court-martial, held at Brunau, to which he was removed, condemned him to death, without any advocate being heard in his defence. All intercession on his behalf was in vain. General St. Hilaire declared that the orders of the emperor were positive; and the sentence was executed at two o'clock on the same day on which it was pronounced. Subscriptions were raised for the family at St. Petersburg, to which the Emperor and Empress of Russia personally contributed; in England, and in several German towns, as Berlin, Leipzig, Dresden, and Hamburg. Some French writers have endeavored to throw the blame of this murder on Marshal Berthier, instead of Napoleon.

PALM OIL. See OIL PALM.

PALM SUNDAY (Lat. *Dominica Palmarum*, or *Dom. in Palmis*), the last Sunday of Lent, is so called from the custom of blessing branches of the palm tree, or of other trees substituted in those countries in which palm cannot be procured, and of carrying the blessed branches in procession, in commemoration of the triumphal entry of our Lord into Jerusalem (John xii). The date of the origin of this custom is uncertain. The first writer in the West who expressly refers to it is Venerable Bede. The usage certainly existed in the 7th century. A special service is found in the Roman missal, and also in the Greek euchologies, for the blessing of 'branches of palms and olives;' but in many countries, other trees, as in England, the yew or the willow, and in Brittany, the box, are blessed instead. A procession is formed, the members of which issue from the church carrying branches in their hands, and singing a hymn suited to the occasion, of very ancient origin. In the Greek Church, the book of the Gospels is borne in front. In some of the Catholic countries of the West, a priest, or occasionally, a lay figure, was led at the head, mounted upon an ass, in commemoration of our Lord's entry into the city—a usage which still exists in Spain and in Spanish America. Before their return to the church, the doors have been closed, and certain strophies of the hymn are sung alternately by a choir within the church and by the procession without, when, on the sub-deacon's knocking at the door, it is again thrown open, and the procession re-enters. During the singing of the Passion in the solemn mass which ensues, the congregation hold the palm branch in their hands, and at the conclusion of the service it is carried home to their respective houses, where it is preserved during the year. At Rome, the Procession of the Palms, in which the pope is carried, is among the most striking of the picturesque ceremonies of the Holy Week. In England, Palm Sunday anciently was celebrated with much ceremonial; but the blessing and procession of the palms was discontinued in the Church of England, together with the other ceremonies abolished in the reign of Edward VI.

PA'LMA. See CANARIES.

PALMA, the capital of the island of Majorca (q. v.) and of the province of Baleares, is situated on the south-west coast of the island, on the Gulf of Parma, which, between Capes Figuera and Blanco, is 18 miles long, and sweeps 12 miles inland. The city is surrounded by orange plantations, and is walled and fortified. The houses, some of which are built of marble, are mostly in the Moorish style of architecture, and a number of the streets are wide and regular. It is the see of a bishop, and contains a Gothic cathedral, simple but beautiful in style, and with a spire which, from the delicate and airy character of its construction, is called the Angel's Tower. Besides other ecclesiastical edifices, the town contains an Exchange—a beautiful and ornate structure in Germano-Gothic—the governor's palace, an academy of medicine and surgery, and a large number of excellent educational institutions, including three *colegios*. In the port, a mole, 500 yards in length, runs out from the bastions facing the south; and on each side of it are ship-building yards, for the construction of the swift lateen vessels so well known in the Mediterranean. The port is small. The first railway in Majorca was opened from P. to Inca in 1875. Wool, silk, and the cordage for the Spanish navy are manufactured. Though one of the chief marts of Europe in the 13th c., P. now carries on but little commerce. Pop. 50,000.

PA'LMA, or PALMA DI MONTECHIARO, a town of Sicily, in the province of Girgenti, 14 miles south-east of the town of Girgenti, near the south-west coast. It is entirely a modern town, its foundation dating only from 1637. There is a trade in almonds, dried fruits, soda, wine, and sulphur. Pop. (1871) 13,458.

PA'LMA CHRI'STI. See CASTOR-OIL PLANT.

PALMBLAD, VILHELM FREDRICK, a Swedish writer of considerable merit, and one of the earliest and most zealous promoters of the literature of his native country, was born in 1788 at Liljested, in East Gotland, where his father held a post under the government. While still a student at Upsala, P. purchased, in 1810, the university printing-press, and immediately entered upon the publication of several literary and scientific periodicals, which, being the first of the kind that had ever appeared in the Swedish language, attracted considerable notice, and by their intrinsic merit, contributed materially to the diffusion of general information and the creation of a taste for learning among the general Swedish public. The earliest of these were the *Phosphoros*, a mixed literary journal; the *Poetisk Kalender*, an annual; and the *Svensk Litteratur Tidning*, a literary review, which lasted till 1824. The Swedish writers Atterbom and Hammarskjold were associated with P. in the management of these journals, and, like him, directed all their efforts to supplant the pseudo-classical school of literature, in favor of the romantic style, and to counteract the false French taste of that period, which, under Gustavus III., had been universally followed in Swedish literature and art. P. successively occupied the chairs of History and Geography and of Greek Literature in the university of Upsala; and at his death in 1852, he left the character of having been one of the most industrious and influential Swedish writers of his day. His principal works are—*Minnestafla ofner Sveriges Regenter* (1831); *Lärobok i nyare Historien* (Ups. 1832); *Handbok i physiska og politiska Geographien* (1837); *Lärobok i Geographien* (Orebro, 1847); *Grekisk Formkunskab* (Ups. 1845); and in addition to these purely instructive works, among his various novels we may instance his *Familjen Falkensvärd* (Oreb. 1844); *Aurora Königsmark* (Oreb. 1846), which rank among the best of their class in Swedish literature. P. was the editor of the great Swedish biography, *Namnkunnige Swenska Män* (Stock. 1835—1852); and besides being an active coadjutor in the direction of the Swedish Literary Society, for which he wrote numerous papers, he was an active contributor to various German works of celebrity, as Ersch and Grüber's *Allgemeine Encyklopädie*, the *Conversations-Lexicon*, &c.

PA'LMÉ, or PALMI, a royal city of South Italy, in the province of Reggio-Calabria, 20 miles north-north-east of Reggio, on the coast of the Bay of Gioja. The town, by means of its port, carries on an active trade. Pop. 13,500.

PALMELLA'CEÆ, a family or group of *Algæ*, of the order or sub-order *Confervaceæ*. In organization, they are among the lowest of plants; they are, however, universally regarded as vegetable, and do not, like the *Diatomaceæ*, occupy a somewhat doubtful position between the animal and vegetable kingdoms. The P. all grow on damp surfaces, but some under the influence of fresh water, and some of salt. Some appear as a mere powdery layer, the granules of which have little adherence to each other, as Red Snow (q. v.); some of them assume the form of a slimy film or gelatinous mass, as Gory Dew (q. v.); and some are more firm and membranous, so as to have something of the character of a frond. The P. bear so great a resemblance to the early stages of plants higher in organization, that doubts are entertained of their right to a distinct place in the botanical system, particularly as their mode of reproduction is not yet well understood. Con-

jugation has been observed in some of them. They propagate with great rapidity by gemmation, or something like it, some of them sending forth tubular filaments from their cells, the extremities of which dilate into new cells, after which the connecting tube closes, and ceases to exist; whilst in others the multiplication of cells takes place by division or segmentation (see MONAD), and the young plants exhibit remarkable powers of motion for a short time, like zoospores, being furnished with vibratile cilia, by which their motion is produced. Ere long, however, their motion ceases, and the process of segmentation is ready to begin anew. The motile organs and powers of some of the P. in the earlier part of their existence, have led to their being mistaken for animalcules.

PALMER (Lat. *palmifer*, a palm-bearer), the name of one of those numerous classes of PILGRIMS (q. v.), whose origin and history form one of the most interesting studies in the social life of medieval Europe. The Palmer, properly so called, was a pilgrim who *had performd* the pilgrimage to the HOLY SEPULCHRE (q. v.), and had returned, or was returning home after the fulfilment of his vow. The Palmers were so called from their carrying branches of the oriental palm, in token of their accomplished expedition. On arriving at their home, they repaired to the church to return thanks to God, and offered the palm to the priest, to be placed upon the altar. The palms so offered were frequently used in the procession of Palm Sunday. Even after the time of his return, the religious character of the Palmer still continued; and although his office might be supposed to have ceased with the fulfilment of his vow, many Palmers continued their religious peregrinations even in their native country. They were thus a class of itinerant monks, without a fixed residence, professing voluntary poverty, observing celibacy, and visiting at stated times the most remarkable SANCTUARIES (q. v.) of the several countries of the West. Their costume was commonly the same as that of the ordinary PILGRIM (q. v.), although modified in different countries.

PALMERSTON, VISCOUNT, HENRY JOHN TEMPLE, an English politician, was born at the family mansion, Broadlands, near Romsey, Hants, October 20, 1784. The Temples are of Saxon origin, and the family claim descent from Edwyn, who was deprived of the earldom of Mercia by the Conqueror, and lost his life in defending himself against the Normans in 1071. Sir W. Temple, the diplomatist and patron of Swift, was a member of this family, which removed to Ireland in the time of Elizabeth. The family was ennobled in 1722, when Henry Temple was created a peer of Ireland with the dignities of Baron Temple and Viscount Palmerston. His grandson, the second viscount, father of the famous peer, superintended his son's education at Broadlands, and then sent him to Harrow. P. afterwards went to the university of Edinburgh, where he attended the prelections of Dugald Stewart and other professors. He next matriculated at St. John's College, Cambridge, whence he was summoned to attend the deathbed of his father, on whose decease, in 1805, P. succeeded to the title. His eminent abilities were early recognized, for he was scarcely of age when the Tory party in the university selected him (1806) as their candidate to succeed Mr. Pitt in the representation. The late Marquis of Lansdowne was the Whig candidate; and Lord Byron, then at Cambridge, in his *Hours of Idleness*, evinces the interest he took in the election. P. was unsuccessful, and again in 1807. He entered parliament, however, in the same year for the borough of Newport, his colleague being Arthur Wellesley, then chief secretary of Ireland. In 1811, he exchanged Newport for the university of Cambridge, enjoyed the distinction of representing his *alma mater* for 20 years, and only lost his seat when he became a member of the Grey administration, and supported the Reform Bill. For the last two years of the unreformed parliament, he sat for the now extinct borough of Bletchingly.

At the first election after the Reform Act, he was returned for South Hampshire, but lost his seat at the general election of 1835. He immediately afterwards found a seat for the borough of Tiverton, which he promised never to leave as long as the electors would permit him to represent them. Having traced his representative, we now turn to his official career. P. entered life as a member of the Tory party, and accepted the office of Secretary at War in the Duke of Portland's administration in 1809. This office he held during the successive governments of Mr. Perceval, the Earl of Liverpool, Mr. Canning, Lord Goderich, and the Duke of Wellington—a period extending from 1809 to 1828. There was ample scope at the War-office for P.'s administrative talents and activity. Our military system swarmed with abuses, and the labor thrown upon the Secretary at War during the Peninsular campaigns was prodigious. In 1817, an attempt was made to assassinate P. by an insane army-lieutenant, named Davis, who fired a pistol at him as he was entering the Horse Guards, the bullet, however, only inflicting a slight wound. P. early attached himself to the Canning section of the Liverpool administration, and he accepted a seat in the cabinet of Mr. Canning. His official connection with the Tory party ceased in 1828, when the 'Great Duke' insisted on accepting Mr. Huskisson's resignation, which was followed by P.'s retirement. The Duke's government was swept away in the reform flood of 1830; and Earl Grey, who became Prime Minister, offered the seals of the Foreign Office to Palmerston. The European horizon was so disturbed at this crisis, that a great political authority declared that if an angel from heaven were in the Foreign Office, he could not preserve peace for three months: P. falsified the prediction. Louis Philippe then filled the throne of France; and for the first time on record England and France acted in concert, and without jealousy, under P.'s foreign ministry. He took a leading part in effecting the independence of Belgium, and in establishing the thrones of Queen Isabella of Spain and Queen Maria of Portugal on a constitutional basis.

In 1841, P. went out of office with the Whigs on the question of free trade in corn; but on their return in 1846, he resumed the seals of the Foreign Office. His second foreign administration furnished various subjects of hostile party criticism, among which may be mentioned the civil war in Switzerland, the Spanish marriages, the European revolutions in 1848, the rupture of diplomatic relations between Spain and Great Britain, and finally, the affair of Don Pacifico and the quarrel with Greece. A vote of censure on the foreign policy of the government was, in 1850, carried in the House of Lords on the motion of Lord Stanley (afterwards Earl of Derby). A counter-resolution, approving the foreign policy of the government, was thereupon moved by Mr. Roebuck in the Lower House. The debate lasted four nights. In a speech of five hours' duration—'that speech,' said Sir Robert Peel, 'which made us all so proud of him'—P. entered upon a manly and dignified vindication of his foreign policy and Mr. Roebuck's motion was carried by a majority of 46. In December 1851, the public were startled at the news that P. was no longer a member of the Russell cabinet. He had expressed his approbation of the *coup d'état* of Louis Napoleon, without consulting either the premier or the Queen; and as explanations were refused, her Majesty exercised her constitutional right by dismissing her minister. P. avenged himself as soon as parliament met, by shattering the Russell administration to pieces on a comparatively trifling question regarding the militia. He refused an offer from the Earl of Derby to join the government which he was commissioned to form, but accepted the post of Home Secretary in the coalition administration of the Earl of Aberdeen in 1852. The fall of this government, on Mr. Roebuck's motion for a Sebastopol committee, placed P. in his 71st year in the position of prime minister, to which he was unanimously called by the voice of the nation. He vigorously prosecuted the Russian war until Sebastopol was taken, and peace was made. His government was defeated in March 1857, on Mr. Cobden's motion condemnatory of the Chinese war.

Parliament was dissolved, and P. met the House of Commons with a large majority. But his administration fell in February 1858, upon the Conspiracy Bill, intended to protect the French emperor against the machinations of plotting refugees. A short Conservative administration followed; but in June 1859, P. was again called to the post of First Lord of the Treasury, which he continued to fill up to his death. It was his ambition to be considered the minister of a nation rather than the minister of a political party; and his opponents have been constrained to admit that he held office with more general acceptance than any English minister since the time of the great Lord Chatham. As an orator, he was usually homely and unpretending, but always sensible and practical. He was a dexterous tactician, and a ready, witty, and often brilliant debater. He was popular as a minister, because he was thoroughly English in his ends and aims. Even his robust health, manly bearing, and physical vigor were elements of his popularity, because they were regarded as a glorification of the English sports, which he was never ashamed to patronize. He desired nothing so ardently as to promote the wealth and grandeur of Great Britain, and his national character and national spirit were thoroughly appreciated by his countrymen. He married, in 1839, the widow of the fifth Earl of Cowper, daughter of the first Viscount Melbourne. As he died without issue, and his only brother died unmarried, the title became extinct on P.'s decease, Oct. 18, 1865. See *Life of P.* by Sir Henry Lytton Bulwer (Lord Dalling), continued by Evelyn Ashley.

PALMER-WORM, a name given to many large kinds of grub, the larvæ of coleopterus insects, destructive to vegetable substances of various kinds. It is used in the English version of the Old Testament as the translation of the Hebrew *gazam*, rendered *kampe* by the Septuagint, which modern Hebrew writers and others very generally regard as a kind of locust, although more probably it is either the grub of a coleopterous or the caterpillar of a lepidopterous insect.—See Kitto in *Pictorial Bible*, on Joel i. 4.

Palmer-flies are much used by anglers on the English streams, and are at certain seasons excellent lures for trout, &c.

PALME'TTO (*Sabal palmetto*, or *Chamærops palmetto*), a species of palm, a native of maritime parts of North America, as far north as lat. 35°, which is further north than any other American species of palm is found. It attains a height of 40—50 feet, and has a crown of large palmated leaves, the blade from one foot to five feet in length and breadth, and the footstalk long. The flowers are small, greenish, and in long racemes; the fruit black, about as long as a pea-pod, and uneatable. The leaves are made into hats. The terminal bud or *cabbage* is eaten. The wood is extremely porous; but is preferred to every other kind of wood in North America for wharfs, as it is very durable, and not liable to be attacked by worms.—The *Chamærops* (q. v.) *humilis* of the south of Europe is also called Palmetto.

PALMETTO-LEAVES, the leaves of the Palmyra (q. v.) palm, *Borassus flabelliformis*, which grows extensively in India and Polynesia. The leaves have great value as a material for the manufacture of hats, mats, &c., and for this purpose are frequently imported into Europe. In their native country they are used as thatch, and for a great variety of other useful applications.

PALMI'PEDÉS, or WEB-FOOTED BIRDS, also called NATATORES, or SWIMMERS, an order of birds, the *Anseres* of Linnæus, very natural and universally recognized by ornithologists, having the feet specially formed for swimming, and the toes *webbed*, i. e., connected by a membrane, at least those which are directed forwards. In swimming, the feet are contracted when drawn forwards, the toes being brought together, and expanded to their utmost extent in the backward stroke. In accordance with their aquatic habits, the P. are further characterized by a boat-like form, calculated to move through the water with little resistance; and by a dense and polished plumage, oiled by a secretion from certain glands near the tail, very impervious to water; whilst warmth is further secured by a clothing of down, more or less abundant, beneath the feathers. They are remarkable for the length of the breast-bone (*sternum*), and the neck is often longer than the legs, a thing very unusual in birds, so that they can plunge the head far down in search of food. The length of the wings differs very much in different sections of the order, and with it the power of flying; as does also the power of diving, which some possess in a high degree, and others, even of the same family, in a very inferior degree. To this order belong geese, swans, ducks, divers, auks, guillemots, puffins, penguins, petrels, albatrosses, gulls, terns, shearwaters, noddies, pelicans, cormorants, frigate-birds, gannets, darters, tropic-birds, &c.

PALMI'TIC ACID ($HO,C_{32}H_{31}O_3$) is one of the most important of the *Fatty Acids*, represented by the general formula $HO,C_nH_{n-1}O_2$ (see OILS AND FATS). In a pure state when crystallized from alcohol, it occurs in the form of beautifully white acicular crystals arranged in tuft-like groups. These crystals are devoid of odor or taste, communicate a fatty feeling to the finger, fuse at 143°.6, and solidify on cooling in the form of crystalline scales. This acid is lighter than water, in which it is perfectly insoluble; but it dissolves freely in boiling alcohol and in ether, and the solutions have a distinctly acid reaction. In small quantities it may be distilled without decomposing, if the heat be carefully regulated. The neutral palmitates of the alkalies constitute soaps, and are soluble in water; if, however, their solutions are largely diluted with additional water, they are decomposed, an insoluble acid salt being precipitated, while a portion of the base remains in solution. The addition of chloride of sodium (common salt) to a solution of an alkaline palmitate produces a similar effect. The other most important compounds of palmitic acid are those which it forms with glycerine and with cetylic ether. With glycerine this acid forms three compounds, viz., a triglyceride or tripalmitate (constituting the ordinary PALMITINE of chemists), a diglyceride, and a monoglyceride. In addition to its existence in the form of palmitine, palmitic acid is found in a free state in old palm oil. In combination with cetylic ether, or of oxide of cetyl, whose composition is represented by the formula $C_{32}H_{33}O$, it is the main constituent of Spermaceti (q. v.), which is in fact essentially a palmitate of oxide of cetyl $C_{32}H_{33}O,C_{32}H_{31}O_3$); and, as a palmitate of oxide of melissyl—a substance which will be noticed in the article WAX—it is the chief ingredient of bees-wax.

PA'LMITINE is a white fat, usually occurring, when crystallized from ether, in the form of a mass of small scaly crystals. According to Duffy, it occurs like the allied fat stearine in three modifications, each of which has a different melting-point—viz., 114°·8, 143°, and 145°. On cooling, it solidifies into a wax-like mass, of lower specific gravity than water, and insoluble in that fluid, but readily soluble in ether and in boiling alcohol. It is a constituent of almost every kind of fat, and is the preponderating ingredient in those of a semi-solid consistence, and in many oils. It receives its name from the abundance in which it occurs in palm oil, and it may readily be obtained from this source by removing the liquid portion (the oleine) by pressure, and purifying the remaining palmitine by crystallization from ether, or a mixture of ether and alcohol. It has been stated in the article on Glycerine (q. v.) that the composition of that substance may be represented by the formula $C_6H_5O_3,3HO$. When palmitic acid unites with it to form a triglyceride (or the substance usually recognized as palmitine), three atoms of the anhydrous acid expel and replace the three atoms of water in the glycerine, and the resulting compound, palmitine, is consequently represented by the formula $C_6H_5O_3 + 3(C_{32}H_{31}O_3)$, or $C_{102}H_{98}O_{12}$.

PALMS (*Palmæ* or *Palmaceæ*), a natural order of endogenous plants, not excelled in importance by any order in the vegetable kingdom except Grasses. They are generally tall and slender trees, often of gigantic height, without a branch, and bearing at the summit a magnificent and graceful crown of very large leaves. The stem is sometimes, however, of humble growth, and more rarely it is thick in proportion to its height; sometimes, but rarely, it is branched, as in the Doom (q. v.) Palm; and sometimes, as in Rattans (q. v.), it is flexible, and seeks support from trees and bushes, over which it climbs in jungles and dense forests, clinging to them by means of hooked spines. Some of the species with flexible stem attain a prodigious length, ascending to the tops of the highest trees, and falling down again. Rumphius asserts that they are sometimes 1200, or even 1800 feet long.

Whatever the form or magnitude of the stem of a palm, it is always woody, and the root is always fibrous. It is only towards its circumference, however, that the stem is hard, and there in many species it is extremely hard; but the center is soft, often containing, when young, a great quantity of starch (sago), and sometimes filled, when old, with a mass of fibres which can be separated without difficulty. Concerning the structure of the stem, see ENDOGENOUS PLANTS. The stem is generally marked externally with rings or scars, where former leaves have been attached; sometimes it is rough with the remaining bases of the leaves, and part of it is sometimes covered with their fibrous appendages. No other plants have leaves so large as many of the P.; the largest of all are those of some of the fan-leaved P., but there are P. with pinnate leaves 50 feet long and 8 feet broad, and undivided leaves are to be seen 30 feet long by 4 or 5 feet broad. There are, however, also small P., and P. with flexible stems, which have small leaves. The number of the large leaves which form the crown of even the most magnificent palm is never great. Whatever the size or form of the leaves, they are alway stalked, the stalk being often in dimensions equal to a large bough of a great oak or other such tree. The leaves are commonly pinnated, the number of pinnules or leaflet being often very great; but about one-sixth of the whole number of known species of P. have fan-shaped leaves, and a few species have undivided leaves. The leaves are in all cases persistent, only falling off in succession as the palm advances in growth, and new ones are formed at the summit. The flowers are sometimes hermaphrodite, sometimes unisexual; the same tree having sometimes male, female, and hermaphrodite flowers, whilst other species are monœcious and others dicœcious.

The perianth has six divisions, three outer and three inner; there are generally six, rarely three stamens; the ovary is composed of three carpels, distinct or united, each with one cell containing one ovule. The flowers are small, but are often produced in dense masses of very striking appearance. Humboldt reckons the number of flowers on a single palm (*Alfonsia amygdalina*) as about 600,000, and every bunch of the Seje Palm of the Oronoco consists of about 8000 fruits. The flowers are produced on scaly spadices, often much branched, and enclosed, before expanding, in leathery or woody spathes, often very large, and sometimes opening by bursting with a loud explosion. The flowers of some P. emit a very powerful odor, which attracts multitudes of insects. The fruit is sometimes a kind of berry, sometimes a drupe, either with a fleshy or a fibrous covering; and sometimes contains a very hard and bony nut. The fruit is sometimes only of the size of a pea or a cherry; sometimes, notwithstanding the smallness of the flowers, it is of very large size, of which the cocoa-nut is a familiar example.

Palms are mostly natives of tropical countries, being found almost everywhere within the tropics, and forming, perhaps, the most striking characteristic of tropical vegetation. The tropical parts of America, however, particularly abound in them, producing a far greater number of species than any other part of the world. A few species are found in temperate regions; one species only, *Chamærops humilis*, being a native of Europe, and extending as far north as lat. 44°, whilst the northern limit of P. in Asia is about lat. 34°, and in North America, lat. 35°. In South America, the southern limit of P. is lat. 36°; in Australia, it is lat. 35°; in Africa, no native species is found further south than lat. 30°; but in New Zealand, one species extends as far south as lat. 38° 22′. Some of the species, however, which are found in

tropical America grow in mountain regions bordering upon the limits of perpetual snow.

Some P. have very narrow geographical limits; the cocoa-nut palm is by far the most extensively distributed species. Some, like the cocoa-nut, grow in maritime, others in inland districts. Some grow on dry and sandy ground, others in the richest alluvial soil, and some in swampy situations; some in open districts, others in dense forests. Some species are generally found singly, some in groups; some even cover tracts of country in which no other tree appears.

The uses of P. are many and various; there is almost no species which is not capable of being applied to some use. Tribes in the lowest grade of civilization depend almost entirely on particular species of palm, as the cocoa-nut palm, for the supply of all their wants. The fruit of some species is eaten; sometimes the fleshy part of the fruit, sometimes the kernel of the nut. The importance of the date and the cocoa-nut needs only to be alluded to; but in this respect they far excel the fruits of all other palms. A grateful beverage is made from the fruit of some P. (see ASSAI), consisting simply of a mixture of the pulp with water; but a kind of wine can be obtained also by fermentation (see DATE). A kind of beverage more generally used is the sap of palm-trees, either fresh or fermented (*palm-wine* or *toddy*), from which also a kind of spirits called Arrack (q. v.) is obtained by distillation; whilst from the fresh sap, boiled down, sugar is obtained—the *jaggery* of the East Indies. The sap of various species of palm is collected and used for these purposes, and that of many others is probably not less suitable. The pulp of the fruit of some species, and the kernel of others, yield bland fixed oil useful for various purposes. See OIL PALM and COCOA-NUT. The soft and starchy center of the stem of some P. affords a very important and abundant article of food. See SAGO. The terminal bud, or *cabbage*, of some species is boiled for the table; and although the taking of the bud is death to the tree, this is little regarded where vegetation goes on with a rapidity and luxuriance unknown in the colder parts of the world.

The young sprouts arising from the seeds of P., when they have begun to vegetate, are another esculent of tropical countries. From the stems of some spieces of palm, as the Wax Palm (q. v.) of the Andes, and from the leaves of some, as the Carnahuba Palm (q. v.), wax is obtained, which is used for the same purposes as bees-wax. The wood of P. is used in house building, and for many other purposes; some affording very hard and beautiful wood for ornamental work, whilst others are suitable only for coarse purposes. The great leaf-stalks are also used for some of the purposes of timber. The stems of the most slender species are used for walking-sticks, &c., and, split or unsplit, for wicker work. See RATTAN. The leaves of many P. are used for thatching houses. The spathes of some species are used as vessels or bags. The fibres of the leaf, the fibres connected with the leaf-stalk, the fibres of the rind of the fruit, and the fibres of the stem of different kinds of P. are used for making cordage, mats, nets, cloths, &c. The most important of these fibres are Coir (q. v.) or Cocoa-nut Fibre, Gomuto (q. v.) or Ejoo Fibre, as Piassaba (q. v.), The coarsest fibres are employed as bristles for making brushes, &c. Stripes of the delicate epidermis of the young unopened leaves of some South American P. are twisted and so used for making a kind of thread; hammocks made of which are highly valued. See ASTROCARYUM. The leaves of the Palmyra Palm and Talipot Palm are used in some parts of the east for writing upon, an iron style being employed instead of a pen. One of the kinds of the resinous substances called *Dragon's Blood* is obtained from the fruit of a palm. The Betel (q. v.) Nut, abounding in Catechu, is the fruit of a palm.

The fruit of many P. is very acrid. The ashes of the fruits of some American species are used by the Indians as a substitute for salt, probably on account of potash, or some salt of potash, which they contain; and much potash may be obtained from the stems and leaves of palms. Vegetable Ivory (q. v.) is the kernel of the fruit of a palm; and somewhat similar to it in quality is the Coquilla Nut (q. v.). But a complete enumeration of the uses to which P. and their products are applied is almost impossible.

Some of the more important species of P. are noticed in separate articles.

About five hundred species are known; but it is probable that many are still undescribed. The most complete work on P. is the monograph by Martius, *Genera et Species Palmarum* (3 vols., large folio, Munich, 1823—1845), a magnificent work, with 219 colored plates; but many new species have been discovered since its publication.

The cultivation of P. in hothouses is attended with great expense. Separate houses are devoted to them in a few gardens, of which the greatest is that at Kew. A very fine palm-house has been erected in the Botanic Garden of Edinburgh. P. are cultivated in hothouses merely as objects of interest, and for the gratification of a refined taste, never for the sake of their fruit or any other product.

PALMY'RA, the name given by the Greeks to a great and splendid city of Upper Syria. Its original Hebrew name was *Tadmor*, which, like the Greek word, means 'city of palms.' It was built, according to the writers of Kings (Book I. chap. ix. verse 18) and Chronicles (Book II. chap. viii. verse 4), by Solomon in the 10th C. B.C.; but it is more probable that he only enlarged it. It occupied a fertile oasis, well watered, and abounding in palm-trees. Barren and naked mountains overlook it from the west, and to the east and south stretches the illimitable sandy desert. P. was, in the Solomonic age, a bulwark of the Hebrew kingdom against the wandering hordes of Beduins; but its early history is obscure and insignificant. After the fall of Selucia, it became a great center of commercial intercourse between the east and the west of Asia. Its commercial importance, wealth, and magnificence greatly increased after the time of Trajan, who subjected the whole country to the Roman empire. In the 3d c., Odenathus, a Syrian, founded here an empire, which, after his murder, rose to great prosperity under his wife, Zenobia (q. v.), and included both Syria and Mesopotamia; but this was not of long duration, for the Roman Emperor Aurelian conquered it in the year 275, and the city was soon after almost entirely destroyed in revenge for the slaughter of a Roman garrison. It never recovered from this blow, although Justinian fortified it anew. The Saracens destroyed it in 744. A village called Tedmor, inhabited by a few Arab families, now occupies the sight. The ruins of the ancient city, white and dazzling in the Syrian sun, excite at a little distance the admiration of all beholders; but when examined in detail, they are said to be far from imposing, though in regard to this latter point opinions differ. They were visited by English merchants resident at Aleppo in 1691, and again by Messrs. Wood and Dawkins in 1751, and since then by a vast number of travelers. The ruins of a temple of Baal, the sun god, are, however, confessedly magnificent. The language of ancient Palmyrene appears, from inscriptions which remain, to have been an Aramic language. See Murray's or Baedeker's *Handbook for Syria and Palestine;* Vogüé's *Syrie Centrale.*

PALMYRA PALM (*Borassus flabelliformis*), a species of palm with a magnificent crown of fan-shaped leaves, a native of the East Indies. The stem attains a height of 25—40, or even 60 feet, and tapers slightly upwards. The leaves are about four feet long, with stalks of about the same length, the stalks spiny at the edges; each leaf having 70—80 rays. The fruit is somewhat triangular, about the size of a child's head; having a thick, fibrous, and rather succulent yellowish-brown or glossy black rind, and containing three seeds each as large as a goose's egg. The P. P. is the most common palm of India, growing spontaneously in many districts, cultivated in others, and reaching as far north as lat. 30°. It is of slow growth; and the wood near the circumference of the stem in old trees is very hard, black, heavy, durable, susceptible of a high polish, and valuable, easily divided in a longitudinal direction, but very difficult to cut across. The P. P. abounds greatly in the north of Ceylon, forming extensive forests; and the timber is exported to the opposite coast of India, being of superior quality to that which is produced there. It is much used in house building. The stalks of the leaves are used for making fences, &c. The leaves are used for thatching houses, for making baskets, mats, hats, umbrellas, and large fans; and for writing upon. Their fibres are employed for making twine and small rope; they are about two feet long, and very wiry. A fine down found at the base of the leaf-stalks is used for straining liquids, and for stanching wounds. The P. P. yields palm-wine, and of course also arrack and sugar (*jaggery*). It furnishes great part of the palm-wine, sugar, and arrack of India. See ARRACK. The fruit is cooked in a great variety of ways, and used for food. The seeds are jelly-like, and palatable when young. A bland fixed oil is extracted from the fruit.

The young plants, when a few inches high, are esteemed as a culinary vegetable, being boiled and eaten generally with a little of the kernel of the cocoa-nut; and sometimes they are dried and pounded into a kind of meal. Multitudes of the inhabitants of the north of Ceylon depend almost entirely on the P. P. for the supply of all their wants. In the 'Palmyra Regions' of the Southern Dektan vast numbers of the people subsist chiefly on the fruit of this palm.

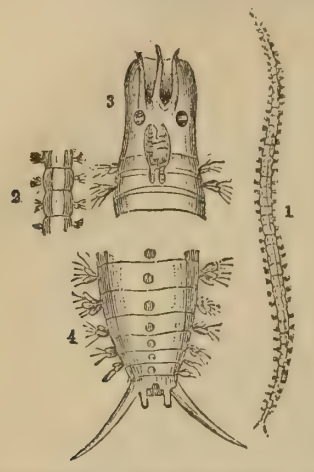
The Deleb Palm (q. v.), so important to the inhabitants of Central Africa, is believed to be nearly allied to the Palmyra Palm.

PALMYRA WOOD. Properly this name applies only to the wood of the Palmyra palm (*Borassus flabelliformis*), but it is generally used for all kind of palm-tree wood imported into this country, amongst which very much is the wood of the cocoa-nut palm, *Cocos nucifera*, and the allied species *C. plumosa*. These woods are also called *Speckled Wood* and *Porcupine Wood* by the dealers—the former name being applied to those veneers cut transversely, and showing the ends of numerous black fibres mixed with the lighter-colored portions; and the latter to longitudinal

sections, in which the mixed black and white fibres much resemble porcupines' quills.

PA'LO BLA'NCO (*Flotovia dicanthoides*, a large tree, a native of Chili, the wood of which is white, and very useful and durable. It is remarkable as one of the few large trees belonging to the natural order *Compositæ*.

PALO'LO, or BALOLO (*Palolo viridis*), a dorsi-branchiate annelid, allied to the Lug-worm, extremely abundant at certain seasons in the sea above and near the coral reefs which surround many of the South Sea Islands, as the Samao Islands and the Fiji Islands. The body is cylindrical, slightly tapering at both ends, divided into nearly equal joints, each joint with a small tuft of



Palolo Viridis (copied from Seemann's *Viti*):
1, the entire animal, half natural size; 2, portion of body, slightly magnified; 3, magnified figure of its head, with its three frontal tentacula and eyes; 4, posterior extremity, dorsal aspect.

gills on each side. In thickness, the P. resembles a very fine straw; it is about three inches long, generally of a greenish color, with a row of round black spots; but the color varies to red, brown, and white. These annelids make their appearance in great multitudes, apparently rising out of the coral reefs, and with a periodical regularity which is very remarkable. They are eagerly sought after by the islanders, who are on the watch for their appearance, and go out in canoes early in the morning to take them by means of nets; but they often occur in such numbers that the water seems to be full of them, and they may be grasped by handfuls. They are a delicacy of which the South Sea Islanders are very fond. To prepare them for use, they are wrapped in bread-fruit leaves, and cooked for twelve or eighteen hours in an oven.

PA'LPI (from the Lat. *palpo*, I touch) are organs occurring in Insects, Crustaceans, and Arachnidans. In Insects, one or two pair of jointed appendages bearing this name are attached to the maxillæ, while one pair is attached to the labium; and in the higher Crustaceans, similar appendages are attached to the mandibles and foot-jaws. In both these classes, the palpi probably serve, through the sense of touch, to take cognizance of the qualities of the substances which are employed as food. In the Arachnidans, the palpi are attached to the maxilliæ only; and vary exceedingly in form and functions. In the scorpions, for instance, they are extremely developed, and terminate in pincers which resemble the chelæ (or pincers) of crabs and lobsters; while in the spiders, they terminate in a single movable claw in the female, and in the male the last joint is dilated, and acts as an accessory generative organ.

PALPITA'TION is the term used to signify inordinately forcible pulsations of the heart, so as to make themselves felt, and frequently to give rise to a most troublesome and disagreeable sensation. It may be either functional or a symptom of organic disease of the heart. Here we shall merely consider it as a functional disorder. Although it may be persistent, it far more frequently comes on in paroxysms, which usually terminate within half an hour, recurring afterwards quite irregularly, sometimes daily or several times a day, and sometimes not till after a long interval. The attack often comes on under some mental or physical excitement, but sometimes when the patient is quite composed, or even asleep. If the paroxysm is a severe one, the heart feels as if bounding upwards into the throat; and there is a sensation of oppression over the cardiac region, with hurried or even difficult respiration. Excluding organic diseases, the causes of this affection are either (1) an abnormally excitable condition of the nerves of the heart, or (2) an unhealthy condition of the blood.

1. Amongst the causes of disturbed innervation may be especially noticed the abuse of tea (especially green tea), coffee, spirits, and tobacco. Any irritation of the stomach and intestinal canal may be reflected to the heart; and hence palpitation may frequently be traced to flatulence, undue acidity, and intestinal worms, especially tape-worms. Everything that causes pressure on the heart, such as tight lacing, abdominal dropsy, or an enlarged uterus, is also liable to occasion this affection.

2. If the blood is abnormally rich and stimulating it may give rise to palpitation, as in Plethora (q. v.); but the opposite condition, known as Anæmia (q. v.), is a much more common cause of this affection. In anæmia the blood is watery and deficient in fibrine, and (far more) in red corpsucles; and being thus in an unnatural state, it acts as an unnatural stimulant, and induces frequent, although not usually strong pulsations. In cases of this kind, singular murmurs (not unlike those which are heard when we apply certain shells to the ear) are heard on applying the stethoscope to the neck over the course of the great jugular veins.

The age at which palpitation most usually comes on is from 15 to 25 years; and the affection—especially if it arise from anæmia—is very much more common in the female than in the male sex.

The treatment of palpitation must entirely depend upon its cause. The use of all nervous stimulants (tea, coffee, alcohol, and tobacco) should be suspended or abandoned. If the patient is clearly plethoric, with a full strong pulse, he should take saline cathartics, and live upon comparatively low diet (including little animal food) until this condition is removed. When, on the other hand, the palpitation is due to an anæmia condition, the remedies are preparations of iron, aloetic purgatives, an abundance of animal food, bitter ale, the cold shower-bath, and moderate exercise.

PA'LSY. See PARALYSIS.

PAMIR (also aptly called *Bam-i-dunya*, 'Roof of the World'), a mountainous region in Central Asia, forming the nucleus of the Central Asian highland system. Hither converge the Hindu Kush, the Himalaya, the Kuen-lun, and the Tian-Shan Mountains. The P. is not so much a plateau or region of lofty plateaux, as a vast mountainous district some 30,000 square miles in area, broken up into ridges and valleys. The ridges rise from 6000 to 9000 feet above the valleys, and the culminating points attain in some cases the great height of 25,000 feet above sea-level.

PA'MLICO SOUND, on the coast of North Carolina, U.S., is separated from the ocean by long, narrow islands of sand, an angle of the largest forming Cape Hatteras, and connected with the ocean by narrow passages; it is 80 miles long, and from 10 to 30 miles wide, and receives the Neuse and Pamlico Rivers.

PA'MPAS (in the Quichua tongue, 'a valley' or 'plain') is a term frequently employed in a general sense as a designation of Southern American plains, in contradistinction to the 'prairies' of North America. It is also used in Peru as a general designation of tracts of level land either on the coast or among the mountains. The chief pampas in Peru are those of the Sacramento. But in its more special and proper signification, the word pampas is given to the immense and partly undulating plains bounded by the Rio Negro of Patagonia, the La Plata and Paraguay, and the base of the Cordilleras. These plains during the wet season afford abundant pasturage to the many herds of wild oxen and horses which roam over them, but they become rapidly parched under the burning heat of the sun, except in the low-lying tracts, or along the banks of rivers. The most fertile of the pampas lie westwards towards the Cordilleras. From the rapid alternation of vigorous growth with parching drought, the growth of trees is impossible, and their place is accordingly supplied by sparse groups of stunted shrubs. The soil, which is in general poor, is a diluvium composed of sandy clay, and abounds in the bones of extinct mammals. Strips of waterless desert, known as *travesias*, stretch across the pampas; these travesias are destitute of all vegetation with the exception of a few bushes, and are markedly distinct in geological character.

The soil of the pampas is more or less impregnated with salt, and saltpetre abounds in many places. The wild animals of the pampas are horses, oxen (both introduced by the Spaniards), nandous, and guanacos. The skins of the horses and oxen, and the flesh of the latter, form a most important item in the trade of this region. The half-white inhabitants of the pampas are called Guachos (q. v.). The whole area of the pampas has been estimated at about 1,500,000 square miles.

PAMPAS GRASS (*Gynerium argenteum*), a grass which covers the *pampas* in the south of Brazil and more southern parts of South America, and has been introduced into Britain as an ornamental plant. It is quite hardy, and its tufts have a splendid appearance. The leaves are six or eight feet long, the ends hanging gracefully over; the flowering stems ten to fourteen feet high; the panicles of flowers silvery white, and from eighteen inches to

two feet long. The herbage is too coarse to be of any agricultural value. The male and female flowers are on separate plants; in panicles; the spikelets 2-flowered, one floret stalked, and the other sessile; the paleæ of the female florets elongated, awn-



Pampas Grass (*Gynerium argenteum*).

shaped, and woolly.—Another species of the same genus, *G. saccharoides*, also a Brazilian grass, yields a considerable quantity of sugar.

PAMPELU'NA, or PAMPLO'NA, a fortified city of Spain, capital of Navarre, of which it is the key, occupies an eminence not commanded by any neighboring height, on the left bank of the Arga, a tributary of the Ebro, 111 m. N.N.W. of Zaragoza by railway, and 200 miles north-north-east of Madrid. The citadel, overlooking the river and commanding the plain, is a regular pentagon, each side being 1000 feet in extent, and is connected with the city by an esplanade or glacis. Magnificent views of the Pyrenees on the north are obtained from the citadel, and there are several very pleasant promenades. The *Cuenca* (plain) of P. is about 30 miles in circumference; and although the climate is somewhat chilly and damp, the gardens are fruitful and the meadows verdant. The city is well built and clean; water is brought from hills about nine miles distant, by means of an aquaduct built after the solid Roman style by Ventura Rodriguez, and a portion of which, 2300 feet in length, is supported on 97 arches, 35 feet in span, and 65 feet in height. The town contains a number of squares with fountains, a theater, and a regular *plaza de toros*—bull arena—capable it is said, of containing 10,000 people Agriculture, the wine trade, and the manufacture of linen and leather, are the only noteworthy branches of industry. P. was blockaded by the Carlists in 1874. Pop. (1877) 25,630.

P. was called by the ancients *Pompeiopolis*, from the circumstance of its having been rebuilt by the sons of Pompey in 68 B.C. It was taken by the Goths in 466, by the Franks under Childebert in 542, and again under Charlemagne in 778. It was subsequently for a time in possession of the Moors, who corrupted the name Pompeiopolis into *Banbilonah*, whence the modern Pamplona. In later times it was seized by the French in 1808, and held by them till 1813, when it fell into the hands of the allies under the Duke of Wellington.

PA'MPHLET (variously derived from Spanish *papaleta*, slip of paper on which anything is written, and *pagina filata*, threaded page), a small book consisting of a sheet of paper, or a few sheets stitched together, but not bound. It generally contains a short treatise on some subject, political or otherwise, which is exciting public attention at the time of its appearance. The word is of considerable antiquity, as it is to be met with in Chaucer; but it was not till about the middle of the 16th c. that pamphlets began to be of common use in political and religious controversy in England and France. Under the second French empire, political pamphlets appeared from time to time which were generally believed to be written under imperial dictation, and either to speak the sentiments of the emperor, or to be feelers of public opinion.

PAMPHY'LIA, anciently a country on the south coast of Asia Minor, with Cilicia on the east and Lycia on the west. It was originally bounded on the inland or northern side by Mount Taurus, but afterwards enlarged, so as to reach the confines of Phrygia. P. is mountainous, was formerly well wooded, and had numerous maritime cities. The inhabitants—a mixed race of aborigines, Cilicians, and Greek colonists—spoke a language the basis of which was probably Greek, but which was disfigured and corrupted by the infusion of barbaric elements. Their coins show that they had adopted to some extent the religion, arts, and games of the Hellenic race. Its political history is unimportant. Along with Phrygia and Lycia it fell to the share of Antigonus on the partition of the Macedonian empire. It afterwards passed successively into the hands of the Græco-Syrian princes, the kings of Pergamus, and the Romans.

PAN, among the Greeks, the chief god of pastures, forests, and flocks. The later rationalizing mythologists, misconceiving the meaning of his name, which they confounded with *to pan*, 'the whole,' or 'the universe,' whereas it is more probably connected with *pao* (Lat. *pasco*), 'to feed,' 'to pasture,' represented him as a personification of the universe, but there is absolutely nothing in the myth to warrant such a notion. Pan neither in his genius nor his history figures as one of the great principal deities, and his worship became general only at a comparatively late period. He was, according to the most common belief, a son of Hermes (Mercury) by the daughter of Dryops; or by Penelope, the wife of Ulysses; while other accounts make Penelope the mother, but Ulysses himself the father—though the paternity of the god is also ascribed to the numerous wooers of Penelope in common. The original seat of his worship was the wild hilly and wooded solitudes of Arcadia, whence it gradually spread over the rest of Greece, but was not introduced into Athens until after the battle of Marathon. Homer does not mention him. From his very birth his appearance was peculiar. He came into the world with horns, a goat's beard, a crooked nose, pointed ears, a tail, and goat's feet; and so frightened his mother that she ran off for fear, but his father, Hermes, carried him to Olympus, where all the gods, especially Dionysus (Bacchus), were charmed with the little monster. When he grew up he had a grim shaggy aspect, and a terrible voice, which bursting abruptly on the ear of the traveler in solitary places—for Pan was fond of making a great noise—inspired him with a sudden fear (whence the word *panic*). It is even related that the alarm excited by his blowing upon a shell decided the victory of the gods over the Titans. He was the patron of all persons occupied in the care of cattle and of bees, in hunting and in fishing.

During the heat of the day he used to take a nap in the deep woods or on the lonely hillsides, and was exceedingly wroth if his slumber was disturbed by the halloo of the hunters. He is also represented as fond of music, and of dancing with the forest nymphs, and as the inventor of the syrinx or shepherd's flute, also called Pan's pipe. Cows, goats, lambs, milk, honey, and new wine were offered him. The fir-tree was sacred to him, and he had sanctuaries and temples in various parts of Arcadia, at Troezene, at Sicyon, at Athens, &c. The Romans identified the Greek Pan with their own Italian god Inuus, and sometimes also with Faunus. See FAUN.

When, after the establishment of Christianity, the heathen deities were degraded by the church into fallen angels, the characteristics of Pan—viz., the horns, the goat's beard, the pointed ears, the crooked nose, the tail, and the goat's feet—were transferred to the Devil himself, and thus the 'Auld Hornie' of popular superstition is simply Pan in disguise.

PANAMA', a city and seaport of the republic of Colombia, in S. America, capital of the 'state' of the same name, at the head of the Bay of Panama, on the southern shore of the isthmus of the same name, in lat. 8°, 56′ N., long. 79° 31′ W. It occupies a tongue of land which extends some distance out to sea in shallow waters. The harbor is safe, but vessels of more than 80 tons burden cannot approach within two miles of the shore, Large vessels anchor at a distance of three miles, near the island of Perico. The important edifices of the city include a beautiful cathedral, a college, and several convents, all of which, however, are falling into decay. There is considerable trade with Europe in pearls, mother-of-pearl, shells, and gold-dust, obtained in the vicinity. P. is chiefly important, however, as the Pacific terminus of the Panama Railway. This railway was completed in 1855, is about 48 miles in length, and connects P. on the Pacific with Aspinwall colony on the Atlantic. By means of it the route to California was much shortened, and mails were carried over it till the completion of the Pacific Railway. Pop. (1870) 18,378. The former city of P., the seat of the Spanish colonial government established in 1518, stood six miles N.-E. of P., and is now a heap of ruins.

PANAMA, ISTHMUS OF, is that portion of the narrow ridge of mountainous country connecting Central and South America, which is bounded on the W. by the frontier of Costa Rica, and

on the E. by the surveyed inter-oceanic route from the Bay of Caledonia on the N. to the Gulf of San Miguel on the S. or Pacific side. It extends in long. from 77° to 83° W. The 'State' of P., one of those which form the United States of Colombia, is co-extensive with the isthmus of the same name. Area, 29,756. Pop. (1870) 220,542. P. contains the provinces of Panama, Azuero, Chiriqui, and Veraguas. The Isthmus is traversed throughout by a chain of mountains, forming the barrier between the Atlantic and Pacific oceans, and of which the highest peak is that of Picacho (7200 feet) in the west. Numerous streams, the largest of which is the Tuira (162 miles long, and navigable for 102 miles), fall into both oceans. On the Pacific shores are numerous beautiful islands, among which Las Perlas, so called from their pearl fisheries, and the island of Coiba, are the chief. On the north coast, the principal harbors are the Chiriqui Lagoon, San Blas, and the Caledonia; on the south shore, Damas in the island of Coiba, the Bay of San Miguel, and Golfo Dulce. Gold, which in ancient times was obtained here in great quantities, is still found, and mines of salt, copper, iron, coal, &c., are worked. The climate is unhealthy, except in the interior and on the flanks of the mountains. Almost all the plants of the torrid zone may be raised here, but maize, rice, plantains, &c. (grown for the purpose of supplying the transit), are the chief crops. The imports amount annually to about £500,000, and the exports to the same value.—In 1855 a railway across the isthmus, from Aspinwall city on the Atlantic to Panama on the Pacific, was opened. The summit of the railway is 250 feet above the level of the sea; and the average value of the goods that annually pass over it is estimated at £11,000,000. The inter-oceanic canal promoted by M. Lesseps, also between Limon or Aspinwall and Panama, is in the main parallel to the railway. It is a level cutting, without locks, the cost being estimated at £33,000,000. Work was begun in 1881. The name, Isthmus of P., is generally used as interchangeable with Isthmus of Darien (q. v.).

PANATHENÆ'A, the most famous festival of Attica, celebrated at Athens in honor of Athene, patron goddess of the city, and intended to remind the people of Attica of their union into one community by the mythical Theseus. Before the time of Theseus, or—to speak more critically—before the formation of the Attic confederacy, this festival was only for the citizens of Athens, and was called simply *Athenæa*. According to tradition, the Athenæa owed its origin to King Erichthonius about 1506 or 1521 B.C. The later Panathenæa appears to have been a double festival. All writers who mention it, speak of a Lesser and Greater Panathenæa, the former held annually, the latter every fourth year. Both took place in the month *Hecatombæon* (July), and lasted several days. The lesser Panathenæa was celebrated with gymnastic games, musical competitions, declamations, and a torch race in the evening, the whole concluding with the sacrifices of an ox. The prize of the victors was a vessel filled with oil from the sacred tree on the Acropolis. The greater Panathenæa only differed from the Lesser in being more solemn and magnificent. Rhapsodists sang the Homeric poems; dramatic representations were given; and a splendid procession took place to the temple of Athene Polias, on the last day of the festival, to present the goddess with a *peplus* or embroidered robe, of crocus color, woven by the maidens (*ergastinai*) of the city. Not alone the Athenians, but the whole population of Attica poured forth on this occasion. The procession is grandly sculptured on the frieze of the Parthenon by Phidias and his disciples.

PA'NAX. See GINSENG.

PA'NCAKE. This article of food is prepared by pouring a rich batter of flour, eggs, and milk into a frying-pan, so as to cover it about half an inch in thickness; the pan having been previously heated, and well supplied with butter, lard, or olive oil. A quick fire is necessary to cook it well, and when the under side is done, a dexterous cook by jerking the frying-pan manages to reverse the cake, so as to bring the upper side downward to be cooked in its turn. It is now a common practice to make pancakes rather smaller than the bottom of the pan, and frequently to add minced apples and other materials to vary and flavor them; these are, however, better known under the name of Fritters.

This dish is particularly associated with Shrove Tuesday, but the origin of the connection is by no means clear. Perhaps it is the relic of a heathen custom. The Saxons called February, *Solmonath*, 'which,' says a writer in *Notes and Queries* (First Series, vol. v. p. 491), 'Dr. Frank Sayers, in his *Disquisitions*, says is explained by Bede, *Mensis Placentarum*, and rendered by Spelman, in an inedited MS., "Pancake month," because, in the course of it, pancakes were offered by the pagan Saxons to the sun.'

PANCHATANTRA (literally, the five books) is the name of the celebrated Sanscrit fable-book of the Hindus whence the *Hitopades'a* (q. v.) was compiled and enlarged. Its authorship is ascribed to a Brahman of the name of Vishn'us'arman, who, as its introduction in a later recension relates, had undertaken to instruct, within six months, the unruly sons of Amaras'akti, a king of Mahilâropya or Mihilâropya, in all branches of knowledge required by a king, and for this purpose composed this work. If the latter part of the story be true, it is more probable, however, as Professor Benfey assumes, that Vishn'us'arman was merely the teacher of the princes, and that the existing work itself was composed by some other personage; for an older recension of the work does not speak of his having brought his tales into the shape of a work. The arrangement of the P. is quite similar to that of the *Hitopades'a*. The fables are narrated in prose, and the morals drawn from or connected with them are interwoven with the narrative in verse; many such verses, if not all, being quotations from older works.—On the history of the P., and its relation to the fable-books and fables of other nations, see the excellent work of Professor Theodor Benfey, *Panchatantra; fünf Bücher indischer Fabeln, Märchen und Erzählungen* (2 vols., Leip. 1859), the first volume containing his historical and critical researches on, and the latter his literal translation into German of, the *Panchatantra*.

PANCREAS (from the Gr. *pan*, all, and *kreas*, flesh) is a conglomerate gland, lying transversely across the posterior wall of the abdomen, varying in length from 6 to 8 inches, having a breadth of about an inch and a half, and a thickness of from half



The under surface of the Stomach and Liver which are raised to show the Duodenum and Pancreas:

st, stomach; *p*, its pyloric end; *l*, liver; *g*, gall-bladder; *d*, duodenum, extending from the pyloric end of the stomach to the front, where the superior mesenteric artery (*sm*) crosses the intestines; *pa*, pancreas; *sp*, spleen; *a*, abdominal aorta.

an inch to an inch. Its usual weight is about three ounces. The head of the pancreas lies in the concavity of the duodenum.

The secretion of this gland, or the pancreatic fluid, is conveyed from its various parts by means of the pancreatic duct to the duodenum. This gland is found in all mammals, birds, reptiles, amphibians, and osseous fishes, and in some cartilaginous fishes.

The physical and chemical characters of the pancreatic fluid, and its uses in the animal economy, are sufficiently noticed in the article DIGESTION.

The diseases of the pancreas are few, and do not signify their existence by any very marked symptoms. The presence of undigested fat in the stools has been frequently observed in cases in which after death the pancreas has been found to be diseased; and if Bernard's view regarding the saponifying power of the pancreatic juice on fatty matters (described in the article already referred to) be correct, the reason why the fat should appear in the evacuations in these cases is sufficiently obvious. The most common form of disease is cancerous deposit in the head of the gland, which frequently induces jaundice by obstructing the common biliary duct near its opening. An accurate diagnosis of disease of this organ is extremely difficult, but fortunately is of comparatively little importance, as it cannot lead to efficient treatment; all that can be done in these cases being to palliate the most distressing symptoms.

The pancreas of ruminating animals is a favorite article of food under the name of sweetbread. That of the calf is most highly esteemed, but that of the lamb is often substituted for it. Dr. Edward Smith questions whether the very high price often paid for calf's sweetbread is warranted by its nutritive qualities, or even by its flavor; although he allows that the flavor is perhaps the most delicate of any meat we are acquainted with. It is either boiled or fried. The thyroid and sublingual glands are also used as sweetbread.

PANCSOVA, an active trading town in the south of Hungary, inhabited by Servians and Germans, 70 miles S.S.W. of Temesvar, and close to the mouth of the Temes in the Danube, which is here a mile wide. It is a military station, contains several churches, a high school, and a quarantine establishment. Silk spinning, brandy distilling, and an active trade in cattle, pigs, and corn, are carried on. Pop. (1880) 17,127.

PANDA (*Ailurus fulgens*), a quadruped of the family *Ursidæ* (see BEAR), a native of the Himalaya, the only known species of its genus, which has a very short muzzle, small rounded ears, a moderately long tail, covered with long hair, semi-retractile

claws. The P. is about the size of a large cat. It dwells chiefly in trees, preying much on birds, but it also eats small quadrupeds and large insects. It has a thick, fine, woolly covering, adapting it to a cold climate, concealed by long, soft, glistening, and richly colored hair, mostly chestnut brown, which passes into black on the sides and legs, and into white on the head. The P. is said to excel all other animals in the brilliancy of its fur,



Panda (*Ailurus fulgens*).

which, however, has not yet acquired any commercial value. The soles of the feet are thickly covered with woolly hair. The P. is also called *Wah* and *Chit-wa*, from a peculiar cry which it utters.

PANDANACEÆ, a natural order of endogenous plants, constituting a remarkable feature in the scenery of many tropical countries, but unknown in the colder regions of the globe. They are trees or bushes, often sending down adventitious roots, sometimes weak and decumbent, or climbing. There are two sections of the order, one (*Pandaneæ*) including the genera *Pandanus Freycinetia*, &c., having long, simple, imbricated leaves, usually spiny on the back and margin, their base embracing the stem, their spiral arrangement often notably visible; the other (*Cyclantheæ*) containing the genera *Cyclanthus*, *Nipa*, (q. v.), *Carludovica*, *Phytelephas*, &c., having pinnate or fan-shaped leaves, and in general appearance much resembling palms, with which they have been often ranked. The two sections, however, are very similar in their flowers and fruit, in which they not a little resemble the humbler *Araceæ* and *Typhaceæ*. The flowers are mostly unisexual, naked, or with only a few scales, arranged on a spadix, and wholly covering it. The stamens are numerous; the ovaries usually clustered, one-celled, each crowned with a stigma; the fruit consists of fibrous, one-seeded drupes, collected or almost combined, or of berries with many seeds.—There are not quite 100 known species. Some are valuable for the fibre of their leaves, some for their edible fruit, &c. See SCREW PINE, KIEKIE, and NIPA. The unexpanded leaves of *Carludovica palmata* furnish the material of which *Panama hats* are made. The tree which yields VEGETABLE IVORY (q. v.) is another of the palm-like section of this order.

PAN'D'AVAS, or the descendants of Pân'd'u (q. v.), is the name of the five princes whose contest for regal supremacy with their cousins, the Kurus, the sons of Dhr'itarâsht'ra, forms the foundation of the narrative of the great epic poem, the *Mahâbhârata* (q. v.). Their names are *Yudhisht'hira*, *Bhîma*, *Arjuna*, *Nakula*, and *Sahadeva*—the former three being the sons of Pân'd'u, by one of his wives, Pr'ithâ; and the latter two, by his other wife Mâdrî. But though Pân'd'u is thus the recognized father of these princes, the legend of the *Mahâbhârata* looks upon him, in truth, merely as their father by courtesy; for it relates that Yudhisht'hira was the son of Dharma, the god of justice; Bhîma, of Vâyu, the god of wind; Arjuna, of Indra, the god of the firmament; and Nakula and Sahadeva, of the As'wins, the twin-sons of the sun.

PANDECTS (Gr. *Pandecton*, all receiving; from *pan*, all, and *dechomai*, I receive), one of the celebrated legislative works of the Emperor Justinian (q. v.), called also by the name *Digestum*, or Digest. It was an attempt to form a complete system of law from the authoritative commentaries of the jurists upon the laws of Rome. The compilation of the Pandect was undertaken after that great collection of the laws themselves which is known as the Codex Justinianeus. It was intrusted to the celebrated Tribonianus, who had already distinguished himself in the preparation of the Codex. Tribonianus formed a commission consisting of 17 members, who were occupied from the year 530 till 533 in examining, selecting, and compressing, and systematizing the authorities, consisting of upwards of 2000 treatises, whose interpretation of the ancient laws of Rome, was from that time forward to be adopted with the authority of law. A period of ten years had been allowed them for the completion of their work; but so diligently did they prosecute it, that it was completed in less than one-third of the allotted time; and some idea of its extent may be formed from the fact that it contains upwards of 9000 separate extracts, selected according to subjects from the 2000 treatises referred to above.

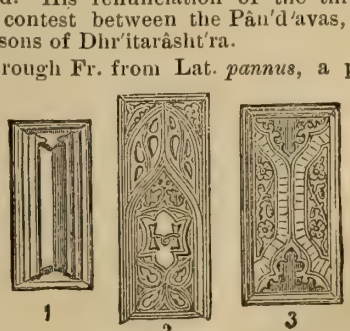
The Pandects are divided into 50 Books, and also into 7 Parts, which correspond respectively with Books 1—4, 5—11, 12—19, 20—27, 28--35, 36—44, and 45—50. Of these divisions, however, the latter (into Parts) is seldom attended to in citations. Each Book is subdivided into Titles, under which are arranged the extracts from the various jurists, who are 39 in number, and are by some called the classical jurists, although other writers on Roman law confine that appellation to five of the number, Papinian, Paulus, Ulpian, Gaius (q. v.), and Modestinus. The extracts from these indeed constitute the bulk of the collection; those from Ulpian alone making one-third of the whole work; those from Paulus one-sixth, and those from Papinian one-twelfth. Other writers besides these 39 are cited, but only indirectly, i. e., when cited by the jurists whose works form the basis of the collection. The principle upon which the internal arrangement of the extracts from individual writers was made had long been a subject of controversy. The question seems now to be satisfactorily solved; but the details of the discussion would carry us beyond the prescribed limits. Of the execution of the work, it may be said that although not free from repetition (the same extracts occurring under different heads), and from occasional inaptness of citation, and other inconsistencies, yet it deserves the very highest commendation. In its relations to the history and literature of ancient Rome it is invaluable; and taken along with its necessary complement the Codex, it may justly be regarded (having been the basis of all the medieval legislation) as of the utmost value to the study of the principles not alone of Roman, but of all European laws.

PANDORA (i. e., the 'All-endowed'), according to Grecian myth, was the first woman on the earth. When Prometheus had stolen fire from Jupiter, Zeus instigated Hephæstus to make woman out of earth to bring vexation upon man by her graces. The gods endowed her with every gift necessary for this purpose, beauty, boldness, cunning, &c.; and Zeus sent her to Epimetheus, the brother of Prometheus, who forgot his brother's warning against receiving any gift from Zeus. A later form of the myth represents P. as possessing a vessel or box filled with winged blessings, which mankind would have continued to enjoy if curiosity had not prompted her to open it, when all the blessings flew out, except Hope.

PANDOURS, a people of Servian origin who lived scattered among the mountains of Hungary, near the village of Pandour in the county of Sohl. The name used to be applied to that portion of the light-armed infantry in the Austrian service which is raised in the Slavonian districts on the Turkish frontier. The P. originally fought under the orders of their own proper chief, who was called Harûn-Basha, and rendered essential service to the Austrians during the Spanish War of Succession, and afterwards in the Seven Years' War. They originally fought after the fashion of the 'free lances,' and were a terror to the enemy whom they annoyed incessantly. Their appearance was exceedingly picturesque, being somewhat oriental in character, and their arms consisted of a musket, pistols, a Hungarian sabre, and two Turkish poniards. Their habits of brigandage and cruelty rendered them, however, as much a terror to the people they defended as to the enemy. Since 1750 they have been gradually put under a stricter discipline, and are now incorporated with the Austrian frontier regiments. The name is now obsolete.

PAN'D'U, literally, 'white,' is the name of the father of the Pân'd'avas (q. v.), and the brother of Dhr'itarâsht'ra. Although the elder of the two princes, he was rendered by his 'pallor'—implying, perhaps, a kind of disease—incapable of succession, and therefore obliged to relinquish his claim to his brother. He retired to the Himalaya Mountains, where his sons were born, and where he died. His renunciation of the throne became thus the cause of contest between the Pân'd'avas, his sons, and the Kurus, or the sons of Dhr'itarâsht'ra.

PANEL (through Fr. from Lat. *pannus*, a piece of cloth, a



Panels.

patch), a space or compartment of a wall, ceiling, woodwork, &c.

enclosed by beams, mouldings, framing, and so forth. It is generally sunk under the plane of the surrounding styles. In woodwork, panels are thinner parts used to fill in strong framing, as in doors, shutters, &c. These are sometimes highly ornamented with tracery, shields, &c. (as in figs. 2 and 3). In late Gothic architecture, the panel is very often carved into the 'linen pattern' (fig. 1). Panelling is a style of ornament greatly used in Elizabethan architecture. The ceilings and walls are covered with it, and every piece of furniture is cut up into panels of every variety of form. Panels are said to 'fielded' when the center of the panel is raised with mouldings, &c.

PANEL (properly the slip or 'pane' of parchment on which the names of the jurors are written) is, in the practice of the English law, used to denote the body or set of jurors, consisting of 12 men, who try a cause, civil or criminal. In Scotch criminal law, the prisoner is usually called the panel.

PANGÉ LINGUA (Lat. 'Proclaim, O Tongue'), one of the most remarkable of the hymns of the Roman Breviary, and like its kindred hymn, *Lauda Sion*, a most characteristic example as well of the medieval Latin versification as of that union of theology with asceticism, which a large class of these hymns present. The Pangé Lingua is a hymn in honor of the Eucharist, and belongs to the service of the Festival of Corpus Christi. It is from the pen of the great angelic doctor, Thomas Aquinas (q. v.) and consists of six strophes of verses in alternate rhyme. Besides its place in the office of the Breviary, this hymn forms part of the service called Benediction with the Blessed Sacrament, and is sung on all occasions of the exposition, procession, and other public acts of Eucharistic worship.

PA'NGOLIN, or PENGOLIN, a name sometimes extended to all the species of *Manis* (q.v.), but originally belonging to *M. pentadactyla*, also called SHORT-TAILED MANIS, and in some parts of India BAJJERKEIT; this species being a native of most parts of the East Indies, and P., its Malayan name, derived from a word which signifies to roll up; the animal having the habit of



Pangolin (*Manis pentadactyla*).

rolling itself up, on apprehension of danger, into a compact ball, the head in the center, and its muscular mail-covered tail enfolding all. The food of the P. consists chiefly of ants, and like the rest of the genus, it is entirely destitute of teeth, and has a round, extensile tongue. Its claws are long and strong; it doubles them up like the American ant-eaters when it walks. It resides in burrows, which it excavates to the depth of seven or eight feet in the ground. It is capable of climbing trees, and the tail is prehensile. The whole length of the animal including the tail, is almost five feet, the tail being not quite half the length of the body. It is a gentle animal, easily tamed, and of an affectionate disposition.

PANIC is where fear, whether arising from an adequate or inadequate cause, obtains the mastery over every other consideration and motive, and urges to dastard extravagance, or hurries into danger, or death. An inexplicable sound causes a rush from a church, a vague report in the market-place causes a run on a bank, and precipitate the very events that are dreaded. This emotion either differs from natural apprehension, or presents so intense and uncontrollable a form of the feeling, that it is propagable from one person to another, and involves alike the educated and ignorant—those who act from judgment as well as those who act from impulse. There are, besides this feature, several grounds for believing that such manifestations of involuntary terror are of morbid origin, and should be regarded as moral epidemics. They have generally arisen during, or have followed, seasons of scarcity and physical want and disease, the ravages of war, or periods of great religious fervour and superstition. The dancing mania, the retreat of the French army from Moscow, and recent and familiar commercial panics afford illustrations of certain of these relations. The most notable instance of universal panic, and that which demonstrates most aptly the connection here indicated, is the dread of the approaching end of the world which pervaded all minds, and almost broke up human society in the 10th century. The empire of Charlemagne had fallen to pieces; public misfortune and civil discord merged into misery and famine so extreme that cannibalism prevailed even in Paris; superstitious and vague predictions became formalized into a prophecy of the end of all things and universal doom in the year 1000. This expectation suspended even vengeance and war. The 'truce of God' was proclaimed. Enormous riches were placed upon the altars. Worship and praise never ceased. The fields were left uncultivated; serfs were set free; four kings and thousands of nobles retired to the cloister; and all men, according to their tendencies, prepared to die.

It is worthy of note that during all pestilences there have arisen epidemic terrors, not so much of the devastations of disease, as of plots and poisonings directed by the rich against the poor. Even where these epidemic terrors are legitimately traceable to local and physical causes, as in the case of the singular affection timoria, which occurs in the marshy and unhealthy districts in Sardinia, the tremor and trepidation, and other phenomena, are ascribed to the magical influence of enemies. For the origin of the name, see PAN.

PA'NICLE, in Botany, a mode of Inflorescence (q. v.) in which the floral axis is not only divided, but also subdivided more or less frequently. The panicle may thus be regarded as a Raceme (q. v.), of which the branches (or flower-stalks) are branched. The panicle is a very common kind of inflorescence. Most of the grasses exhibit it, and many other plants, both endogenous and exogenous. The common lilac affords a good example of it. The panicle, variously modified as to its form, and the arrangement and relative lengths of its branches and branchlets, becomes a Cyme (q. v.), Thyrsus (q. v.), &c.

PA'NICUM. See MILLET.

PAN'INI, the greatest known grammarian of ancient India, whose work on the Sanscrit language has up to the present day remained the standard of Sanscrit grammar. Its merits are so great that P. was ranked among the R'ishis (q. v.), or inspired seers, and at a later period of Sanscrit literature, was supposed to have received the fundamental rules of his work from the god S'iva himself. Of the personal history of P., nothing positive is known, except that he was a native of the village S'alâtura, situated north-west of Attock, on the Indus—whence he is also surnamed S'âlâturîya—and that his mother was called Dâkshî, wherefore, on his mother's side, he must have been a descendant of the celebrated family of Daksha. A tale-book, the *Kathâsaritsâgara* (i. e., the ocean for the rivers of tales), gives, indeed, some circumstantial account of the life and death of P.; but its narrative is so absurd, and the work itself of so moderate a date—it was written in Cashmere, at the beginning of the 12th c.—that no credit whatever can be attached to the facts related by it, or to the inferences which modern scholars have drawn from them.

According to the views expressed by Goldstücker (*Pân'ini, his Place in Sanscrit Literatare:* London, 1861), it is probable that P. lived before S'âkyamuni, the founder of the Buddhist religion, whose death took place about 543 B.C., but that a more definite date of the great grammarian has but little chance of ascertainment in the actual condition of Sanscrit philology.—The grammar of P. consists of eight Adhyâyas, or books, each book comprising four Pâdas, or chapters, and each chapter a number of Sûtras (q. v.) or aphoristical rules. The latter amount in the whole to 3996; but three, perhaps four, of them did not originally belong to the work of Pân'ini. The arrangement of these rules differs completely from what a European would expect in a grammatical work, for it is based on the principal of tracing linguistic *phenomena*, and not concerned in the classification of the linguistic *material*, according to the so-called parts of speech. A chapter, for instance, treating of a prolongation of vowels, will deal with such a fact wherever it occurs, be it in the formation of bases, or in conjugation, declension, composition, &c. The rules of conjugation, declension, &c., are, for the same reason, not to be met with in the same chapter or in the same order which European grammars would teach them; nor would any single book or chapter, however apparently more systematically arranged—from a European point of view—such as the chapters on affixes or composition, suffice by itself to convey the full linguistic material concerned in it, apart from the rest of the work. In a general manner, P.'s work may therefore be called a natural history of the Sanscrit language, in the sense that it has the strict tendency of giving an accurate description of facts, instead of making such a description subservient to the theories according to which the linguistic material is usually distributed by European grammarians.

Whatever objections may be raised against such an arrangement, the very fact of its differing from that in our grammars makes it peculiarly instructive to the European student, as it accustoms his mind to survey language from another point of view than that usually presented to him, and as it must induce him, too, to question the soundness of many linguistic theories now looked upon as axiomatic truths. As the method of P. requires in a student the power of combining many rules scattered all over the work, and of combining, also, many inferences to be drawn from these rules, it exercises, moreover, on the mind of the stu-

dent an effect analogous to that which is supposed to be the peculiar advantage of the study of mathematics. The rules of P. were criticised and completed by Kâtyâyana (q. v.), who, according to all probability was the teacher, and therefore the contemporary, of Patanjali; and he in turn, was criticised by Patanjali (q. v.), who sides frequently with Pân'ini. These three authors are the canonical triad of the grammarians of India; and their works are in truth, so remarkable in their own department, that they exceed in literary merit nearly all, if not all, grammatical productions of other nations, so far as the two classes are comparable. The rules of P. were commented on by many authors. The best existing commentary on them is that called the *Kâs'ikâvr'itta*, by Vâmana Jayâditya, which follows these rules in their original order. At a later period, attempts were made to arrange the rules of P. in a manner which approaches more to the European method; the chief work of this category is the *Siddhânta-Kaumudi*, by Bhat't'oji-dîkshita. P. mentions, in his Sûtras, several grammarians who preceded him, amongst others, S'âkatâyana.

Manuscripts of a grammar ascribed to a grammarian of this name exist in the Library of the India Office in London, and in the Library of the Board of Examiners at Madras. On the ground of a few pages only of the latter an attempt has been very recently made to prove that this grammar is the one referred to by P., and therefore older than the work of the latter. But the facts adduced in proof of this hypothesis are so ludicrously weak, and the reasoning upon them so feeble and inconclusive, whereas, the evidence in favor of the comparatively recent date of this work is so strong, that no value whatever can be attached to this hasty hypothesis. For the present, therefore, P.'s work still remains the oldest existing grammatical work of India, and probably of the human race. The Sûtras of P., with a modern commentary by two native pandits, and with extracts from the *Vârtikas* of Kâtyâyana and the *Mahâbhâshya* of Patanjali, were edited at Calcutta in 1809. This edition, together with the modern commentary, but with garbled extracts from the extracts mentioned, was reprinted at Bonn in 1839—1840 by Dr. O. Boehtlingk, who added to it remarks of his own and some indices.—For the literature connected with P., see Colebrooke's preface to his *Grammar of the Sanscrit Language* (Calc. 1805), and Goldstücker's *Pân'ini*, &c., as mentioned above.

PAÑIPU'T, the chief town of the district Kurnal, in the division of Delhi, Punjab, is situated 54 miles (by road 78 miles) north by west from Delhi, in a fertile tract, the resources of which are largely developed by artificial irrigation. Pop. (1868) 25,276. Being a station on the great military road between Afghanistan and the Punjab, and to some extent an outpost of Delhi, it has been at various times the scene of strife between the inhabitants of India and invaders. The *first* great battle of P. was fought in 1526, and gained by Mirza Baber, the ex-ruler of Ferghana, at the head of 12,000 Mongols, over Ibrahim the emperor of Delhi, whose unwarlike array numbered 100,000 men, with 1000 elephants. This victory seated Baber on the throne of Hindustan as the first of the 'Great Mogul' dynasty. The *second* great battle was fought, in 1556, by the Mongols under Akbar, grandson of Baber, and third of the Mogul emperors, against Hemu, an Indian prince who had usurped the throne of Delhi. Hemu's army was defeated with great slaughter, and himself slain. The *third* battle was fought on the 14th of January 1761, between Ahmed Abdalli, ruler of Afghanistan, and the till then invincible Mahrattas. The Jats, who had been forced to join the Mahrattas, deserted to the Afghans at a time when victory seemed to be declaring for the former; and this act of treachery, together with the loss of their leaders, threw the Mahrattas into confusion, and in spite of their most resolute valor they suffered a total defeat. They left 50,000 slain on the field of battle, including all their leaders except Holkar, and 30,000 men were killed in the pursuit, which was continued for four days. The Mahrattas never recovered this crushing blow. It was at Kurnaul, a town a little to the north of P., that Nadir Shah of Persia, in 1739, won the celebrated battle over the Mogul emperor, which placed North-Western India at his feet.

PANIZZI, Sir Antonio, principal librarian of the British Museum from 1856 to 1866, was born on the 16th Sept. 1797, at Brescello, in the *ci-devant* duchy of Modena. For his education he was sent first to the public school of Reggio, and afterwards to the university of Padua, where, in 1818, he took the degree of Doctor of Laws, with a view to practising at the bar. Early in life his sympathies were enlisted on behalf of the friends of Italy, as opposed to domestic tyranny and foreign intrusion, and when, in 1821, the popular revolution broke out in Piedmont, the young advocate became one of its leaders. The attempt, however, failed; and P., who had been denounced by a pretended friend, was arrested at Cremona. Having by some means contrived to escape, he took refuge in Lugano, and from thence in a short time found his way to Geneva. Meanwhile, during his absence, he was tried at home *per contumaciam*, as it is called, and sentenced to death, with confiscation of property. Nor was he allowed to remain at Geneva. The governments of Austria and Sardinia demanded from the Swiss Confederation the expulsion of all concerned in the recent outbreak, and among these P. was obliged to depart. Forbidden to pass through France, he reached England by way of Germany and the Netherlands. He now resided for about a month in London, when he proceeded to Liverpool, with an introduction from Ugo Foscolo to Roscoe the historian, who received him with the utmost hospitality. At Liverpool, where he was introduced into the best circles by Mr. Roscoe, he taught Italian, and continued to reside in that town until 1828, when he came to London again, and was chosen professor of Italian in the university of London, just then opened for students. In 1831, through the instrumentality of Lord Brougham, he was appointed one of the assistant-librarians in the British Museum; and upon the retirement of the Rev. Mr. Baber, in 1837, from the office of Keeper of the Printed Books, P. was appointed his successor. In the previous year there had been a parliamentary committee on the state of the British Museum, before which P. gave valuable evidence, and likewise urged the adoption of measures for the improvement and augmentation of the library, which, upon becoming keeper, he was in a still better position to advocate.

In 1838 he superintended the removal of the printed books from the old suite of rooms in Montague House to the new library; and in the same year, in conjunction with some of his assistants, he drew up the well-known 91 rules for the formation of a new catalogue of the library. These rules were approved by the trustees, and the first volume of a catalogue framed after them was printed and published in 1841. No other volume has been since published, and P., before a royal commission of inquiry into the Museum in 1847, justified the suspension of the printing until the whole catalogue should be finished. In 1845, P. drew up an elaborate report of the deficiencies existing in the library, in consequence of which the trustees applied to the Lords of the Treasury for 'an annual grant of £10,000 for some years to come, for the purchase of books of all descriptions.' This grant having been obtained, the library rapidly increased in numbers, to such a degree that in 1849 the books amounted to 435,000, as compared with 235,000, the ascertained number in 1838. The number of volumes is now estimated at considerably over 1,000,000. Upon the resignation of Sir H. Ellis, in 1856, P. was appointed to the post of principal librarian of the British Museum, an office he held ten years. In a literary capacity, P. is known by an edition of the *Orlando Innamorato di Boiardo, and Orlando Furioso di Ariosto: with an Essay on the Romantic Narrative Poetry of the Italians, Memoirs and Notes by A. Panizzi* (9 vols. Lond. 1830—1834). He also edited the *Sonetti e Canzone* of Boiardo (Lond. 1835), and a collection of reprints of the first four editions of the *Divina Commedia* (Lond. 1858). He was also the author of a privately-printed pamphlet, *Chi era Francesco da Bologna*, proving the identity of the type-founder employed by Aldus, and the inventor of the well-known Aldine or Italic type, with the painter Francesco Francia. P. wrote occasional articles for the reviews. P., who retired on a pension in 1866, and in 1869 received the order of K.C.B., died 8th April 1879. His *Epistolario* was announced in 1880, also a *Life* by Fagan.

PA'NJIM. See Goa.

PA'NNAH, or PU'NNAH, a decayed town of India, in the district of Bundelcund, stands on the north-eastern slope of a plateau, 115 miles south-west of Allahabad. It was formerly a large, thriving, and well-built town; but whole streets are now desolate, or are tenated only by monkeys, which, posted on the roof or at the windows, view the town's-people without alarm. The palace of the rajah is a beautiful building, surmounted by elegant kiosks, but is in many places ruinous. The source of the former prosperity of P. was its rich diamond mines. Owing to the diminished value of the gem, however, and the increased tax upon the produce of the mines, this branch of industry has much fallen off. The diamonds are generally tinted with color; very few of them being of first-water, or completely colorless. This town is the chief place of a territory of the same name, which is bounded on the north by the British district of Banda, and on the south by the British district of Nerbudda. See Bundelcund.

PANNELS, in Artillery, are the carriages upon which mortars and their beds are conveyed on a march.

PANNO'NIA, a province of the ancient Roman empire, bounded on the N. and E. by the Danube, on the W. by the mountains of Noricum, and on the S. reaching a little way across the Save; and thus including part of modern Hungary, Slavonia, parts of Bosnia, of Croatia, and of Carniola, Styria, and Lower Austria. It received its name from the Pannonians, a race of doubtful origin, but who at first dwelt in the country between the Dalmatian Mountains and the Save, in modern Bosnia, and afterwards more to the south-east in Moesia. The Roman arms were first turned against them and their neighbors, the Iapydes, by Augustus in 35 B.C., and after the conquest of Segestica or

Siscia (Siszek) he subdued them. An insurrection took place in 12 B.C., which Tiberius crushed after a long struggle; and a more formidable one of the Dalmatians and Pannonians together in 6 A.D., which was suppressed by Tiberius and Germanicus, but not till 8 A.D.

Fifteen legions had to be assembled against the Pannonians, who mustered 200,000 warriors. Hereupon the Pannonians settled in the more northern countries, which received their name, and of which the former inhabitants, the Celtic Boii, had been in great part destroyed in Cæsar's time. The country was now formed into a Roman province, which was secured against the inroads of the Marcomanni and Quadi by the Danube, and on its other frontiers had a line of fortresses. Military roads were constructed by the conquerors, who also planted in the country many colonies and municipia, and thus gave it a rough coating of civilization. Great numbers of the Pannonian youth were drafted into the Roman legions, and proved, when disciplined, among the bravest and most effective soldiers in the imperial army. P. was subsequently divided into Upper (or Western) and Lower (or Eastern) P., and under Galerius and Constantine underwent other changes. Upper Pannonia was the scene of the Marcomannic war in the 2d century. In the 5th c. it was transferred from the Western to the Eastern Empire, and afterwards given up to the Huns. After Attila's death, in 453, the Ostrogoths obtained possession of it. The Longobards under Alboin made themselves masters of it in 527, and relinquished it to the Avari upon commencing their expedition to Italy. Slavonian tribes also settled in the south. Charlemagne brought it under his sceptre. In the reigns of his successors, the Slavonians spread northward, and the country became a part of the great Moravian kingdom, till the Magyars or Hungarians took it in the end of the 9th century. In the time of the Romans, Siscia (Siszek), Vindobona (Vienna), Carnuntum (near Haimburg), and Arrabo (Raab) were among its principal towns.

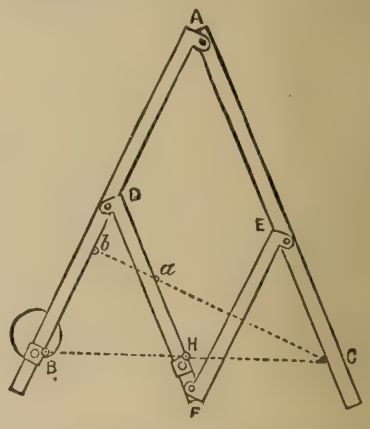
PANORA'MA (Gr. *pan*, all, *orama*, a view), a pictorial representation of the whole surrounding landscape as seen from one point. The invention of the panorama is claimed by the Germans for Professor Breisig of Danzig, but it does not appear that he ever constructed one. The real inventor was Mr. Barker, an ingenious artist of Edinburgh, to whom the idea occurred while taking a sketch of the city from the top of Arthur Seat. After surmounting numerous difficulties—one of which was the invention of a new kind of perspective for the horizontal lines—he succeeded in producing an effective panoramic view of Edinburgh, which was exhibited in that city in 1788, and in London in the following year. The next panorama executed by Barker was a view of London from the top of the Albion Mills. A large building was now erected in Leicester Square for the exhibition of such views. On Mr. Barker's death in 1806, he was succeeded by his son, in partnership with a pupil, Mr. Burford, the painter of the chief modern panoramas. The first step in the construction of a panorama is to obtain sketches of the entire region to be represented; each sketch is a representation of a portion of the landscape in the form of a sector of a circle, with the sketcher's position as a center, and the horizon for circumference. The canvas to which the sketches are to be transferred is hung round the sides of a circular room, and forms the surface of a cylinder, on the inside of which the panorama is painted. The canvas, brushes, &c., are of the finest description manufactured, and the painting and coloring are elaborated in the most careful manner, in order to render the optical illusion—which every one who has seen a good panorama must have experienced—as complete as possible.

The stage from which the picture is viewed is placed in the center of the room, about 30 feet on every side from the picture; the picture itself is fastened above to a strong circular hoop, and, hanging down, has its lower edge fastened to a similar hoop, which is heavily weighted te keep the picture steady. The light is admitted by an aperture in the roof, which is concealed by an awning from the spectators on the stage. Notwithstanding important defects in the panorama, one of which is that the light more strongly illumines the upper than the lower parts of the picture—thus throwing the foreground comparatively into shade—many cases are on record of spectators being for the time completely under the influence of mental illusion. One of the best instances of this occurred during the exhibition of the third panorama in London. Part of the view consisted of a representation of the wreck of a ship's boat, with sailors struggling in the waves; and at sight of this, a dog belonging to one of the spectators at once leaped over the handrail to the rescue of the supposed drowning men. Panoramas, though frequently exhibited in France, Germany, and other European countries, have met with little success out of Great Britain. The most popular panorama ever executed was that of the Battle of Waterloo, the exhibition of which brought in ten thousand pounds. There are many modifications of the panorama, but that above described is the most important.

PANSLAVISM. This term is applied to the movement lately set on foot, and generally ascribed to Russian influence, for the amalgamation of all races of Slavonic descent into one body, having one language, one literature, and one social polity. The writings of Adam Gurowski and Kollar, and the anonymous pamphlet which appeared at Leipzig in 1837, under the title of *Die Europæische Pentarchie*, have exercised a very widespread influence in this direction among all the Slavonic people of the German states; and although the other nations of Europe have hitherto had no reason to anticipate any practical results from a movement towards Panslavism, the Slavonians of the Austrian empire have always taken occasion to show that they regarded themselves as standing apart from German interests in times of public disturbance. Thus, in 1848, instead of taking part with their fellow-citizens in the election of representatives to the German parliament at Frankfurt, the leading promoters of Panslavism summoned a Slavonic congress at Prague, which was attended by Slavonians from Bohemia, Moravia, and Silesia, and by Slavonic Poles, Croats, Servians, and Dalmatians, who appeared in their national costumes. The impracticability of the grand schemes promulgated in the manifestoes of the conclave, had been sufficiently shown ere the congress was interrupted by a democratic rebellion, which was suppressed with much bloodshed. Since 1860, when questions of nationality began to come more into the foreground, P. has exercised some direct influence on Austrian affairs: both northern and southern Slavs tending towards united action in opposition to the centralistic and dualistic aims of Germans and Magyars respectively. In 1867 a great Slavonic congress was held at Moscow without result. Panslavistic tendencies contributed to the great changes that took place in 1877–78 in the Balkan peninsula.

PANSY. See VIOLET.

PA'NTAGRAPH (Gr. *panta*, all, *graphein*, to delineate), an instrument by the aid of which any engraving may be copied on paper, though its use is in practice restricted to the copying of maps and plans. The copy can be drawn to any scale. The instrument consists of four rods, AB, AC, DF, and EF, jointed together, as in the figure; the points D and E are so taken that AD is equal to EF, and AE to DF, and consequently ADEF is always a parallelogram. If C be a determinate point near the end of the rod AE, and any line, CHB, be drawn cutting the other three rods, the triangles BAC and BDH are similar; so that when the point B is fixed, the points C and H, which can from



the structure of the instrument, move in any direction, will describe similar figures different in size; that described by C being to that described by H in the proportion of CB to HC. The practical working of the instrument is as follows: The points H and B are determined by the ratio BH to BC, which is the proportion the scale of the copy bears to that of the original; a socket, which slides along the arm, is fastened exactly at B on the under side; below this is placed a heavy weight, with a stalk fitting into the socket, thus rendering B the center of motion of the instrument, if the weight be heavy enough. A pencil is fitted into another socket at H, and a rod of metal with a sharp point, called the *tracer*, is fastened at C, and the instrument is fitted with castors at various points underneath, to allow of its being moved freely. The operator then passes the tracer over the outline to be copied, and simultaneously the pencil at H makes the copy on the required scale. If a copy on a scale nearly as large as the original be required, the fulcrum must be placed in DF, and the pencil in DB; while if a magnified copy be required, the pencil and tracer must exchange the positions assigned them in the first case. The defects of this instrument are its weight and the difficulty of rendering it perfectly mobile, both of which prevent that steady motion of the tracer which is necessary for making an accurate copy.

To remedy these defects, the pantagraph has been constructed

in a variety of forms, all of which, however, like the one described, depend upon the principle that the two triangles which have for their angular points, the fulcrum the pencil-point and a joint, and the fulcrum the tracer-point and a joint, must always preserve their similarity.

PANTELLA'RIA, a volcanic island in the Mediterranean, 36 miles in circumference, and lying 60 miles S. W. of the Sicilian coast. The chief products are wine, oil, cotton and fruit.

PANTHAYS, a Mohammedan community occupying the province of Yun-nan in the south-west of China, who asserted their independence in 1855. In 1859 they captured Talifoo, the second city of the province, and in 1858, the capital. Their leader Wensoai (King Suleiman) established his authority over about 4,000,000 of people, of whom not above a tenth were Mohammedans. In 1866 the Chinese government recognized the independence of the P., and in 1872 their king sent his son Hassan on a mission to Europe. Meanwhile the Chinese again attacked the P., defeated them utterly, and finally suppressed their empire. P. is an anglicised form of *Pan-si*, the name by which the Mohammedans called themselves.

PA'NTHEISM (Gr. *pan*, all, and *theos*, God), the name given to that system of speculation which, in its spiritual form, identifies the universe with God (*akosmism*), and in its more material form, God with the universe. It is only the latter kind of pantheism that is logically open to the accusation of Atheism (q. v.); the former has often been the expression of a profound religiosity. The antiquity of pantheism is undoubtedly great, for it is prevalent in the oldest known civilization in the world—the Hindu. Yet it is a later development of thought than Polytheism (q. v.), the natural instinctive creed of primitive races, and most probably originated in the attempt to divest the popular system of its grosser features, and to give it a form that would satisfy the requirements of philosophical speculation. Hindu pantheism as *akosmism* is taught especially by the Upanishads (q. v.), the Vedânta (q. v.), and Yoga (q. v.) philosophies, and by those poetical works which embody the doctrines of these systems; for instance, the Bhagavadgîtâ, which follows the Yoga doctrine. It is poetical and religious, rather than scientific, at least in its phraseology; but it is substantially similar to the more logical forms developed in Europe. The Hindu thinker regards man as born into a world of illusions and entanglements, from which his great aim should be to deliver himself. Neither sense, nor reason, however, is capable of helping him; only through long continued, rigorous, and holy contemplation of the supreme unity (Brahma) can he become emancipated from the deceptive influence of phenomena, and fit to apprehend that he and they are alike but evanescent modes of existence assumed by that infinite, eternal, and unchangeable Spirit who is all in all. Hindu pantheism is thus purely spiritual in its character; matter and (finite) mind are both alike absorbed in the fathomless abyss of illimitable and absolute being.

Greek pantheism, though it doubtless originated in the same way as that of India, is at once more varied in its form, and more ratiocinative in its method of exposition. The philosophy of Anaximander (q. v.) the Milesian may almost, with equal accuracy, be described as a system of atheistic physics or of materialistic pantheism. Its leading idea is, that from the infinite or indeterminate (*to apeiron*), which is 'one yet all,' proceed the entire phenomena of the universe, and to it they return. Xenophanes (q. v.), however, the founder of the Eleatic school, and author of the famous metaphysical *mot, Ex nihilo, nihil fit*, is the first classical thinker who promulgated the higher or idealistic form of pantheism. Denying the possibility of creation, he argued that there exists only an eternal, infinite One or All, of which individual objects and existences are merely illusory modes of representation; but as Aristotle finely expresses it—and it is this last conception which gives to the pantheism of Xenophanes its distinctive character 'casting his eyes wistfully upon the whole heaven, he pronounced that unity to be *God*.' Heracleitus (q. v.), who flourished a century later, reverted to the material pantheism of the Ionic school, and appears to have held that the 'All' first arrives at consciousness in man, whereas Xenophanes attributed to the same universal entity, intelligence, and self-existence, denying it only personality. But it is often extremely difficult, if not impossible, to draw or to see the distinction between the pantheism of the earlier Greek philosophers and sheer atheism. In general, however, we may affirm that the pantheism of the Eleatic school was penetrated by a religious sentiment, and tended to absorb the world in God, while that of the Ionic school was thoroughly materialistic, tended to absorb God in the world, and differed from atheism rather in name than in fact. But the most decided and the most spiritual representatives of this philosophy among the Greeks were the so-called 'Alexandrian' *Neo-platonists* (q. v.), in whom we see clearly, for the first time, the influence of the East upon Greek thought.

The doctrines of Emanation, of Ecstasy, expounded by Plotinus (q. v.) and Proclus (q. v.), no less than the fantastic Dæmonism of Iamblichus (q. v.), point to Persia and India as their birthplace, and in fact differ from the mystic teaching of the Vedanta only by being presented in a more logical and intelligible form, and divested of the peculiar mythological allusions in which the philosophy of the latter is sometimes dressed up.

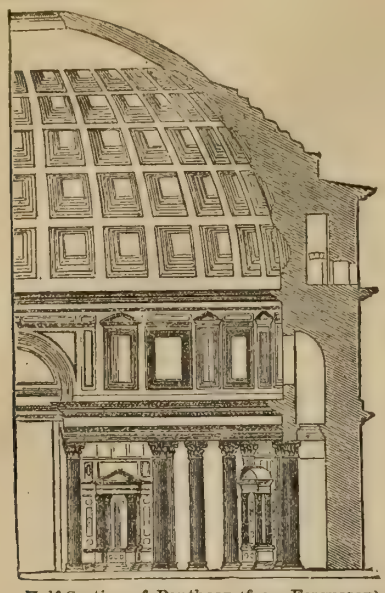
During the middle ages, speculation was, for the most part, held in with tight reins by the church, and in consequence we hear little of pantheism. Almost the only philosopher who advocated, or who even seems to have thought about it, is John Scotus Erigena (see ERIGENA), who was probably led to it by his study of the Alexandrians, but his speculations do not appear to have been thought by him incompatible with a Christian faith; and in point of fact there are several profoundly mystical expressions employed in the new Testament, especially in the Epistles of John, in which the soaring spiritualism of Christianity culminates in language that has at least a pantheistic form; e. g., 'God is love; and he that dwelleth in love dwelleth in God, and God in him.' Erigena is regarded as the link that unites ancient and modern pantheism. We find in him now a reflection of the East and of Greece, and now a foreshadowing of the doctrines of Schelling and Hegel. His opinions were, with some scholastic modifications, introduced, in the 12th and 13th centuries, into theology by Amalric or Amaury de Chartres (a disciple also of Abelard), and his pupil David de Dinant, who were condemned as heretics by a council held at Paris.

Modern pantheism first shows itself in Giordano Bruno (q. v.), burned at Rome for his opinions in 1600. In Bruno reappear the speculations of the Eleatics and the Neo-Platonists, but with a still more definite recognition than we meet with in them of an absolutely perfect supreme spirit. The universe, in the eyes of the unfortunate Italian, is not, properly speaking, a creation, but only an emanation of the Infinite mind—the eternal expression of its infinite activity; and hence the Infinite mind penetrates and fills, with different degrees of consciousness, all the heights and depths of the universe. To see God everywhere, to realize that He alone is, and that all else is but a perishable phenomenon or passing illusion—that there is but *one* intelligence in God, man, beast, and what we call matter—this should be the aim of all true philosophy. Spinoza (q. v.) comes next among pantheists in the order of time, but he is perhaps the greatest, certainly the most rigorous and precise of the whole class that either the ancient or the modern world has seen. His system is based, like the geometry of Euclid, on certain definitions and axioms, and he claims to have given it as conclusive and mathematical a demonstration as the latter. None will deny the keenness and cogency of his ratiocination. But human beings will not be forced into pantheistic convictions by any mere logical goad, however sharp; and the system, impregnable as it seems, has never had a formal adherent. The principal result at which, after a long, firm-linked chain of reasoning, Spinoza arrives, is, that there is but one substance, infinite, self-existent, eternal, necessary, simple, and indivisible, of which all else are but the modes. This substance is the self-existent God.

To call Spinoza an atheist is ridiculous. The extravagant phrase of Schleiermacher, 'a God-intoxicated man' (*'ein gott-trunkener mann*), would be greatly nearer the truth, for no human system of philosophy whatever exhibits such an all-controlling and even overwhelming sense of the omnipresent God. Many critics have said that he was far more of an old Hebrew in his system than he dreamed. Although he had no direct followers, he exercised great influence on the development of metaphysical speculation in Germany, where, with the exception of Kant (q. v.), the three greatest philosophers of recent times—Fichte (q. v.), Schelling (q. v.), and Hegel (q. v.)—have all promulgated systems of a thoroughly pantheistic and ideal character. Neither England, France, nor America has produced a single great pantheistic philosopher (unless Mr. Emerson be regarded as such); but there is an immense amount of pantheistic sentiment floating about in the poetry, criticism, theology, and even in the speculative thinking, in these and all European countries in the present age. This is attributable to the ravages made by biblical criticism, and the progress of the physical sciences in the region of religious beliefs. Multitudes of men are puzzled what to think and what to believe. They do not like to face the fact that they have actually lost faith in revelation, and are no longer relying for help and guidance on the Spirit of God, but on the laws of nature; so they take refuge from the abhorred aspect of the naked truth that they are 'atheists' in a cloud of rose-colored poetical phrases, which, if they mean anything, mean pantheism.

PANTHE'ON, a Greek or Roman temple dedicated to all the gods. The 'Pantheon' of Rome, now the church of Santa Maria Rotonda, is the only ancient edifice in Rome that has been per-

fectly preserved. The P. is lighted through one aperture in the center of its magnificent dome. It was erected by Agrippa, son-in-law of Augustus, 27 B.C.



Half Section of Pantheon (from Fergusson).

PANTHER (*Felis pardus*), one of the largest *Felidæ*, now supposed to be identical with the Leopard (q. v.), or a mere variety of it, differing only in its larger size and deeper color. Cuvier



American Panther or Puma (*Felis concolor*).

distinguishes the P. from the leopard, but without stating any characters other than those of color. The name P. (vulg. 'Painter') is given to the Puma (q. v.) in America.

PANTHER, in Heraldry, is borne gardant, and incensed, i. e., with fire issuing from his mouth and ears.

PA'NTOMIME, among the ancient Romans, denoted not a spectacle but a person. The pantomimes were a class of actors who (as the name implies) acted not by speaking, but wholly by mimicry—gesture, movements, and posturings—corresponding therefore pretty closely to the modern ballet-dancers. When they first made their appearance in Rome cannot be ascertained; probably the *histriones* (Etrusc. *hister*, a dancer) brought from Etruria to Rome 364 B. C. were pantomimes; but the name does not once occur during the republic, though it is common enough from the very dawn of the empire. Augustus showed great favor to this class of performers, and is consequently supposed by some writers to have been himself the inventor of the art of dumb acting. The most celebrated pantomimes of the Augustan age were Bathyllus (a freedman of Mæcenas), Pylades, and Hylas. The class soon spread over all Italy and the provinces, and became so popular with the Roman nobles and knights (who used to invite male and female performers to their houses to entertain their guests), that Tiberius reckoned it necessary to administer a check to their vanity, by issuing a decree forbidding the aristocracy to frequent their houses, or to be seen walking with them in the streets. Under Caligula they were again received into the imperial favor; and Nero, who carried every unworthy weakness and vice to the extremity of caricature, himself acted as a pantomime. From this period they enjoyed uninterrupted popularity as long as paganism held sway in the empire.

As the pantomimes wore masks, no facial mimicry was possible; everything depended on the movements of the body. It was the hands and fingers chiefly that spoke; hence the expressions, *manus, loquacissimæ, digiti clamosi*, &c. To such perfection was this art carried, that it is said the pantomimes could give a finer and more precise expression to passion and action than the poets themselves. The subjects thus represented in dumb show were always mythological, and consequently pretty well known to the spectators. The dress of the actors was made to reveal, and not to conceal the beauties of their person; and as, after the 2d c., women began to appear in public as pantomimes, the effect, as may easily be supposed, of the æsthetical costume was injurious to morality. Sometimes these pantomimic actresses even appeared quite naked before an audience—a thing which could never have happened had the Roman communities not become thoroughly base, sensual, and impure. It was quite natural, therefore, that pantomimic exhibitions should have been denounced by the early Christian writers, as they even were by pagan moralists like Juvenal.

Under HARLEQUIN is described the character of the modern pantomimes, which word denotes not the performers, but the pieces performed. A few additional facts are here given to complete that notice. The Christmas Pantomime, or Harlequinade, is, in its present shape, essentially a British entertainment, and was first introduced into this country by a dancing-master of Shrewsbury named Weaver, in 1702. One of his pantomimes entitled *The Loves of Mars and Venus*, met with great success. The arrival, in the year 1717, in London of a troupe of French pantomimists with performing dogs gave an impetus to this kind of drama, which was further developed in 1758 by the arrival of the Grimaldi family, the head of which was a posture-master and dentist.

Under the auspices of this family, the art of producing pantomimes was greatly cultivated, and the entertainment much relished. Joseph Grimaldi, the son of the dentist, was clever at inventing tricks and devising machinery, and *Mother Goose*, and others of his harlequinades, had an extended run. At that time the wit of the clown was the great feature; but by and by, as good clowns became scarce, other adjuncts were supplied, such as panoramas or dioramic views; and now the chief reliance of the manager is on scenic effects, large sums of money being lavished on the *mise en scene*. This is particularly the case as regards the transformation scene—i. e., the scene where the characters are changed into clown, harlequin, &c.—as much as £1000 being frequently spent on this one effort. In London alone, a sum of about £40,000 is annually expended at Christmas time on pantomimes. The *King of the Peacocks*, a pantomime produced at the London Lyceum Theatre during the management of Madame Vestris, cost upwards of £3000. Even provincial theaters, such as those of Manchester or Edinburgh, consider it right to go to considerable expense in the production of their Christmas pantomime.

PA'OLI, PASCAL, a famous Corsican patriot, was born in 1726, at Morosaglia, in Corsica. His father, having taken a leading part in the unsuccessful insurrection of the islanders against the Genoese and their French allies, was obliged to retire to Naples in 1739, taking his son with him. Here P. received an excellent education. In July 1755, he was summoned by the supreme magistracy to Corsica, and was elected captain-general of the island, and the chief of a democratic government, possessing all the power of a king, but without the title. He energetically and successfully applied himself to the reformation of the barbarous laws and customs of the island, and at the same time to the expulsion of the Genoese, who, notwithstanding the aid they received from an influential section of the islanders, were deprived of nearly all their strongholds, their fleet was defeated, and they were finally obliged to seek help from France.

After the withdrawal of the French troops, they were again speedily deprived of the places they had recaptured, and in 1768 they ceded the island to France. P. refused all the advantageous offers by which the French government sought to bribe him, as he had before refused those of the Genoese, and continued to struggle for the independence of his country, but he was signally defeated by the Comte de Vaux, at the head of the French troops, and the French became masters of the island. After one year's struggle, P. was compelled to take refuge on board of a British frigate, in which he sailed for England, where he was treated with general sympathy. Twenty years afterwards, the French revolution of 1789 recalled him to Corsica, and as a zealous republican he entered into the schemes of the revolutionary party; but during the anarchy of France in 1792—1793, he conceived a scheme for making Corsica an independent republic. Until this time he had been on the best terms with the Bonaparte family, but they now joined the Jacobin party whilst he allied himself with Britain, favored the landing of 2000 British troops in the island in 1794, and joined them in driving out the French. He then surrendered the island to George III., but becoming dissatisfied with the government, he quarrelled with the British viceroy, whilst many

of his countrymen were displeased with the course he had adopted in allying himself with the British. He therefore retired from the island in 1796, and spent the remainder of his life in the neighborhood of London. P. died near London, February 5, 1807.

PA'PA, a large market town in the west of Hungary, stands in a beautiful district on the Tapolcza, an affluent of the Marczal, 60 miles south-south-east of Presburg. It contains a stately castle, with a beautiful garden, handsome Catholic and Lutheran churches, a Catholic gymnasium, Reformed college, and an hospital. Stoneware, cloth, and pipes are manufactured, and a trade in wine is carried on. Pop. (1869) 14,223.

PAPA, the Latin form of the title now, in the Western Church, given exclusively to the Bishop of Rome. Originally, however, meaning simply 'father,' it was given indiscriminately to all bishops. Tertullian (*De Pudicitia*, cxiii.) so employs it. Dionysius, a priest of Alexandria, calls his bishop Papa Heraclias. St. Cyprian, in the letters of his clergy, is addressed *Beatissimo Papæ Cypriano*. The same form is employed towards him by the clergy of Rome itself. Even Arius so addresses his own bishop Alexander. In the next century, St. Jerome addresses the same title to Athanasius, to Epiphanius, and most of all to Augustine. Indeed it would appear certain that down to the time of Gregory of Tours it was used not uncommonly of bishops in the Western Church. And there are evidences of its being occasionally applied to the inferior clergy, for whom, however, some adjunct was employed, in order to distinguish them from bishops. Thus, we sometimes read of *papæ pisinni*, minor popes; and the tonsure was called by the name *papa letra*. In the Greek Church, as is well known, whether in Greece Proper or in Russia, papa is the common appellation of the clergy. The circumstance of its having been originally of general application, is acknowledged by all learned Roman Catholic controversialists and historians.

PA'PACY. See POPES.

PAPAL STATES (Italian, STATI DELLA CHIESA, or STATI PONTIFICI), a territory or rather group of states in Central Italy, formerly united into one sovereignty, with the pope for its head. It was of an irregular form, resembling the letter Z, the upper portion lying to the east of the Appennines, the lower to the west of that range, these two being connected by a third strip, which crossed the peninsula from east to west. The P. S. were bounded on the N. by the Po, on the S. by Naples, on the E. by the Gulf of Venice and Naples, and on the W. by Modena, Tuscany, and the Tyrrhenian Sea. Detached portions, as Benevento and Pontecorvo, lay within the Neapolitan territory. The country is traversed by the Apennines, which attain their highest elevation in the Monte della Sibilla, which is about 7402 feet above sea-level. Owing to this range, which traverses the peninsula in the direction of its length, lying so much nearer the east than the west coast, the streams to the east of it have a short course and little volume, being, in fact, mere mountain torrents; while on the west side a few of the rivers are of considerable size. Of the latter, the Tiber (q. v.) is the largest. The eastern coast is bold and rugged, and destitute of proper harbors, that of Ancona alone excepted; towards the north, at the mouth of the Po, it gradually subsides into a low, level, marshy tract, with numerous lagunes. The country west of the Apennines is traversed by ranges of hills parallel to them, and gradually decreasing in elevation as they approach the sea. The coast itself is almost wholly flat, sandy, or marshy, with no deep bays and few good harbors besides Civita Vecchia. There are numerous small lakes, principally in the northern portion of the country, the chief of which are Lake Bolsena, Lake Perugia, and Lake Bracciano, the last an old crater, situated almost 1000 feet above sea-level.

The country was divided for administrative purposes into 20 districts, as follows: 1 Comarca, including Rome and the Agro Romano; 6 Legations, Bologna, Ferrara, Forli, Ravenna, Urbino, Velletri; and 13 Delegations, Ancona, Ascoli, Benevento, Camerino, Civita Vecchia, Fermo, Frosinone, Macerata, Orvieto, Perugia, Spoleto, Rieti, Viterbo; with a total area of 15,774 English square miles, and a population of above 3,000,000. The Legations of Bologna, Ferrara, Forli, and Ravenna constituted the *Romagna;* Spoleto and Perugia were known as *Umbria;* and Ancona, Fermo, Macerata, and Ascoli constituted the *March of Ancona*. The inhabitants, with the exception of 16,000 Jews, were of Italian race, and of the Roman Catholic religion. The only provinces which latterly remained under the papal rule were, Rome with the Comarca, the legation of Velletri, and the delegations of Civita Vecchia, Frosinone (excepting Pontecorvo), and Viterbo, with a total area of 4493 English square miles, and a population of about 700,000. The chief cities and towns in the territory were Rome (the capital), Viterbo, Velletri, Alatri, and Civita Vecchia.

Climate and products.—The climate of the P. S. is one of the finest in the world, and the heat of summer is tempered by the mild and cooling sea-breezes; but in the flats south of the Po and in the Campagna of Rome, the noxious atmosphere produced by the exhalations from the marshes is most destructive of human life. Fever and ague are very prevalent among the inhabitants of the neighboring districts, and notwithstanding the attempts to remedy the deadly influence of the marshes by drainage and cultivation, it has hitherto been undiminished (see MAREMMA). Violent siroccos are occasionally experienced on the west coast. The northern portion, from its elevation, is exposed to severe cold during winter. The soil of the P. S. is in general extremely fertile; but the higher mountain districts are either quite barren, or only adapted for pasture; and not more than one-third of the whole surface is under cultivation.

The practice of agriculture is in its most primitive state, notwithstanding the fact that agriculture, as a science, originated here, and was practised for many centuries before it was introduced into the other countries of Europe; but the many political changes and revolutions which have convulsed the country, have acted as a bar to all enterprise. It must, however, be mentioned, that the present pope has, by salutary enactments, and by the establishment of agricultural societies, done much for the improvement of this branch of industry. The products are similar to those of the rest of Italy. The manufactures are comparatively unimportant—silks, woollens, and leather are the chief; but plate-glass, rope, sailcloth, cotton goods, paper, artificial flowers, wax-candles, soap, stoneware, &c., are also manufactured in various places. The fisheries are important. The chief minerals are alum, vitriol, saltpetre, sulphur, coal, rock-salt, marble, and alabaster.

Many of the manufactured goods, and wine, olive oil, wool, hemp, tobacco, bread-stuffs, catgut, &c., were exported, the total exports amounting to about £2,600,000, while the imports reached nearly £14,000,000 The statistics were latterly very unreliable, but the fact that the P. S. are now no more, renders details of trade under pontifical rule a matter of little importance. Indeed, no information on such topics were issued under the latest years of the political power of the pope.

Government.—The pope possessed absolute and unlimited power, but the members of the college of cardinals, who elected him, generally kept the chief offices of state in their own hands, and assisted the pope in the government of his states, as well as in the affairs of the church. The secretary of state was at the head of of political affairs, and was nominated by the pope. He presided over both the ministerial council and the council of state. The former council, which consisted of five or more ministers, heads of departments, selected by the pope, had a voice in legislation, and also the right of authoritative interpretation of the laws; the latter, which consisted of thirteen members, also nominated by the pope, had, in matters of legislation and finance only the right of giving advice; but it settled any question of competency that might arise between the various branches of the administration. After 1850, there was also a separate *finanz-consulta* for the regulation of financial affairs. The Comarca, which was more directly under the central government, was ruled by a cardinal president; the Legation was ruled by a cardinal-legate, aided by a provincial chamber of deputies. There were civil and criminal courts in all the provinces, minor courts in the communes, with courts of appeal in all the chief cities, and a central tribunal at Rome. All the proceedings of these courts were public, except trials for political offences.

The papal army, which formerly amounted to 20,000 men, in June 1863, numbered only 8513 men, infantry, cavalry, artillery, &c. included, and a considerable portion of the papal territory was garrisoned by French troops, without whose aid the pope's power could not have been maintained.

The income and expenditure for 1859, the last year of the entirety of the P. S., were respectively 14,453,325 scudi (£3,126,028), and 15,019,346 scudi (£3,248,038); but the three succeeding years showed a widely different result; the expenses being largely increased by the cost of the war, while from the rebellious provinces scarcely any taxes were collected. The income and expenditure for these three years were nearly as follows:

	Expenditure.	Income.
1860	£4,720,809	£1,716,658
1861	4,291,644	1,716,658
1862	2,145,822	1,072,911

The finances continued in the same deplorable condition, and the national debt amounted to about £17,000,000. The tax known as 'Peter's pence,' which was collected from all the Roman Catholic countries, had produced at the beginning of 1863 about £1,080,000.

History.—During the rule of the Goths and Lombards in Italy, the inhabitants of Rome and all who desired to live free from the barbarian yoke, feeling that the Greek empire was incapable of protecting them, and at the same time observing the pertinacity and energy with which the pope asserted the importance and dignity of Rome, naturally looked up to him as in some sort a protector; and it is to the gradual growth and spread of this feeling that the important position subsequently taken by the popes as authorities in temporal matters is chiefly due. About 720 A.D.,

Gregory III., having quarrelled with the Emperor Leo the Isaurian, declared the independence of Rome. In 726, Pepin le Bref compelled the Lombard king to hand over Ravenna, Rimini, Pesaro, Fano, Cesena, Urbino, Forli, Comacchio, and fifteen other towns, to the pope, who now assumed the state of a temporal sovereign. Pepin's example was followed by his son Charlemagne; but, notwithstanding, the pope's sovereignty was more nominal than real, as the towns were not in his possession, and he only obtained a small share of their revenues. In the 11th c., the Normans greatly aided to increase the papal temporal authority, and in 1053 the duchy of Benevento was annexed.

In 1102, the Countess Matilda of Tuscany left to the pope her fiefs of Parma, Mantua, Modena, and Tuscany; but these were immediately seized by the German emperor, and of this magnificent bequest only a few estates came into the pope's hands. Between this period and the end of the 13th c., the popes succeeded, often by unscrupulous means, in obtaining from many of the free towns of Italy an acknowledgment of the superiority of the Roman see over them; and in 1278 the Emperor Rodolf I. confirmed the popes in the acquisitions thus obtained, defined authoritatively the boundaries of the P. S., and acknowledged the pope's exclusive authority over them, by absolving their inhabitants from their oath of allegiance to the empire. The P. S. at this time included Perugia, Bologna, Bertinoro, the Duchy of Spoleto, the Exarchy of Ravenna, and the March of Ancona; but many of the towns were either republics or hereditary principalities, and in none did the pope possess real authority. Sixtus IV., in the end of the 15th c., managed to annex the Romagna to his dominions; in effecting which he is accused of having employed intrigue, perjury, and murder. His successors, Alexander VI. and Julius II., increased the P. S. by the addition of Pesaro, Rimini, Faenza, Parma, Placentia, and Reggio. By the victory of the French at Marignan (1515), the very existence of the papal power was threatened; but the able policy of Leo X. averted the threatened danger. In 1545, Paul III. alienated Parma and Placentia, and erected them into a duchy for his son, Pietro Luigi Farnese; but this loss was partly made up by the acquisitions of Gregory XIII. In 1598, the possessions of the House of Este, viz., Ferrara, Comacchio, and a part of the Romagna, were seized by Pope Clement VIII.; and the P. S. received their final additions in Urbino (1623), Ronciglione, and the duchy of Castro (1650). The Romagna was seized by Napoleon in 1797, and incorporated in the Cisalpine Republic; and in the following year, Rome was taken by the French, and the P. S. erected into the *Roman Republic*.

Pius VII., in 1800, obtained possession of his states, but they were almost immediately retaken by the French, and finally (1809) incorporated with France, Rome being reckoned the second city of the empire. In 1814, the pope returned to his dominions, and was formally reinstated by the treaty of Vienna, mainly through the exertions of the *non-Roman Catholic* powers, Russia, Prussia, and Britain; but the clerical misgovernment contrasted so strongly with the liberal administration of France, that in 1830 the people of Ancona and Bologna rose in rebellion. They were put down by the aid of an Austrian army, but the abuses in the administration were so flagrant, that even Austria urged the necessity for reform. Her remonstrances, however, were not attended to, and the Bolognese again rebelled. This second revolt supplied Austria with a pretext for occupying the northern Legations, and the French at the same time garrisoned Ancona. Occasional risings took place from time to time up to 1846, when Pope Pius IX. assumed the tiara, and burst upon the astonished world in the new character of a reforming pope. His projects were of a most liberal character, and were put in force with great energy, despite the opposition of Austria; but, alarmed at the spread of revolution in Europe during 1848, he halted in his career, just at the critical moment when to halt was to be lost. The people rose, and Pius IX. fled to Gaeta, whilst Rome was proclaimed a republic. He was restored, and his subjects reduced to submission by the arms of France, Austria, Naples, and Spain.

The Austrians held the Legations in subjection to the pope's authority till 1859; and the French occupied Rome in his behalf for ten years more. In July 1859, the four northern legations (the Romagna), taking advantage of the withdrawal of the Austrian troops, quietly threw off the papal authority, and proclaimed their annexation to Sardinia, which was formally acknowledged by Victor Emmanuel in March 1860. The pope now raised a large body of troops, appointing Lamoricière, an eminent French general, to command them, for the purpose of resisting any further encroachments on his dominions; but the news of Garibaldi's success in Sicily and Naples produced revolt in the Legation of Urbino and in the Marches, the people proclaiming Victor Emmanuel. The Sardinians accordingly marched into the P. S., defeated Lamoricière in two encounters and finally compelled him to retire into Ancona, where, after a siege of seven days, he was compelled to surrender with his whole army. The revolted provinces of Umbria, Urbino, and the Marches were immediately annexed to Sardinia; and the isolated provinces of Benevento and Pontecorvo (a part of Frosinone), which were situated within the kingdom of Naples, shared the same fate. In October 1870, the French having withdrawn, the remnant of the P. S. voted for annexation to the kingdom of Italy.

PAPAVERA'CEÆ, a natural order of exogenous plants, herbaceous or half shrubby, usually with a milky or colored juice. The leaves are alternate, without stipules; the flowers on long one-flowered stalks. The fruit is pod-shaped or capsular; the seeds numerous. The order is distinguished for narcotic properties. Opium (q. v.) is its most important product. The juice of Celandine (q. v.) is very acrid. A number of species are used in their native countries for medicinal purposes. The seeds yield fixed oil, which, with the exception of that obtained from *Argemone Mexicana*, is quite bland. See POPPY. The flowers of many species are large and showy, most frequently white or yellow, sometimes red. Several kinds of Poppy and Eschscholtzia are frequent in our gardens. There are in all about 130 known species, natives of all quarters of the world, and of tropical and temperate climates, but they abound most of all in Europe.

PAPAW' (*Carica Papaya*), a South American tree of the natural order *Papayaceæ*—of which order about 30 species are known—which has now been introduced into many tropical and subtropical countries. It grows to the height of 15—30 feet, with leaves only at the top, where also the fruit grows close to the stem. The leaves are 20—30 inches long. The fruit is of a green color, very similar in appearance to a small melon, and with a somewhat similar flavor. It is eaten either raw or boiled. The seeds are round



Papaw Tree (*Carica Papaya*).

and black, and when chewed, have in a high degree the pungency of cresses. The powdered seeds and the juice of the unripe fruit are most powerful anthelmintics. A constituent of this juice is *Fibrine*, otherwise unknown in the vegetable kingdom, except in the Fungi. The milky juice of the tree is very acrid. The leaves are used by negroes instead of soap to wash linen. The juice of the fruit and the sap of the tree have the singular property of rendering the toughest meat tender in a short time. Even the exhalations from the tree have this property; and joints of meat, fowls, &c., are hung among its branches to prepare them for the table. It is a tree of extremely rapid growth, bears fruit all the year, and is exceedingly prolific. The fruit is often cooked in various ways.—The *Chamburu* (*C. digitata*), another species of the same genus, a native of Brazil, is remarkable for the extremely acrid and poisonous character of its juice, and the disgusting stercoraceous odor of its flowers.—In the middle and southern states of America the name P. is given to the *Uvaria* (or *Asimina*) *triloba*, a small tree of the natural order *Anonaceæ*, the fruit of which, a large oval berry, three inches long, is eaten by negroes, but not generally relished by others. All parts of the plant have a rank smell.

PA'PENBURG, a small town of Hanover, in the bailiwick of Osnabrück, on a canal navigable for sea-going vessels, 27 miles south-south-east of Emden, on Dollart Bay, by the Emden and Hanover Railway. It originated in a small colony which sprung up here, and was supported principally by peat-cutting, an employment for which the fens and moors of the vicinity afford abundant facilities. The town is cleanly built, after the Dutch model; its houses stretch along the canal banks. It possessed, in 1881, about 190 ships, and carries on manufactures of sail-cloth and ropes. Its commerce is considerable. Pop. (1880) 6736.

PAPER. This well-known fabric is usually composed of vegetable fibres minutely divided and recombined in thin sheets, either by simple drying in contact, or with the addition of size or some other adhesive material. Probably the earliest use of paper was for the purpose of writing upon, and its earliest form was the Papyrus (q. v.) of the Egyptians. The stems of the papyrus plant, which are often eight or ten feet long, are soft and green, externally like the common rush; and the interior consists of a compact cellular tissue or pith. At the bottom of each stem the portion immersed in the mud and water is whiter and more compact; and under the outer skin a number of thin pellicles lie one above the other. These were removed, and laid side by side with their edges overlapping each other, and crosswise upon these was placed one or more similar layers, until the sheet was sufficiently thick; pressure was then applied for a time, and afterwards the sheet was dried in the sun. The width of such sheets, of course, depended upon the length of the portion of papyrus stems taken; but they could be made any length by joining a number of the squares end to end by glue or any other adhesive material. The *scapus*, or roll, usually consisted of about 20 of them.

Owing to the fact that the various layers of the papyrus decrease in thickness as they are nearer to the center of the stem, the makers were enabled to produce papers of different qualities; and in the time of the Romans many varieties were known, which differed as to the quality of the material, and the size of the pieces of which the sheets were composed. The finest quality was made from the innermost layer of membrane, and was called *Hieratica*, or paper of the priests. This was made for the Egyptian priests, who interdicted its sale until covered with sacred writing. In this state it was, however, an article of trade, and the Romans found a means of removing the writing, and sold the palimpsest sheets in Rome under the name of *Augustus* paper, used as a Latin equivalent for its former Greek name of *hieratica*. It was, however, supposed by many that it was named after the Emperor Augustus, and in consequence a second quality was called after his wife, *Livinia;* and the original name of the first quality came in time to be applied to the third quality. The next quality was called *Amphitheatrica*, it is supposed, from its having been made in the vicinity of the Alexandrian amphitheater. This last, when imported to Rome, was partly remanufactured by Q. Remmius Fannius Palæmon, the schoolmaster and paper-maker, who, by a peculiar process of his own, reduced its thickness, and rendered it equal to the first quality, when it was sold under the name of *Fanniana*. There were other inferior qualities, of which one called *Emporetica* was used as shop-paper.

Pliny, from whom we get these very interesting particulars, tells us that all these kinds were manufactured in Egypt, and required the Nile water for their formation. He says, that 'when it is in a muddy state it has the peculiar qualities of glue, and the various kinds of paper are made on a table where they are moistened with this water. The leaves or sheets of membrane are laid upon it lengthwise, as long indeed as the papyrus will admit of, the jagged edges being cut off at either end; after which a cross layer is placed over; the same way, in fact, that hurdles are made. When this is done, the leaves are pressed together, and dried in the sun.' The idea of the adhesive quality of the Nile water is erroneous, but it is very probable the Egyptian manufacturers encouraged the error. It is obvious the whole merit consisted in using the membranes fresh, whilst their own natural gum was in proper condition to make them adhere together.

In India and China, the art of writing with a style or sharp point upon dried palm and other leaves, and also some kinds of bark, is common even at the present day, especially in Ceylon, where we find it common to employ the leaves of the talipot and other palms as paper. Perhaps it was from the employment of these materials, or it is even possible from watching the operations of the paper-making wasps and other insects, that the manufacture of larger pieces, by pulping the materials and spreading them out to a greater extent, was suggested. Whatever was the true origin of the art, it is now lost in the vista of time.

It is known that the Chinese were acquainted with the art of making paper from pulp artificially prepared as early as the commencement of the Christian era; and it is thought they used the bark of various trees, the soft parts of bamboo stems, and cotton. In the 7th c., the Arabians learned the art of making it of cotton from the Chinese, and the first manufactory was established, about 706 A.D., at Samarcand. From thence it was transplanted to Spain, where, under the Moors, paper was made not only of cotton, but it is thought also of hemp and flax. The exact time of the introduction of paper made of linen rags is very uncertain; but the best evidence is offered by the Arabian physician Abdollatiph, who writes, in an account of his visit to Egypt in the year 1200, 'that the cloth found in the catacombs, and used to envelop mummies, was made into garments, or sold to the scribes *to make paper for shopkeepers:*' and as there is no doubt that these mummy-cloths were linen, it proves that the use of this material is of no mean antiquity. Of the use of linen rags in Europe, the earliest proof is in the celebrated document found by Ichwandner in the monastery of Goss, in Upper Styria, which purports to be a mandate of Frederick II., emperor of the Romans, and is dated 1242. It is written on paper which has been proved to be made of linen. The practice of making a distinctive water-mark on the paper, by means of an impression on the fine sieve of threads or wires upon which the floating pulp is received (fig. 4), was also of very early date, as MSS. as old as the 13th c. bear it. But there is really no satisfactory information respecting the exact time or place of the introduction of paper-making into Europe; by some it is supposed that Spain was the first to receive the art, and that thence it spread to France and Holland, and afterwards to England. It is quite certain that England was a long time behind these countries. As a proof of this, we find that the first patent for paper-making was taken out in 1665, by one Charles Hildeyerd, but it was for 'The way and art of making blew paper used by sugar-bakers and others.'

The second was in 1675, by Eustace Barneby, for 'The art and skill of making all sorts of white paper for the use of writing and printing, being a new manufacture, and never practised in any way in any of our kingdomes or dominions.' This, then, was the first commencement of the making of writing and printing paper; but that it did not equal the manufactures of other countries is shown by the specification of another patent, taken out by John Briscoe in the year 1685, which is thus expressed: 'The true art and way for making English paper for writing, printing, and other uses, *both as good and as serviceable in all respects, and especially as white as any French or Dutch paper.*' As a general rule, it was the custom of paper-makers to employ linen rags for fine papers, but a great variety of other materials have been in use from its first introduction; for as early as 1680, Nathaniel Bladen took out a patent for 'An engine method and mill, whereby hemp, flax, lynnen, cotton, cordage, silke woollen, and all sorts of materials' might be made into paper and pasteboard; and from that time innumerable efforts have been made to prepare other materials than cotton and linen rags for the manufacture of paper. The following is a summary of the patents which have been taken out in Britain for making paper from various materials, with the dates, which will show to those engaged in this investigation in what directions the inquiry has been previously conducted. The arrangement is alphabetical, and consequently not in the order of dates.

Materials.	Names of Inventors, and Dates of Patents.
Aloe Fibre	Berry, 1838; D'Harcourt, 1838; Small, 1838; May, 1852; Burke, 1855.
Asbestos	Maniere, 1853.
Bagging or Sackiug	Stiff, 1853; Wheeler & Co., 1854; Rossiter & Co., 1854; Smith & Co., 1855.
Banana Fibre	Berry, 1838; Lilly, 1854; Jullion, 1855; Burke, 1855, Hook, 1857.
Barks of various kinds	Koops, 1800; Balmano, 1838; Nerot, 1846; Coupier, 1852; Johnson, 1855; Kelk, 1855; Lotteri, 1855; Niven, 1856; Broad, 1857; Hope & Co., 1857.
Bass or Bast	Ruck and Touche, 1856; Touche, 1857.
Bean-stalks, &c	D'Harcourt, 1838; Brooman, 1855.
Cane (Sugar)	Berry, 1838; Coupier, 1852; Johnson, 1855; Jullion, 1855; Ruck & Touche, 1856; Hook, 1857.
Cocoa-nut Fibre	Newton, 1852; Holt and Forster, 1854.
Cocoa nut Kernel	Diaper, 1854.
Clover	Coupland, 1854; Holt and Fraser, 1854; Plunkett, 1857.
Cotton	Bladen, 1682; Williams, 1833; Coupier, 1852; Crossley, 1854; Siblet, 1857.
Dung	Jones, 1805; Zander, 1839; Lloyd, 1852; Hill, 1854.
Esparto or Alfa	Routledge, 1856.
Flax	Bladen, 1682; Koops, 1800; Jones, 1805; Ball, 1817; Berry, 1838; Gibbs, 1833; De la Garde, 1825; Coupier, 1852; Collins, 1853; Pownal, 1852; Coupland, 1854; Broad, 1857.
Flax, New Zealand	Berry, 1838; Gibbs, 1833 and 1857; Gillman, 1854.
Fresh-water Weeds	Archer, 1855.
Fur	Williams, 1833.
Grasses	Stiff, 1853; Evans, 1854; Clift, 1854; Coupland, 1854; Jeyes, 1854; Crossley, 1854; Jackson, 1854; Johnson, 1855; Fraser, 1855; Gilbee, 1855; Holt and Fraser, 1854; Pariset, 1856.
Gutta-percha	Hancock, 1846.
Hair	Williams, 1833.
Hay	Koops, 1800; Castelain, 1854; Pariset, 1856.

Materials.	Names of Inventors and Dates of Patents.
Heath	Crossley, 1854.
Hemp	Bladen, 1682; Hooper, 1790; Koops, 1800; De la Garde, 1825; Gibbs, 1832; Coupier, 1852; Collins, 1853; Bargnano, 1853; Jackson, 1854; Helin, 1854; Broad, 1857; Ball, 1817.
Hops and Hop-lines	De la Garde, 1825; D'Harcourt, 1838; Balmano, 1838; M'Guaran, 1839; Sheldon, 1843; Barling, 1854; Crossley, 1854; Holt and Fraser, 1854; Taylor, 1854; Broad, 1857; Plunkett, 1857.
Husks of Grain	Wilkinson, 1852.
Jute	Calvert, 1846; Nerot, 1846; Coupier, 1852; Helin, 1854; Jackson, 1854; Smith and Hollingworth, 1855.
Leather	Hooper, 1790; Trappes, 1854; Ocks, 1856; Van den Hout, 1856; Lichtenstadt, 1857.
Leaves	Balmano, 1838; Warner, 1853; Vivien, 1853; Johnson, 1855; Moll, 1855; Ruck and Touche, 1857.
Maize, Husk, and Stems	D'Harcourt, 1838; Balmano, 1838; Ruck and Touche, 1857.
Manilla Hemp or Plantain Fibre	Newton, 1852.
Moss	Nesbitt, 1824; Bellford, 1854; Johnson, 1855.
Nettles	Jones, 1805; De la Garde, 1825; Clift, 1854.
Old Writing Paper	Koops, 1800.
Pea Stalk	D'Harcourt, 1838.
Peat or Turf	Ley, 1852; Clarke, 1853; Lallemande, 1853; Crossley, 1854; Hemming, 1857; Westerman, 1852.
Roots of various kinds.	Balmano, 1838; De la Bertoche, 1855; Johnson, 1855; Ackland, 1854; Barling, 1855; Dubus, 1857.
Sawdust	Wilkinson, 1852; Johnson, 1855.
Sea-weeds	Martenoli de Martonoi, 1855; Archer, 1855.
Silk	Bladen, 1682; Bull, 1817; Williams, 1833.
Straw	Koops, 1800; Lambert, 1824; Zander, 1839; Coupier, 1852; Stiff, 1853; Poole, 1853; Helin, 1854; Fraser, 1855; Chanchard, 1856; Castelain, 1854; Broad, 1857; Wheeler, 1857.
Tan (Spent Bark)	Crossley, 1854; Jeyes, 1854; Holt and Forster, 1854; Horton, 1855; Rossiter and Bishop, 1854.
Thistle-down	Bellford, 1854.
Thistles	Koops, 1800; Lord Berridale, 1854; Lilie, 1854.
Tobacco-stalks	Adcock, 1854.
Wood	Koops, 1801; Gesgrand, 1838; Brooman, 1853; Swindells, 1854; Newton, 1852; Johnson, 1855; Kelk, 1855; Martin, 1855; Predeval, 1855; De Frontur, 1855; Chanchard, 1856; Amyot, 1856; Newton (Voelter), 1857; Poisat, 1857; Coupier, 1852.
Wool	Bladen, 1682; Williams, 1833; Dickenson, 1807; Crossley, 1854.
Wrack Grass or Zostera	Spooner, 1857.

But whatever the material employed, the process for nearly all is the same. The rags, bark, fibres, or other substance, have to be reduced with water into a fine smooth pulp. This, in the early stages of the manufacture, was accomplished by macerating and boiling the material, until, in the case of bark, fibres, or other raw material, the fibres could be drawn out from the cellulose matter, after which it was beaten with mallets, or with pestles in mortars, or stampers moved by some power. Water is generally used, but in Holland wind-mills do this work. The beating is continued until the material is reduced to a very smooth pulp. The pulping, in our machine paper-mills, is much more rapidly accomplished by boiling the linen or cotton rags, or other material in a strong lye of caustic alkali. This effectually cleans the rags, and other vegetable fibres are softened and separated in a remarkable manner by it; they are then put into a machine called the washing-machine (fig. 1), which washes out dirt and everything but the pure vegetable fibre. This machine (figs. 1, 2, and 3) is a large cast-iron vessel, usually about 10 feet in length, 4½ feet in width, and 2½ in depth. In the middle, occupying about two-thirds of its length, is a partition, always cast with it, called the mid-feather, *a* (figs. 1 and 2), to support the axle or driving-shaft,

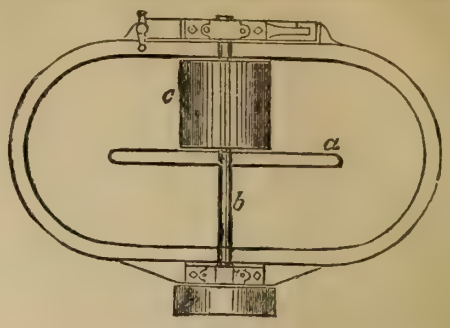


Fig. 1.

b (figs. 1 and 2). This turns the cylinder *c* (fig. 1), which has a large number of teeth or ridges running across it, which grip and tear the rags, or other materials, as they are drawn under it by the current formed by its revolutions. In order to facilitate this,

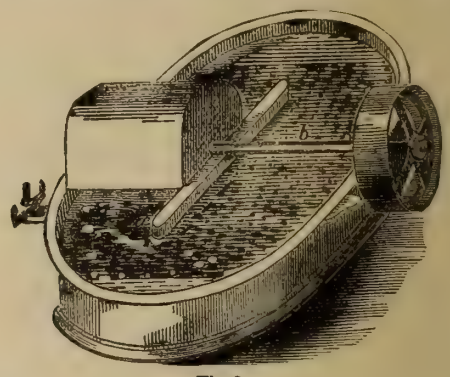


Fig. 2.

a peculiar form is given to the bottom of the part in which the cylinder works, as seen in fig. 3. The rise, *a* (fig. 3), is called the back-fall, and the materials are drawn up to, and through the

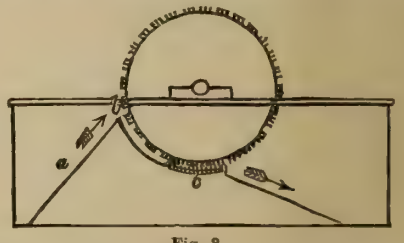


Fig. 3.

narrow space at *b*, by the current; then, as they pass over the ridgid surface, *c*, they come in contact with the rigid surface of the cylinder, and are thus violently ground and drawn through, the stream carrying them round and round until they are thoroughly washed, and partly pulped, or as it is technically called, *broken in*.

The washing-machine is supplied with a continued flow of clean water, and the soiled water as regularly escapes through a fine gauze screen, in the ends of the cylinders, in which is an ingenious arrangement for raising it and carrying it away through the axis, which is hollow. The contents of the washing-machine are then allowed to flow out through a large valve, opening downwards into the draining-chest. Here the water is drained away, and the *stuff* is then placed in the bleaching vats, which are made of stone, and each calculated to contain a hundredweight of stuff, which is here submitted to the action of a strong solution of chloride of lime for about twenty-four hours, and frequently agitated; after which it is transferred to a hydraulic press, and pressed so as to remove the greater portion of the liquid and chloride of lime. It is then placed in another washing-engine, and for an hour is submitted to the same process as in the first; by which all vestiges of the bleaching materials are removed, and the stuff so much more broken down as to be called *half-stuff*. From this engine it is let out by a valve, and finds its way into the *beating-engine*, which is placed at a lower level so as to receive it. Here the arrangement is nearly the same as in the washing and intermediate engines; but the ridges on the bars below the cylinder, and on the cylinder itself, are much sharper, and the disintegration of the fibres is carried on with great rapidity until

they are quite separated; and the flow of the water in a rapid current, as it passes the cylinder, draws them out and arranges them in the water in much the same way as wool or cotton is laid on the carding-cylinders of a carding-machine. This operation takes about five hours, at the end of which time the materials have been worked up with the water into an almost impalpable pulp. This is then let out into the pulp vat, where it is kept continually agitated by a wooden wheel revolving in it, called a *hog*, and from this the hand-workman or machine is supplied.

We will now suppose the pulp formed and ready for use in the vat, and will first describe the process of hand-making, as formerly practised in all countries, and still in use, more or less, in all paper-making countries. The workman or vatman takes an implement called a *mould*, which consists of a sheet of very fine network, attached to a frame, as in fig. 4. In Europe this net-

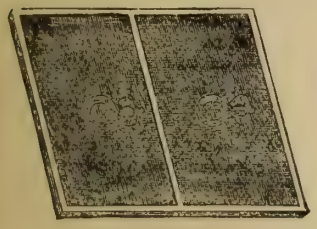


Fig. 4.



Fig. 5.

work was always made of very fine wire; but in India, China, and Japan it is usually made of fine fibres of bamboo, which the workmen of these countries split and weave with remarkable skill There are usually two kinds of moulds employed. In one, as in fig. 4, the wires are woven across each other, forming a very fine gauze, and paper made with them is known as *wove*. In the other, there are several cross-bars in the frame, and straight wires are laid from side to side, and about four or five to each half sheet are laid across them lengthwise, to keep them in position; the transverse wires are about twenty to the inch; the longitudinal ones are a little more than an inch apart. Paper made on such moulds is called *laid*, and is easily known by the impression of the wires upon it. Whichever kind of mould is used, another implement called the *deckle* (fig. 5) is required. It is a thin frame, which exactly corresponds to the frame of the mould, and the workman first places the deckle on the mould, and then dips them into the pulp; the deckle forms a ridge which retains just enough of the liquid pulp for the sheet of paper. The water of the pulp speedily drains through the wire gauze, and after it has stood in an inclined position for a few minutes, another workman, called the *coucher*, applies the face of the sheet of pulp to a piece of felt or flannel cloth stretched on a board, called the *couch*, and the sheet thus pressed, leaves the mould, and is left on the *couch*. Every successive sheet is similarly treated, and they are piled one on another, with a sheet of felt between each, until from four to eight quires, or a *post*, as it is called, is formed. Each post is put in a press, and under pressure parts with nearly all the moisture in the sheets of paper. The felts are then removed, and after several pressings, and other minor operations, the paper is hung on hair ropes, called *tribbles*, in the drying-loft; and when dried, resembles blotting-paper, and cannot be written upon. This is remedied by dipping it in a weak solution of hot size, sometimes tinged with color, after which it is pressed, dried, folded, and made up into quires. Hot pressing and glazing are done by passing the sheets through hot and polished iron rollers.

In Britain very little paper is now made by hand, the paper-machine having changed the character of the manufacture. It is usually stated that Louis Robert, a Frenchman, invented the paper-machine, and that it was brought to this country by Didot of Paris in an imperfect state, but received improvements from Fourdrinier. But it must not be overlooked that Bramah took out a patent in 1805, rather more than a year before Fourdrinier, for very similar improvements to those described in Fourdrinier's specification. The object of all was to cause an equal supply of the pulp to flow upon an endless wire-gauze apron, which would revolve and carry on the paper until it is received on an endless sheet of felt, passing around and between large couching cylinders. These machines have now been brought to such perfection, that paper can be made in one continuous web of any length; and before leaving the machine, is sized, dried, calendered, hot-pressed, and cut into sheets. Different engineers have contrived variations of construction in the paper-machine, but the general principles of all are the same. We therefore select for illustration the machine which was exhibited by Mr. George Bertram of Edinburgh, and which was universally acknowledged to be by far the most complete and perfect which was presented in the International Exhibition of 1862. Since then no very important improvements have been made in the main part of the machine, but the drying portion has been greatly extended.

Fig. 6 is a side view of the machine, and fig. 7 a vertical one. The principle of the machine is very simple; it contains a pulp vat, A (figs. 6 and 7), with a hog or wheel inside to agitate the

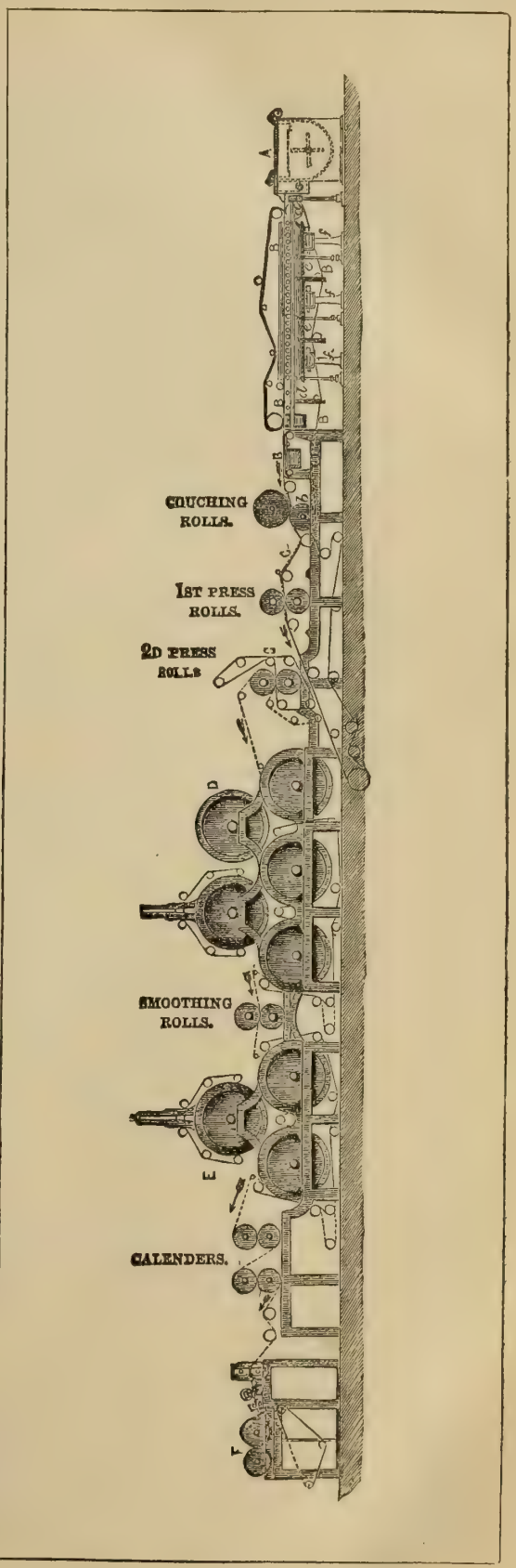


Fig. 6.

pulp, and an arrangement for pouring the pulp over the wire-gauze mould, B, B, B, B, which instead of being in single squares, as in the hand-process, is an endless sheet moving round two roll-

ers, *a*, *b*, which keep it stretched out and revolving when in operation. Under the part which receives the pulp there is a series of small brass rollers, *d* (fig. 6), these, being nearly close together, keep it perfectly level, which is a most necessary condition; besides which, there is a shallow trough *ee* (fig. 6), called the *save all*, which catches and retains the water, which always escapes with some pulp in suspension; and an arrangement of suction boxes and tubes, *f*, *f*, *f* (fig. 6), worked by air-pumps, which draw much of the water out as the pulp passes over them. The pulp is kept from running over the sides by straps called the *deckles*, which are also endless bands, usually of vulcanized India-rubber, carried round moving rollers, so that they travel with the wire-gauze, and therefore offer no resistance to it. In addition to all this, the frame-work on which the surface of the wire-gauze rests has a shogging motion, or side-shake, which has an important effect in working the fibres together before the pulp finally settles down. When it reaches the *couching-rolls*, which press out most of the remaining moisture, and carry it forward to the first and second series of press-rolls by means of an endless web of felt which passes round them, the speed of these rollers and the traveling sheet of felt, CC (figs. 6 and 7), is nicely calculated, so as to prevent a strain upon the still very tender web of paper. Sometimes the upper rollers of these two series are filled with steam, in order to commence drying the web. The paper is now trusted to itself, and passes on, as indicated by the arrows, from the second press-rolls to the first set of *drying cylinders*, DD (figs. 6 and 7), where it again meets with a felt sheet, which keeps it in close contact with the drying cylinders, which are of large size, and filled with steam. Around these it passes, drying as it goes; is then received between the two *smoothing-rolls*, or damp calenders, which press both surfaces, and remove the marks of the wire and felt, which are until then visible on the paper. This is necessarily done before the drying is quite completed; and from the smoothing-rolls it passes to the second series of drying cylinders, E (figs. 6 and 7), where the drying is finished, and thence to the calenders, which are polished rollers of hard cast-iron, so aujusted as to give a considerable pressure to the paper, and at the same time a glossiness of surface. For writing-papers, the paper passes through a shallow trough of size after leaving the drying cylinders, and then passes over another series of skeleton cylinders, with fans moving inside, by which it is again dried without heat, and afterwards passes through the calenders.

Printing and other papers are usually sized by mixing the size in the pulp, in which stage the coloring materials—such as ultramarine for the blue tint of foolscap—are also introduced. Still following the paper web in the drawing (fig. 6), it is seen to pass from the calenders to another machine, F; this slits the web into widths, which are again cross cut into sheets, the size of which is regulated at will. The water-mark is impressed on machine-made paper by means of a fine light-wire cylinder with a wire-woven pattern; this is placed over the wire-gauze sheet upon which the pulp is spread, but near the other end of it, so that the light impression of the marker may act upon the paper just when it ceases to be pulp, and this remains all through its course. There are many other interesting points about the paper-machine, but their introduction here would rather tend to confuse the reader. Its productive power is very great; it moves at a rate of from 30 to 70 feet per minute, spreading pulp, couching, drying, and calendering as it goes, so that the stream of pulp flowing in at one end is in two minutes passing out finished paper at the other. It has been computed that an ordinary machine, making webs of paper 54 inches wide, will turn out four miles a day, and that the total production of all the mills in Britain is not less than 6,000,000 of yards) or 3400 miles daily.

For very obvious reasons, the manufacture of paper has been localized on the banks of streams that afford an abundant supply of pure water for washing and pulping. Kent is celebrated for its paper-mills and for the fine quality of its paper, and is the chief county in this respect. Next follow Hertfordshire (where it was first commenced in England in 1490 by John Tate of Stevenage, of whom it is said in a book printed by Caxton,

> Which late hathe in England doo make thya paper thynne,
> That now in our Englyssh thys booke is printed inne;

and the same John Tate is mentioned in Henry VII.'s Household Book, under dates May 25, 1498 and 1499, 'for a rewarde geven at the paper-mylne,' and 'geven in rewarde to Tate of the mylne, 6*s*. 8*d*.'). Buckinghamshire, Oxfordshire, and Lancashire. It was introduced into Scotland in the year 1695, when a company was formed for carrying it on under 'Articles' signed at a general meeting held in Edinburgh, which articles are now in the Library of the British Museum. It has become a very important branch of manufacture; and not only is paper of a very fine quality made from rags and the new material Esparto, Alfa, or Spanish Grass (the *Lygeum Sparteum* of botanists), but also the manufacture of paper-machines is carried on most successfully both for foreign and home use. Both of these manufactures are carried on in the immediate neighborhood of Edinburgh.

Since the introduction of the penny postage, penny papers, and other economical measures, especially the abolition of the excise-

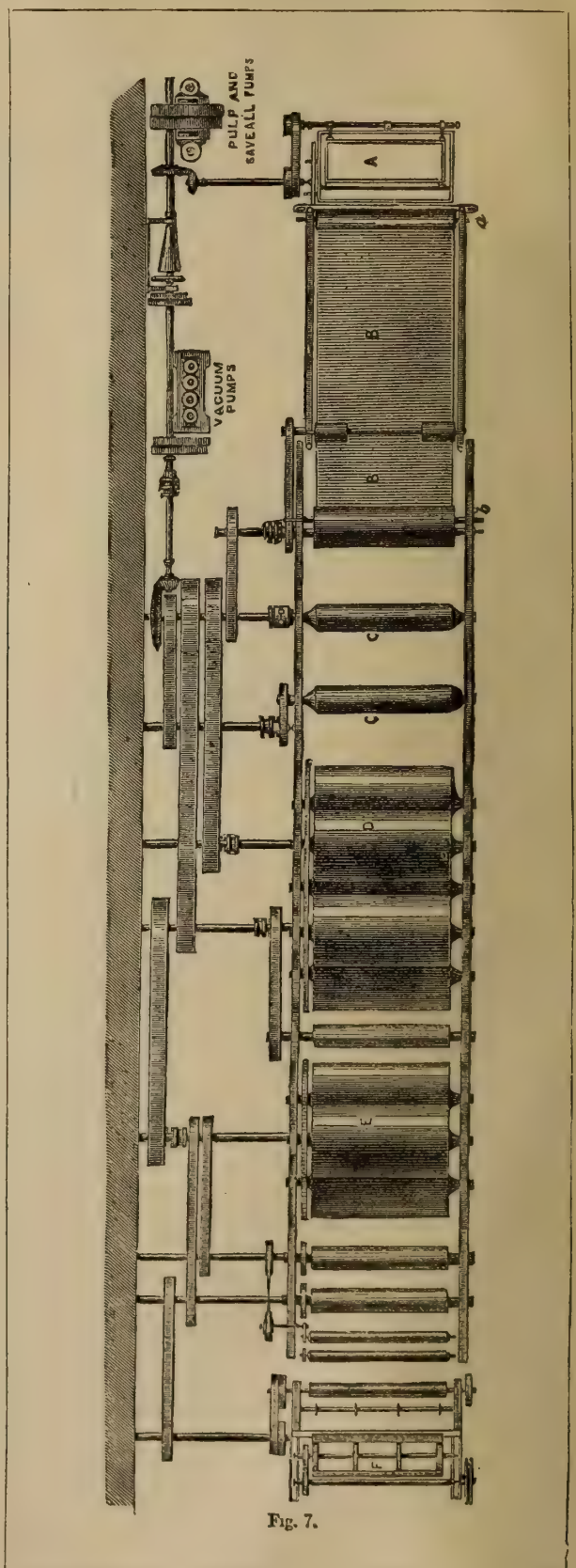


Fig. 7.

duty, an enormous impetus has been given to this branch of our home-manufacture, and considerable difficulty has been found in supplying the makers with raw material: this difficulty has been much increased by the export duties laid by other countries upon

the export of rags. The greatest relief has been experienced by improved methods for preparing paper pulp from straw, and from the introduction of the Esparto, which yields half its weight of paper. Of this material our imports have risen to 190,000 tons per annum, which represents 95,000 tons of paper. The imports of rags, notwithstanding the foreign impediments, are also very large. During the five years ending in 1875, they were as follows: 1871, 26,868 tons; 1872, 22,254 tons; 1873, 16,151 tons; 1874, 17,232 tons; 1875, 15,879 tons. In 1880, the 29,642 tons imported were valued at £451,782. Judging from good data, this manufacture has more than trebled since the abolition of the paper-duty, at which time it was very nearly 100,000 tons, a quantity so vast, that it will remove all surprise at the difficulty of supplying the raw materials.

The following are the principal varieties of ordinary paper, and the sizes of the sheets given in inches:

1. *Writing and Printing Papers.*—*Pot* (so named from its original water-work, a tankard), 12½ by 15; *Double Pot*, 15 by 25. *Foolscap*, 16½ by 13½; *Sheet-and-third Do.*, 22½ by 13½; *Sheet-and-half Do.*, 22½ by 13½; *Double Do.*, 27 by 17. *Post* (so called from its use in letter-writing; one of its original water-marks was a postman's horn), 18¾ by 15½; *Large Do.*, 20¾ by 16½; *Medium Do.*, 18 by 22½; *Double Do.*, 30½ by 19. *Copy*, 20 by 16½. *Double Crown*, 20 by 30. *Demy*, 20 by 15; *Printing Do.*, 22½ by 17¾; *Medium Do.*, 22 by 17½; *Medium Printing Do.*, 23 by 18½. *Royal*, 24 by 19; *Printing Do.*, 25 by 20; *Super-royal*, 27 by 19; *Super-royal Printing*, 21 by 27. *Imperial*, 30 by 22. *Atlas*, 34 by 26. *Columbier*, 34½ by 23½. *Elephant*, 28 by 23; *Double Do.*, 26¾ by 40. *Antiquarian*, 53 by 31: this is generally, if not always, hand-made.

These sizes are somewhat lessened by ploughing and finishing off the edges previous to sale.

2. *Coarse Papers for wrapping and other purposes.*—*Kent-cap*, 21 by 18; *Bag-cap*, 19½ by 24; *Havon-cap*, 21 by 16; *Imperial-cap*, 22½ by 29. *Double 2-lb.*, 17 by 24; *Double 4-lb.*, 21 by 31; *Double 6-lb.*, 19 by 28. *Cartridge*, *Casing*, and *Middle-hand*, &c., 21 by 16. *Lumber-hand*, 19½ by 22½; *Royal-hand*, 20 by 25; *Double Small-hand*, 19 by 29.

Purple papers of a soft texture, unsized, are used in very large quantities by sugar-refiners, of the following sizes: *Copy-loaf*, 16¾ by 21¾; *Powder-loaf*, 18 by 26; *Double-loaf*, 16½ by 23; *Single-loaf*, 21½ by 27; *Lump*, 23 by 33; *Hambro'*, 16½ by 23; *Titler*, 29 by 35; *Prussian*, or *Double Lump*, 32 by 42.

Blotting and Filtering Paper.—This is unsized paper, made of good quality, and usually colored pink or red, and of the same size as demy.

Besides these, which are well-known trade definitions, there are very many others, amounting, if we include *paste* and *mill boards*, to at least twelve or fifteen hundred, so that even paper-manufacturers require the aid of a treatise upon the subject of the sizes, qualities, &c., and such a treatise is in common use.

Even as regards materials, varieties are endless. In an old German book by Jacob Christian Schäffers, published at Regensburg in 1772, there are no less than eighty-one samples of different kinds of paper bound up and forming part of the book, and innumerable others have been made since.

Rice paper is a beautiful material imported from China, about which numberless errors have been written. It is now known to be formed of thin slices of the pith of the plant called *Aralia papyrifera*. This pith can be obtained from the stems in beautiful cylinders, from one to two inches in diameter, and several inches in length. The Chinese workmen apply the blade of a sharp, straight knife to these cylinders of pith, and, turning them round dexterously, pare them from the circumference to the center, making a rolled layer of equal thickness throughout. This is unrolled, and weights are placed upon it until it is rendered perfectly smoooth and flat. Sometimes a number are joined together to increase the size of the sheets. It will be seen that this more nearly resembles the ancient papyrus than modern paper; but it is more beautiful than the former, being a very pure pearly white, and admirably adapted to the peculiar style of painting of the Chinese.

The ordinary papers of the Chinese, Japanese, and East Indians have much resemblance to each other, which arises from the manufacture and material being similar; the bark of the paper mulberry (*Broussonetia papyrifera*) being chiefly used. The Chinese and Japanese are the most skilful paper-makers in the world, and some of the East Indian papers surpass the European manufactures completely.

Some useful kinds of paper are the result of manipulations subsequent to the paper-maker's work. Thus:

Lithographic Paper is prepared from good printing-paper by laying on one side of the sheets a preparation consisting of six parts of starch, one of alum, and two of gum-arabic dissolved in warm water, and applied whilst hot with a proper brush. Generally a little gamboge is added, to give it a slight yellow color.

Copying Paper, for manifold-writers, is made by applying a composition of lard and black-lead to one side or both of sheets of writing-paper; and after leaving it on for a day or so, it is carefully and smoothly scraped off and wiped with a soft cloth.

Tracing Paper is good printing-paper rendered transparent by brushing it over with a mixture of Canada balsam and oil of turpentine, or nut oil and turpentine. In either case it must be carefully dried before using.

There are two distinct classes of colored papers. In one, the color is introduced into the pulp, and is consequently in the body of the paper; in the other, the colors are mixed with size, and applied to the surface. There have been many ingenious and tasteful inventions for decorating the surface of paper, such as by giving it a marbled and even a beautiful iridescent appearance, but they are too numerous for the limits of this article.

Paper is subject to much adulteration. China-clay and gypsum are generally used for the white sorts, and the heavy ferruginous ochres for the coarse and brown kinds.

PAPER-BOOK, in English Law, is the name given to the pleadings on both sides in an action at law, when the issue is one, not of fact, but of law.

PAPER-HANGINGS. This name is applied to the webs of paper, *papiers peints* of the French, usually decorated, with which interior walls are often covered. Previous to the invention of the paper-machine, sheets of paper of the size called *Elephant*, 22 by 32 inches, were pasted together, to make 12 yards length, before the pattern was imprinted; but this is now rendered unnecessary by the facility of making webs of any length. Upon the paper it is usual first to spread a ground-color, with proper brushes, taking care to produce a perfectly smooth surface. The colors employed are opaque, and are mixed with size, and sometimes also with starch, and most of the ordinary pigments are used. In the early stages of the art, it was usual to have the patterns stencilled (see STENCILLING) on the ground-color. The stencilling plates were usually pieces of pasteboard, one being required for every differently-colored portion of the pattern. Afterwards, wooden blocks were adopted, similar to those used in calico-printing, made of pear or poplar wood, generally the width of the paper, forming, indeed, huge woodcuts, on which the pattern is in high relief. As many blocks are required as there are colors in the pattern, each bearing only so much of the pattern as is represented by the color to which it is assigned. Of course, the whole beauty of the work depends upon the nice adjustment of one portion of the pattern to another; and this is determined by guide-pins in the blocks, which are so managed as not to disfigure the surface with their points.

The pattern-block, being coated with its particular color from the color-tub, is laid on the paper, which is stretched out for the purpose on a table, and a lever is brought to bear upon it with sufficient pressure to make the whole of the block bear equally upon the paper. When one block has been printed the whole length of the paper by a succession of impressions, the piece is taken to the drying-room, and dried, previous to receiving the next color; and it often happens that the same operations have to be repeated a dozen different times before the pattern is completed. This process is now being rapidly superseded by the cylinder printing-machines, which are of the same kind as are used in printing textile fabrics. In these machines, the pattern is engraved on a series of copper cylinders, and each part or color has a separate cylinder, and an arrangement for keeping it constantly supplied with color when working. The cylinders are so arranged as, by the sum of their revolutions, to make the pattern complete; so that as the web of paper passes the first, it receives the color for one portion of the pattern, and reaches the second in exact time to have the next color applied in the right places. In this way the entire piece only occupies a few seconds in receiving the complete decoration.

The polished or glazed papers have the ground prepared with gypsum or plaster of Paris, and the surface dusted with finely-powdered steatite, or French chalk. When perfectly dry, this is rubbed hard with a burnishing-brush, until the whole is evenly polished. This is generally done before the pattern is printed, but in some cases pattern and ground are both polished. In making the *flock-papers*, the printing is done in the same way as in the block-printing, only, instead of colored material, a composition called *encaustic* is printed on. It consists of linseed-oil, boiled with litharge, and ground up with white-lead; sufficient litharge is used to make it dry quickly, as it is very adhesive. The flock is prepared from the shearings of woollen cloths from the cloth-mills, by washing and dyeing the shearings to the various colors, then stove-drying and grinding them in a peculiar mill, which, in their brittle state, after leaving the stove, breaks them short. After this they are sifted, to obtain various degrees of fineness. By nice management, the prepared flock is so sprinkled over the whole of the printed surface as to coat the encaustic, and adhere evenly and firmly to it. The same adhesive material is used for printing in gold and other metals. The pattern being printed with the encaustic, gold or other metallic leaf

is applied, and when it is properly fixed, the loose metal is brushed away with a hare's-foot or other soft brush. Some of the finest French papers have much of the pattern actually painted in by hand, a process which, of course, renders them very costly.

PAPER MULBERRY. See MULBERRY.

PAPER NAUTILUS. See ARGONAUT.

PAPHLAGO'NIA, anciently a province of Asia Minor, extending along the southern shores of the Black Sea, from the Halys on the east, to the Parthenius on the west (which separates it from Bithynia), and inland on the south of Galatia. Its limits, however, were somewhat different at different times. The Paphlagonian mountains were covered with forests, and the inhabitants were famous as hunters. Crœsus made P. a part of the kingdom of Lydia, and Cyrus united it to Persia; it subsequently became part of the empire of Alexander the Great, and afterwards of the kingdom of Pontus, was included in the Roman province of Galatia, and in the 4th c. of the Christian era was made a separate province by Constantine. Its capital was Sinope. The Paphlagonians are supposed to have been of Syrian, or at least of Semitic origin, like the Cappadocians. They were proverbially rude, coarse, and deficient in understanding, but this probably refers only to the country-people in the interior.

PA'PHOS, anciently the name of two cities in the isle of Cyprus. The older city, sometimes called *Palaipaphos* (now *Kuklos* or *Konuklia*), was situated in the western part of the island, about 1¼ miles from the coast. It was probably founded by the Phœnicians, and was famous, even before Homer's time, for a temple of Venus, who was said to have here risen from the sea close by, whence her epithet *Aphrodite*, 'foam-sprung,' and who was designated the Paphian goddess. This was her chief residence, and hither crowds of pilgrims used to come in ancient times.—The other Paphos, called *Neopaphos* (now *Baffa*), was on the sea-coast, about seven or eight miles north-west of the older city, and was the place in which the apostle Paul proclaimed the gospel before the proconsul Sergius.

PA'PIAS, Bishop of Hierapolis in Phrygia, was a Christian writer, who flourished in the 2d century. According to Irenæus, he was a disciple of the apostle John; but Eusebius, who quotes (*Historia Ecclesiastica*, chap. 39) the words of Irenæus, immediately subjoins a passage from P. himself, in which the latter distinctly states that he did not receive his doctrines from any of the apostles, but from the 'living voice' of such followers of theirs as 'are still surviving.' He was, however, an 'associate' of Polycarp, a bishop in the same province of proconsular Asia; and as the latter was a disciple of the apostle John, it is probable that Irenæus—a somewhat hasty writer—inferred that his companion must have been the same. The *Paschal or Alexandrian Chronicle* states that he suffered martyrdom at Pergamus, 163 A.D. Eusebius describes P. as 'well skilled in all manner of learning, and well acquainted with the Scriptures;' but a little further on, he speaks of him as a man 'of limited understanding' (*smikròs on tòn noûn*), and a very credulous chronicler of 'unwritten tradition,' who had collected 'certain strange parables of our Lord and of his doctrine, and some other matters *rather too fabulous*.' The work in which these were contained was entitled *Logion Kuriakon Exegêseos Biblia E'*. (Five Books of Commentaries on the Sayings of our Lord). It is now lost, but certain fragments of it have been preserved by Irenæus, Eusebius, Maximus Confessor, and other writers. These fragments are extremely interesting, because of the light which they throw on the origin of the New Testament Scriptures, and their importance may be estimated from the fact, that they contain the earliest information which we possess on the subject. It is P. who is our authority for the statement, that the evangelist Matthew drew up a collection of our Lord's sayings and doings (*ta logia*) in the Hebrew (probably Syro-Chaldaic or Aramaic) dialect, and that every one translated it as he was able.

There can be no doubt that this is a perplexing statement, suggesting as it does the delicate question: 'If Papias is correct, who wrote our present Matthew, which is in Greek, and not in Hebrew?' (For a consideration of this point, see MATTHEW.) P. also tells us, either on the authority of John the Presbyter, or more probably on that of one of his followers, that the evangelist Mark was the interpreter (Hermeneutes) of Peter, and wrote 'whatsoever he [Peter] recorded, with great accuracy.' But the passage is far from implying that Mark was a mere amanuensis of Peter, as some have asserted, but only, as Valesius has shown, that Mark listened attentively to Peter's preaching, culled from it such things as most strictly concerned Christ, and so drew up his gospel. P., it remains to be said, was an extreme millennarian. See MILLENNIUM.

PAPIER-MACHÉ (Fr. mashed or pulped paper). This manufacture has certainly been in use for more than a century in Europe; but it is not improbable that it was first suggested by some of the beautiful productions of Sinde and other parts of India, where it is employed in making boxes, trays, &c., as well as in China and Japan. Its first application, as far as we know, was to the manufacture of snuff-boxes by a German named Martin, in 1740, who learned it of a Frenchman named Lefevre; but the French say that he learned the art in England. Properly speaking, papier-mâché is paper-pulp moulded into shape, and it has been used, not only to make small articles, such as boxes, trays, &c., but in the interior decoration of houses for cornices, ceilings, &c. The ceilings in Chesterfield House, and some other fine Elizabethan structures, are made of this material, which at one time, owing to a combination of the stucco-workers to raise the price of their labor, took the place almost entirely of stucco in house ornamentation.

At present, a combination of both stucco and paper is similarly employed under the name of *Carton-pierre*. From the extension of the applications of papier-mâché to the manufacture of a number of light and useful articles, modifications have taken place in its composition, and it is now of three kinds—1st, the true kind, made of paper-pulp; 2d, sheets of paper pasted together after the manner of pasteboard, but submitted to far greater pressure; and 3d, sheets of thick millboard cast from the pulp are also heavily pressed. The term papier-mâché is in trade held to apply rather to the articles made of the pulp than to the pulp itself; and a vast manufacture has sprung up during the present century, particularly in Birmingham, in which a great variety of articles of use and ornament are made of this material. They are coated with successive layers of asphalt varnish, which is acted upon by heat in ovens until its volatile parts are dissipated, and it becomes hard, and capable of receiving a high polish. Mother-of-pearl is much used in their decoration, for which purpose, when several layers of the varnish still remain to be applied, thin flakes of the shell of the form of the pattern are placed on the varnish, and are covered by the succeeding layers, giving rise to elevations where they are hidden by the coats of varnish. The surface is then ground down smooth and polished, and the grinding down brings to light the pieces of mother-of-pearl shell, which thus present the appearance of inlaid patterns. The fine surface which can be given to the asphalt varnish, also permits of burnished gilding and other decorative applications with excellent effect.

PAPI'LIO. See BUTTERFLY.

PAPILIONA'CEÆ, a suborder of the natural order of plants generally called *Leguminosæ* (q. v.).—The plants of this suborder are the only plants known which have flowers of the peculiar structure called *papilionaceous*, and of which the Pea and Bean afford familiar examples. The name is derived from Lat. *papilio*, a butterfly. Papilionaceous flowers have five petals, imbricated in estivation (bud), one of which, called the *vexillum*, or *standard*, is superior, turned next to the axis, and in estivation folded over the rest; two, called the *alæ*, or *wings*, are lateral; and two are inferior, which are often united by their lower margins, forming the *carina*, or *keel*. The number of the P. is very great—about 4800 species being known. They are found in all parts of the world, abounding in the tropics. Many have superb and beautiful flowers; many are plants of beautiful form and foliage, trees, shrubs, or herbaceous plants; many possess valuable medicinal properties; and many are of great importance as furnishing food for man and for domestic animals, others as furnishing dyes, fibre, timber, &c. See BROOM, LABURNUM, CLOVER, BEAN, PEA, LUCERNE, LIQUORICE, INDIGO, SANDAL-WOOD, &c.

PAPI'LLÆ. This term is applied by anatomists to minute, elongated, conical processes, projecting from the surface of the true skin into the epidermis, highly vascular and nervous in their character, and taking an active part in the sense of touch. Their form and structure are described in the article SKIN. The mucous membrane of the tongue also contains three varieties of papillæ, which are described in the article TASTE, ORGAN AND SENSE OF.

PAPIN, DENIS, a celebrated French physicist, was born at Blois, 22d August 1647, and studied medicine in Paris, where, after receiving his degree, he practised for some time as a physician. He now became acquainted with Huyghens—an incident which strengthened in him an original predilection for physical science; and from this time, he devoted himself almost exclusively to his favorite study. Before P.'s time, the intense force which can be generated in water, air, &c., under the action of heat, was well known, but he was one of the first to indicate the principal features of a machine by which this property could be made of practical utility. He soon acquired a wide reputation; and on visiting England was received with open arms by the philosophers of that country, and became a member of the Royal Society in 1681. While in England P. & Boyle (q. v.) together repeated their experiments on the properties of air, &c.; but in 1687, P. was called to the chair of Mathematics in the university of Marburg, in Hesse-Cassel. In 1696 he went to live in the town of Cassel; and in 1707 he came to London. He died in poverty and neglect in 1712. The French Academy of Sciences, withholding from P. the honor of 'associate,' enrolled him among

its 'correspondents'—a proceeding on the part of the Academy which has, with reason, excited the astonishment of F. Arago. To P. undoubtedly belongs the high honor of having first applied steam to produce motion by raising a piston; he combined with this the simplest means of producing a vacuum beneath the raised piston—viz., by condensation of aqueous vapor; he is also the inventor of the 'safety-valve,' an essential part of his 'Digester' (q. v.) By this latter machine, P. showed that liquids in a vacuum can be put in a state of ebullition at a much lower temperature than when freely exposed to the air.

P.'s sagacity led him to many other discoveries; he discovered the principle of action of the siphon, improved the pneumatic machine of Otto de Guericke (q. v.), and took part against Leibnitz in the discussion concerning 'living' and 'dead' forces. Unfortunately for science, P.'s numerous writings have not yet been collected, but many of them will be found in the *Philosophical Transactions*, *Acta Eruditorum*, and the *Recueil de Diverses Pièces*. He published two works—one being an explanation of the construction and uses of his 'digester' (Lond. 1681), afterwards (1682) translated into French, and his experiments entitled *Nouvelles Expériences du Vide* (Paris, 1674). It was not till nearly a century after that the great value of P.'s discoveries was perceived. See his Life by Gerland (Berlin, 1881).

PAPINIA'NUS, ÆMILIUS PAULLUS, the most celebrated of Roman jurists, was born towards the middle of the 2d c.; and during the reign of the Emperor Severus (q. v.), whom he succeeded as *Advocatus Fisci*, and whose second wife is said to have been P.'s relative, he held the office of *Libellorum Magister*, and afterwards that of *Præfectus Prætorio*. After the death of Severus, his son and successor, Caracalla, dismissed P. from his office, and soon afterwards caused him to be put to death on various pretexts, the real reason, however, appearing to be that the emperor was afraid the influence of a man so able and upright would be dangerous to his power. P.'s works consist chiefly of 37 books of *Quæstiones*, 19 of *Responsa*, 2 of *Definitiones*, two works, *De Adulteriis*, and a Greek fragment; and from these works there are in all 595 excerpts in the Digest (q. v.).

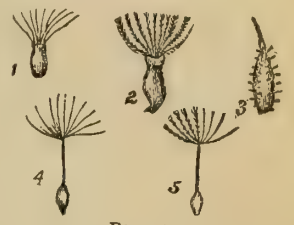
The pupils of P. include the most famous names in Roman jurisprudence, such as Ulpian, Paullus, Pomponius, Africanus, Florentinus, and Modestinus, but the master stands superior to them all. The high reputation he enjoyed among his contemporaries and successors may be gathered from the epithets *Prudentissimus*, *Consultissimus*, *Disertissimus*, bestowed upon him by various emperors, and from the first book of the Codex Theodosii, *De Responsus Prudentum*, in which, after declaring the works of P., Paullus, Caius, Ulpian, Modestinus, and four others, to be authority for a judge's decision, it is declared that should these jurists be equally divided in opinion, that opinion which was maintained by P. was to be considered right; while his commentator, the celebrated Cujacius (q. v.), goes so far as to declare 'that Papinianus was the first of all lawyers who have been, or are to be,' and that 'no one ever will equal him.' His high reputation as a jurist was much enhanced by the strong moral feeling and stern unbending honesty which were equally characteristic of him, and which have stamped his works with an ineffaceable impress. P.'s works were studied both before and after Justinian's time by Roman legal students of the third year, who were for this reason denominated Papinianistæ. The fragments of P.'s works which now remain are somewhat obscure, and the excerpts from them in the Digest are in general so brief, that the aid of a commentator is required.

PAPIST (Lat. *papista*, an adherent of the pope) is a name applied, generally with some admixture of contempt, to members of the Roman Church. Of itself, it implies nothing more than that they are adherents of the pope; but in its popular use it includes all the distinctive doctrines of Roman Catholics, and especially those which are supposed to be peculiarly cherished by the supporters of the papal authority. It is therefore in many cases held to be synonymous with the profession of the extremest opinions permitted in the Church of Rome, and even those which are popularly regarged as superstitious. Understood literally, no consistent Roman Catholic would disclaim it; but in the imputed signification explained above, it is held to be offensive.

PAPPENHEIM, GOTTFRIED HEINRICH, COUNT VON, an imperial general of great note in the Thirty Years' War, was born at Pappenheim, in Middle Franconia, Bavaria, 29th May 1594, of a very ancient Swabian family, in which the dignity of Marshal of the Empire became hereditary about the 13th or 14th c., and many of whose members had greatly distinguished themselves in the wars of the middle ages. When about 20 years of age, P. went over to the Roman Catholic Church, and thenceforth signalized himself by his fiery zeal in its cause. After serving under the king of Polaad in his wars with the Russians and Turks, P. joined the army of the Catholic League, and in the battle oi Prague (1620) stayed the flight of the Austrian cavalry, and by a well-timed and furious charge turned the tide of battle against the Bohemians. In 1623, he received from the emperor the command of a cavalry regiment of the famous 'Pappenheimer Dragoons;' and in 1625, became general of the Spanish horse in Lombardy; but in 1626 re-entered the Austrian service, and after suppressing a dangerous revolt of the peasants of Upper Austria, in which 40,000 of the peasants perished, he joined the army which was opposed to the Protestant league, and, in association with Tilly, carried on many campaigns against the Danes, Swedes, and Saxons. It was P. who urged and induced Tilly to take Magdeburg by assault, and himself led and directed the attack. Moreover, it is he, rather than Tilly, who was to blame for the ferocious massacres which followed. His reckless bravery involved Tilly, against his will, in the disastrous battle of Breitenfield; but to some extent he retrieved his character by his strenuous efforts to remedy the loss, and protect the retreat of the army. After Tilly's death, he was associated with Wollenstein, who detached him with eight regiments to protect Cologne, but on hearing of the advance of Gustavus, sent an urgent order for his return.

P. arrived at Lutzen at the moment when Wallenstein's army was on the point of being completely routed, and at the head of his cuirassiers charged the left wing of the Swedes, throwing it into confusion, and almost changing the fortune of the battle by his extraordinary bravery. He was mortally wounded in the last charge, and died a few hours afterwards at Leipzig, November 7, 1632, with a smile on his countenance, after learning that Gustavus Adolphus had died before him. 'God be praised!' he said; 'I can go in peace, now that that mortal enemy of the Catholic faith has had to die before me.'

PA'PPUS, in Botany, an appendage of the fruit of plants belonging to certain natural orders, of which the great natural order *Compositæ* is the chief. It consists either of simple (figs. 1 and 4) or feathery (figs. 2 and 5) hairs, sessile or stalked, arising from the summit of the fruit, and is produced by a development of the tube and limb of the persistent calyx. Its object appears to be to waft the ripened seed to the new situation in which it is to grow. *Thistle-down* is the pappus of the thistle.—The pappus is sometimes represented by mere teeth or scales.



Pappus:
1 and 2, sessile; 3, scale-like; 4 and 5, stalked.

PAPPUS of Alexandria, one of the later Greek geometers, of whose history nothing is known; he is said by Suidas to have lived during the reign of Theodosius the Great, emperor of the East (379—395). Some writers are of opinion that he lived two centuries earlier, but the former is much the more probable opinion. The chief work of P. is his *Mathematical Collections*, of which the last six, out of eight books, are extant. The *Collections*, as their name implies, are an assemblage into one book of scattered problems and theorems, the work of Apollonius, Archimedes, Euclid, Theodosius, &c., to which he has joined his own discoveries.

The first two books are supposed (on insufficient grounds) to have treated of arithmetic and arithmetical problems, but only a small fragment of the second book is extant: the third book is a collection of problems, mostly of solid geometry: the fourth treats of curves other than the circle, according to the method of pure geometry: the fifth contains problems of maxima and minima: the sixth treats of the geometry of the sphere: the seventh, which is by far the most important to modern geometers, as it is almost the sole authority we possess on the subject of the history and methods of the Greek geometrical analysis, treats principally of analysis; it also contains the proposition now known as 'Guldinus' Theorem,' which was plagiarized from P. by Father Guldin: the eighth and last book treats of machines. P. was the author of several other works which are lost, excepting only a fragment of his *Commentary on Four Books of Ptolemy's Syntaxis*. P., as an independent investigator, enjoys a high reputation, and is considered by Des Cartes as one of the most excellent geometers of antiquity. Some of his problems have been looked upon with high interest by all succeeding geometers. The *Mathematical Collections* have been published in whole or part, at various periods, but the only complete editions are the two Latin versions, the first by Commandine (Pisa, 1588), and the second by Manolessius (Bologna, 1660), and the Greek edition of H. J. Eisenmann (Paris, 1824). The portion of the Greek text of the 2d book, which was wanting in Commandine's MS., was published (1688) in London by Dr. Wallis.

PAPU'Ä, or NEW GUINEA, is, with the exception of Australia, the largest island on the globe. It lies in lat. 0° 30′—10° 40′ S., and long. 131°—150° 30′ E., and is about 1300 miles in length. In outline the island is very irregular, the western part being nearly insulated by Geelvink Bay, on the north, and M'Clure's Inlet

from the west. The head of Geelvink Bay is separated from the south coast by an isthmus only 35 miles in breadth. Eastward from this, the island increases in breadth from 200 to 360 miles, and terminates in the south-east, in a narrow peninsula of lofty mountains. The area is given by Wallace at 300,000 square miles.

There is probably no region on the globe so little known as P.; the coast has not even been visited in some parts, and the maps published to this date show unsurveyed portions. It is not known with certainty who discovered Papua. It is attributed to a Spaniard, Alvaro de Saavadra. To him the first detailed notice of the island is due, and it was he who first noticed the resemblance of the inhabitants to African negroes, and for that reason gave the country the name of New Guinea. In 1606, the Spanish frigate *La Almiranta*, Captain Luiz Vaes de Torres, made the island, and sailed along the southern shore to the strait that bears his name. In 1676, the Dutch captains, Schouten and Le Maire, landed on the island to obtain fresh water. They were unpectedly attacked by the natives, who killed 18 of their men. M. de Bougainville, in 1768, also made the south coast of the island, and worked to windward along it. The English navigators, Cook in 1770, and Forrest in 1774, Edwards in 1791, and the following year Captain Bligh, of *Bounty* notoriety, saw portions of the south coast. Flinders, in 1799, visited the island, and added a few facts to our scanty information. In the course of the voyage of the French ship *Astrolabe*, under the command of J. Dumont d'Urville, the distinguished naturalists, Quoi and Gaymard, studied the natural history of the island, and more especially its zoology. A Dutch expedition in 1828 added to the information of the western coast.

In 1845, Captains Blackwood and Owen Stanley, of Her Majesty's ships *Fly* and *Bramble*, surveyed part of the southern coast; and between 1846 and 1850, the last-named officer surveyed the southern shores of the eastern peninsula. In 1858, the Dutch government sent a surveying expedition in the steamer *Etna* to the north and north-west coasts. In 1869, attention was called to our lack of information on P., and to the fact that so little had been done to explore this great and fertile island, which lay almost within sight of Australia, and might be looked on as belonging to that continent. Sir Charles Nicholson especially directed the attention of our Australian colonists to the importance of their becoming acquainted with the island, lying, as it does, on the highway to India and China, and believed to be rich in minerals and commercial products. In 1871, a Russian steam corvette left on the north-east shores the naturalist, Miklukho Maclay, who lived for 15 months there, and has repeatedly visited P. since. Meyer, and the Italian travelers Beccari and D'Albertis, have added much to our knowledge of the interior. The agents of the London Missionary Society have also extended our knowledge of the country. Early in 1873, H. M. S. *Basilisk*, Captain Moresby, was sent to suppress the system of kidnapping natives in the neighborhood of Torres Strait; and this being accomplished, Captain Moresby employed his time in continuing the survey of the eastern coasts commenced by Captain Owen Stanley. He found the eastern part of the island different in form from the representations as given on our maps, inasmuch as a considerable portion of the eastern promontory consisted of islands with deep channels between, instead of being a continuous line of coast. But little is known of the geography of the island beyond the coast. The northern side is hilly and densely covered with wood, whilst such portions of the southern coasts as have been visited are low, and apparently swampy, but still densely wooded.

A range of mountains, the Charles Louis Mountains, commences on the south coast near Geelvink Bay, and extends due east, rising gradually to a height of nearly 17,000 feet, where it is lost sight of at a distance of 100 miles from the coast; but it is not improbable that this range continues through, and subdivides the island until it joins the high land of the eastern peninsula, where a successsion of mountains, from 14,000 to 5000 feet high, continue to the eastern extreme. A large island, Frederick Henry Island, 100 miles long by about 50 broad, on the south-west coast, was supposed to be part of the mainland until Lieutenant Kool, of the Dutch navy, passed through the strait that separated it. The London Missionary Society's agents, in their steamer the *Ellangowan*, have also lately found that what was considered the south cape of P. is detached from the mainland, and have called it Stacy Island. The Fly River has been ascended 160 miles by the same parties. The whole of the south-eastern coast to the eastern extreme of the island, and continuing to the Louisiade Archipelago beyond, is fringed with dangerous coral reefs, and as during the monsoons the currents acquire a great velocity, the danger of navigating is considerable. Captain Moresby has discovered a new passage at the south-east point of the main island, China Strait, which is navigable for large ships, and apparently free from dangers; it is considered that this discovery will lead to more rapid communication between China and Australia. The tides, however, at springs, run at the rate of 5 or six knots, but more careful and elaborate surveys will doubtless render navigation more safe and expeditious in these waters.

There cannot be a doubt that in an island of such vast extent as P., not only does the character of the human family greatly diverge, but there may possibly exist several distinct races. With our little knowledge, two distinct races are admitted, viz., the Papuans, so called from the Malayan 'frizzled hair,' and the Haraforas. The Papuans are said to resemble the Australian aborigines, but, as a rule, are stouter. The Haraforas are distinguishable from the Papuans by lighter color and straighter hair; they also exhibit greater activity of body.

Except in the swampy districts, the climate is not unhealthy, though the temperature varies greatly, the thermometer sometimes indicating 95° F. by day, and falling to 75° by night. On the south-west coast, the east monsoon or rainy season begins about the middle of April, and ends in September; the dry season is from September to April, and on the north coast they are just reversed.

The island is everywhere clothed with the most luxuriant vegetation, cocoa-nut, betel, sago, banana, bread-fruit, orange, lemon, and other fruit-trees lining the shores; while in the interior are abundance of fine timber trees, as the iron-wood, ebony, canary-wood, the wild nutmeg, and the massoi, the fragrant bark of which is a leading article of export from the south-west coast. In the districts of the Arfak and Amberbakin Mountains the sugar-cane, tobacco, and rice are cultivated.

The natural history of the western part of P. has been recently examined by Mr. Wallace. This naturalist established the fact that a deep channel in the bed of the ocean, running west of Celebes, and east of the great islands of Java and Borneo, now known as Wallace's Line, separates two regions, in which the islands rise from shallow waters, and which are totally unlike each other in their botany and zoology. The islands on either side of this line he supposes to be the relics of submerged continents. Those on the west, or the Great Malay Islands, belong to the continent of Asia, and have its plants and animals. Those to the east of the line, on the other hand, including P., have a flora and fauna resembling those of Australia. The latter island has a dry climate and stunted vegetation. P., on the contrary, has a warm and moist climate, pre-eminently fitted to produce a varied, luxuriant vegetation; and it is clothed from end to end with magnificent forests. Insect life is, as might be expected, abundant and varied; the Papuan species being remarkable for fine forms and beautiful colors. Still more interesting to the naturalist is the variety of birds, of which 120 species are singers, 30 parrots, and 28 pigeons. Those of land species which have been examined belong to 108 genera, 29 of which are found exclusively in Papua. The beautiful birds of paradise are peculiar to the island, and distinguish it from all other regions. In contrast to this variety of birds is the small number of mammals. The great pachyderms and quadrumana of the Malay Islands are wanting, and the mammals are 2 bats, 1 pig, 10 marsupials, 1 cetacea, and 1 carnivora. There is one true kangaroo similar to those of Australia. The climbing kangaroos take the place of the monkeys of the Asiatic area. It is believed that Wallace's Line, or one nearly coincident with it, separates two varieties of the human race, the Malays and the Papuans, or rather areas in which one of these races predominates.

Mr. Alfred Wallace, in his *Malay Archipelago*, says of the Papuans: 'There has been much difference of opinion about the races of the Oceanic region, but it is generally admitted that they belong to four different types—those of (1) the Malays; (2) the Negritos or Papuans; (3) the Polynesians; (4) the Australians. The most distinguished of recent ethnologists class the Malays with the Mongols; the Negritos or Papuans, and the Polynesians, with the negroes of Africa; and distinguish widely the Australians from both. They do not recognize any fundamental distinction between the dark Papuans and the light-complexioned Polynesians. The western parts of the island are inhabited by the former, the eastern parts by the latter. The Papuans are well made, have regular features, intelligent black eyes, small white teeth, curly hair, thick lips, and large mouth; the nose is sharp, but flat beneath, the nostrils large, and the skin dark brown. They are,' Mr. Wallace says, 'superior in stature to average Europeans, but have long and thin legs, and the splay foot of the negro.' He thinks the Papuans superior to the Malays in intelligence. In the western parts, they are divided into small distinct tribes, frequently at war with each other. The men build the houses, hollow the trunks of trees into canoes, hunt and fish; while the women do all the heaviest work, cultivating the fields, making mats, pots, and cutting wood. Their food consists of maize, sago, rice, fish, birds, the flesh of wild pigs, and fruits, &c. 'They are copper colored, of a light active build, often with very good features, which they paint; but the men's teeth and mouths are much disfigured by constant use of betel-nut. The hair is usually worn frizzled out into a huge mop.

The women's hair is always cut short. Their weapons appear

to be spears, swords, clubs, and stone hatchets, but no bows and arrows were seen amongst them. Occasionally human jaw and spinal bones are worn as bracelets and ornaments. They appeared to take pleasure in making us understand that they had eaten the original owners of the bones; but these bones, as well as the few skulls exhibited in their villages, appeared to be of an ancient date. The houses are built after the Malay fashion, on poles raised 5 or 6 feet above the ground, and consist of one large apartment.' The natives of Humboldt's Bay have a temple in every village, though nothing is known of their religion.

In the eastern part of the island, the negro type of the inhabitants passes into that of the Polynesians. Captain Moresby says of them, that they have the light complexion and in all respects the appearance of the Polynesians, typically represented by the New Zealanders, that they are a friendly and intelligent people, and gladly receive the English seamen at their villages, where they mixed freely with them. They practise several useful arts, such as pottery, and possess extensive, well-fenced plantations. In the north-eastern part of the island, their villages are terraced and cultivated to a great height, in a manner which a Chinaman might envy. Captain Moresby believes them to be a fine, promising race, and thinks that, with the aid of civilizing influences, a prosperous future is in store for them.

The Dutch scientific expedition of 1858 appended to their report a vocabulary of the Myfore language, of about 1200 words, collected by Ottow and Geisler, missionaries at Doreh, on the west of Geelvink Bay. It is, however, known to differ greatly from languages spoken in other parts; and natives of the South Sea Islands have a facility in communicating with the Papuans on the Torres Strait. The London Missionary Society has therefore begun to Christianize them through Samoan teachers directed by British missionaries. The first chapel, on Murray Island, was opened in 1875. The population of P. and the immediately adjacent islands has been estimated at 800,000, but no correct estimate of the numbers can be formed. The exports are massoi bark, trepang or bêche-de-mer, tortoise-shell, pearls, nutmegs, birds of paradise, crown-pigeons, ebony, resin, slaves, &c.

The inhabitants seem to be divided into a great number of petty tribes, quite independent of each other. No native government is known to extend over a great part of the island. The Dutch acquired the rights of their tributary, the sultan of Tidore, and it was partly to assert them that an expedition was undertaken in 1828. At this time, the Dutch built a fort called Du Bus, in Triton Bay, 3° 46′ S. lat., and 134° E. long, and declared the whole island west of a line running from Cape Bonpland in the north, along 141° E. long., to Torres Strait, to belong to the Netherlands, but the settlement was abandoned. In 1858, the Dutch made another attempt to establish a colony. The *Ætna* was fitted out for that purpose. The expedition visited a great part of the north-western coast. Recent attempts of parties of miners to tap the metallic treasures of P. have not as yet met with success.

That a great future is open to this vast territory is undoubted. Rich in natural products and mineral wealth to an extent of which we can have no conception, situated in such close contiguity to one of our largest possessions, and between it and China, Japan, and India, it is of immediate consequence to England; the western part may be regarded as under the Dutch power. In 1883, the government of Queensland annexed the eastern portion of P. in the name of the Queen of Great Britain and Ireland; but its action was not sanctioned by the Imperial government, greatly to the dissatisfaction of Queensland and the other Australian colonies. (The name P., commonly called *Pa'pua* in England, should be pronounced *Papoo'a*.)

See *The Western Pacific*, by W. Coote (1883); *The Malay Archipelago*, by A. R. Wallace; *Neu Guinea und seine Bewohner*, by Otto Finsch (Bremen, 1865); *Dall' Italia alla Nuova Guinea—Viaggio della Corvetta 'Vittor Pisani'* (Florence, 1873); *New Guinea*, by L. M. d'Albertis (1880); Paper by Giglioli, in *Ocean Highways* for December 1873; *Discoveries and Surveys in New Guinea and the D'Entrecasteaux Islands*, by Captain Moresby (1876); *Chronicle of London Missionary Society* for 1876; *Proceedings of Geographical Society* (1879).

PA'PULÆ AND PAPULAR DISEASES. Papulæ, or pimples, constitute one of the eight orders of Bateman and Willan's classification of cutaneous diseases. They occur as little elevations of the cuticle, of a red color, containing neither pus nor any other fluid, and ending usually in a scurf. They are generally supposed to denote inflammation of the papillæ of the skin; but Erasmus Wilson believes that they represent an inflammatory condition of the secretory orifices, whether sudoriferous or sebaceous. The diseases regarded as papular are Strophulus, Lichen, and Prurigo; but there are other diseases in which the first external symptom is a papular eruption, as, for example, small-pox, in which the papula speedily develops itself into a pustule.

PAPY'RI. Rolls made of the paper of the papyrus plant are commonly known as *papyri*, corresponding to the Greek *biblia*. These rolls are of a very remote antiquity, some of the still remaining Egyptian papyri being certainly as old as the 6th dynasty, and others as old as the 12th, or from about 2000 B.C. This is owing to their mode of preservation, and to the peculiarly dry character of Egypt. These rolls have been found deposited in different ways, those of a religious nature being placed upon the bodies of mummies, at the feet, arms, or even in the hands, sometimes, indeed, packed or laid between the bandages, or even spread over the whole bandages, like a shroud. At the time of the 19th and 20th dynasties (1320—1200 B.C.), they were often deposited in hollow wooden figures of the god Ptah Socharis Osiris, or of the god Osiris, which were placed near the mummies.

Papyri of a civil nature were deposited in jars or boxes, which were placed near the mummies, or have been found in the remains of ancient libraries. The following are the principal kinds of Egyptian papyri: I. Hieroglyphical papyri, always accompanied by pictures or vignettes, and consisting of three classes: 1. Solar litanies or texts, and pictures relating to and describing the sun's passage through the hours of the night, when that luminary was supposed to enter the Egyptian Hades or Hell. 2. Books of the empyreal gate, or heaven, with vignettes of deities, and other representations referring to the genesis of the cosmos or universe. 3. The so-called Ritual, consisting of a series of sacred or hermetic books, some of a very remote antiquity, accompanied with rubrical titles and directions as to their efficacy and employment, and comprising various formulas ordered to be placed on the coffins, amulets, and other furniture of the dead, for the better preservation of the souls of the dead and of the mummies in the future state. In this book, chapters giving an account of the future judgment of the *makhenu*, or boat of the dead, of the Elysian Field, and of the Halls through which the dead had to pass, are also found. The work was considered by the Egyptians themselves mystic, and parts were supposed to be written by the god Thoth himself. A copy more or less complete, according to the wealth of the deceased, was deposited with all the principal mummies; and from the blank spaces left for the name, which was afterwards filled up, it is evident they were kept ready made.—II. Hieratic papyri, written in the hieratic or cursive Egyptian hand, comprising a more extensive literature than the hieroglyphic papyri.

This hand-writing being used for civil as well as religious purposes, the papyri found in it differ considerably from one another, and comprise rituals of the class already mentioned, principally in use about the 26th dynasty, or the 6th c. B.C., but found also on some few papyri of a remote period; a book called the *Lamentations of Isis;* magical papyri, containing directions for the preparation of charms and amulets, and the adjuration of deities for their protection; civil documents, consisting of the examination of persons charged with criminal offences, the most remarkable of which are that of an offender charged with the practice of magic in the 19th dynasty, another of a criminal charged with various crimes, in the reign of Sethos I., the examination of a conspiracy in the palace of Rameses II., and the *procès-verbal* of an offender charged with violating the sepulchres of the kings in the reign of Rameses IX. Besides these, there are several letters of various scribes upon subjects connected with the administration of the country and private affairs; laudatory poems of Egyptian monarchs, one describing the campaign of Rameses II. against the Khita or Hittites; historical documents, the journeys in foreign parts; the endowment of temples by Rameses III.; works of fiction, one of the adventures of two brothers, the death of the younger, owing to the false accusation of the wife of the elder, his revival, and transformation into a bull and a Persea tree; another the story of a doomed prince, and the advèntures of different persons. Works on plants and medical subjects, books of proverbs, lists of kings, historical accounts, are amongst these documents.—III. The last class of Egyptian papyri, those written in the demotic or enchorial character, consist of rituals, contracts for the sale of mummies and lands, accounts and letters, and miscellaneous documents. These papyri are often bilingual, sometimes accompanied with hieratic or Greek versions. Many of these papyri have been translated by De Rougé, Chabas, Heath, Goodwin, Birch, and others. Many Greek papyri have been found belonging to the archives of the Serapeion, referring to the adminstration of that temple, the orations of Hypereides, and some of the books of Homer. At all times in the history of Egypt, libraries of papyri seem to have existed, and, under the Ptolemies, are said to have contained as many as 700,000 rolls.

Another class of ancient papyri, those of Pompeii and Herculaneum, are of considerable interest, as showing the condition and arrangement of a Roman library. The papyri of Herculaneum are from 8½ to 12¾ inches wide, and are rolled up in a cylindrical roll, *volumen*, upon a stick or inner roll, *bacillus, umbilicus*, having a stud at the end, *cornu*. They had their titles written on a strip, *lorum*, in red letters, and the writing was either on blind lines, or else on lines ruled with lead. About 1800 papyri were discovered at Herculaneum, in 1753, in the library of a small house, charred to a cinder, and some of these, by the greatest skill and

care, have been unrolled by a very laborious process at Naples. Unfortunately, they have not answered the literary expectations formed of them, consisting of the works of philosophers of the Epicurean school, which the proprietor of the library seems to have collected. Some of the papyri were in Latin, and more difficult to unroll. Many of them have been published. They are only written on one side. When a small number were required, they were placed in a cylindrical bronze chest (*cista*), packed tightly in a perpendicular position, and were taken out single, and read by unrolling from one end. These papyri were of various prices; old ones, like old books, being of immense value, but those containing the works of contemporary authors were not dearer, perhaps, than modern books. Many extensive private and public libraries existed in Greece and Rome, but all have perished except those exhumed from Herculaneum.

Wilkinson, *Man. and Cust.* iii. 62, 147, 188, v. 482; Winckelmann, ii. Bd. i. 1; Chabas, *Pap. d'Harris* (Chalon, 1860); *Papyrus Hieratiques* (8vo. Chalon, 1863); *Voyage d'un Egyptien* (1866); Pleyte, *Papyrus de Turun* (1869—1874); *Cambridge Essays* (1858), p. 227; La Rougé, *Rev. Contemp.* xxvii., p. 389; Devena, *Papyrus Judicione de Turin* (1868); *Trans. Soc. Bibl. Arch.* (1874).

PAPY'RUS, a genus of plants of the natural order *Cyperaceæ* of which there are several species, the most important being the EGYPTIAN P. or *Papyrus* of the ancients (*P. antiquorum*, *Cyperus papyrus* of Linnæus); a kind of sedge, 8 to 10 feet high; with a very strong, woody, aromatic, creeping root; long, sharp-keeled leaves; and naked, leafless, triangular, soft and cellular stems, as thick as a man's arm at the lower part, and at their upper extremity bearing a compound umbel of extremely numerous drooping spikelets, with a general involucre of 8 long filiform leaves, each spikelet containing 6—13 florets. By the ancient Egyptians it was called *papu*, from which the Greek *papyrus* is derived, although it was also called by them *byblos* or *deltos*. The Hebrews called it *gomé*, a word resembling the Coptic *gom*, or volume; its modern Arabic name is *Berdi*. So rare is the plant in the present day in Egypt, that it is supposed to have been introduced either from Syria or Abyssinia; but it has been seen till lately in the



Papy us (*P. antiquorum*).

vicinity of the Lake Menzaleh, and specimens sent to England; and as it formerly was considered the emblem of Northern Egypt, or the Delta, and only grown there if introduced, it must have come from some country lying to the north of Egypt. It has been found in modern times in the neighborhood of Jaffa, on the banks of the Anapus, in the pools of the Liane, near Syracuse, and in the vicinity of the Lake Thrasymenus. It is represented on the oldest Egyptian monuments, and as reaching the height of about ten feet. It was grown in pools of still water, growing ten feet above the water, and two beneath it, and restricted to the districts of Sais and Sebennytus.

The P. was used for many purposes, both ornamental and useful, such as crowns for the head, sandals, boxes, boats, and cordage, but principally for a kind of paper called by its name. Its pith was boiled and eaten, and its root dried for fuel. The papyrus or paper of the Egyptian was of the greatest reputation in antiquity, and it appears on the earliest monuments in the shape of long rectangular sheets, which were rolled up at one end, and on which the scribe wrote with a reed called *kash*, with red or black ink made of an animal carbon. The process of making paper from the papyrus is described in the article PAPER When newly prepared, it was white or brownish white and lissom; but in the process of time, those papyri which have reached the present day have become of a light or dark brown color, and exceedingly brittle, breaking to the touch. While papyrus was commonly used in Egypt for the purposes of writing, and was, in fact, the paper of the period, although mentioned by early Greek authors, it does not appear to have come into general use among the Greeks till after the time of Alexander the Great, when it was extensively exported from the Egyptian ports under the Ptolemies. Fragments, indeed, have been found to have been used by the Greeks centuries before. It was, however, always an expensive article to the Greeks, and a sheet cost more than the value of a dollar. Among the Romans it does not appear to have been in use at an early period, although the Sibylline books are said to have been written on it, and it was cultivated in Calabria, Apulia, and the marshes of the Tiber. But the staple was no doubt imported from Alexandria, and improved or adapted by the Roman manufacturers. So extensive was the Alexandrian manufactory, that Hadrian, in his visit to that city, was struck by its extent; and later in the empire, an Egyptian usurper (Firmus, 272 A.D.) is said to have boasted that he could support an army off his materials. It continued to be employed in the Eastern and Western Empire till the 12th c., and was used among the Arabs in the 8th; but after that period, it was quite superseded by parchment. At the later periods, it was no longer employed in the shape of rolls, but cut up into square pages, and bound like modern books.

As a matter of scientific interest, experiments on the manufacture of paper from the P. have been made in recent times by Landolina, Seyffarth, and others.—Another species of P. (*P. corymbosus* or *P. Pangorei*) is much used in India for making mats. See INDIAN GRASS MATTING.

PAR or PARR, a small fish, also called BRANDLING and FINGERLING in different parts of Britain, inhabiting rivers and streams, and at one time believed to be a distinct species of the genus *Salmo*, but now almost universally regarded as the young of the salmon. The question will be noticed in the article SALMON. It may here, however, be mentioned, that it is difficult to discriminate the young of different species of this genus. The par rises with extraordinary readiness to the artificial fly; and until it began to receive protection as the fry of the salmon, vast numbers were killed both by youthful and adult anglers.

PARA', or BELE'M, a thriving city and seaport of Brazil, capital of the province of the same name, stands on the east bank of the river Para, 80 miles from its mouth. Lat. 1° 28′ S., long. 48° 28′ W. The harbor is formed by an abrupt curve or inlet of the channel of the river, which is here 20 miles broad. Vessels of large size are admitted; but the anchorage, though safe, has of late years become increasingly difficult of access, owing to the approaches getting silted up. The streets are paved and macadamized, but are for the most part in bad repair; the houses, like those of most Brazilian towns, have whitened walls and red-tiled roofs. Among the principal buildings are the palace, the cathedral and the churches. There are also numerous public squares, a college, and a beautiful botanic garden. The city is supplied with water by water-carts that perambulate the streets. The 'Amazon Navigation Company,' a Brazilian association, has erected large workshops, coal depôts, and wharfs; and steam navigation is rapidly extending. The imports have an annual value of about 5,000,000 dollars; the annual exports reach nearly 8,000,000 dollars, of which about 6,000,000 are for india-rubber. The imports are principally cotton manufactures, wheat and flour, cutlery and hardware, wool, gold and silver wares, coins, and wine. The exports are india-rubber, coffee, sugar, raw cotton, hides, tobacco, diamonds, and cocoa. Pop. 35,000.

P. is the mart through which passes the whole commerce of the Amazon and its affluents. The city was the seat of revolution during the whole of the year 1835, when a great number of lives were lost and houses destroyed, and grass grew in streets that previously had been the center of business. It is only since the year 1848 that the city can be said to have fairly entered upon the path of orderly commercial progress; and since that period, its advance has been continuous and rapid.

PARA', an important province of the empire of Brazil, in the extreme north of the country, is bounded on the N. by Guiana and the Atlantic, on the E. by Maranhao and Goyaz, on the S. by Matto Grosso, and on the W. by Amazonas. Area, 460,000 square miles; pop. (1872) 280,000. It is one of the largest provinces of Brazil—having an area nearly twice the extent of Austria—is watered by the Amazon and its great affluents the Tapajos, Xingu, and Tocantins; and forms a portion of a district—the Amazon Valley—which has been described by the most thorough explorer of this region as unequalled for richness of vegetable production and fertility of soil. The surface of the country is level, and consists of great plains, intersected by rivers, and covered with primeval forests, and in some cases with rich pasture. The climate, though warm, is not unhealthy. The precious metals, with diamonds, iron, and coal, are found, but are not worked. The

timber is valuable, and the chief crops raised upon the very limited area as yet brought under cultivation are coffee, rice, millet, and cotton.

PARA′, the name of the south arm of the Amazon, forming an outlet for that river into the Atlantic, on the southern side of the island of Marajo (q. v.). It is 200 miles in length, is 20 miles broad opposite the city of Para, and is 40 miles broad at its mouth. Its most important affluent, and the source whence it draws, perhaps, the great mass of its volume of waters, is the Tocantins. Formerly, the name Para, which is said to signify 'father of waters,' was applied in a general way to the river Amazon. At the time of the spring-tides, the *bore* rushes up the river with enormous force, forming a wave 15 feet high.

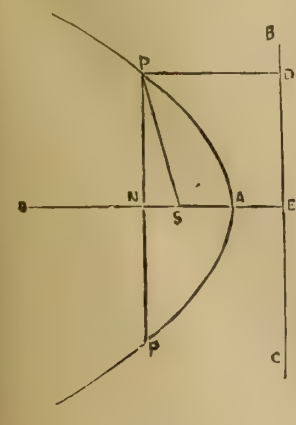
PARA′, a coin of copper, silver, or mixed metal, though most generally of copper, in use in Turkey and Egypt; it is the 40th part of a piastre, is divided into 3 aspers, and varies much in value, owing to the debased and complicated condition of the Turkish coinage. Pieces of 5 paras are also in use. The para is equal to about $\frac{1}{18}$th of a penny sterling in Turkey, and $\frac{1}{16}$th of a penny sterling in Egypt. See PIASTRE.

PARA GRASS. See PIASSABA.

PA′RABLE (Gr. *parabolé*, a comparison) was originally the name given by the Greek rhetoricians to an illustration avowedly introduced as such. In Hellenistic and New Testament Greek, it came to signify an independent fictitious narrative, employed for the illustration of a moral rule or principle. This kind of illustration is of Eastern origin, and admirable examples are to be found in the Old and New Testaments, particularly in the discourses of our Lord. It is no less interesting than curious to learn that many of Christ's parables, or at least much of his parabolic imagery, are to be found in the writings of Hillel, Shammai, and other great rabbis, as, for example, the parables of the Pearl of Great Price, the Laborers, the Lost Piece of Money, the Wise and Foolish Virgins, &c.

Among modern writers, the German divine Krummacher (q. v.) has greatly distinguished himself in this species of composition. The parable differs with the Fable (q. v.) in the probability or veri-similitude of the story itself, and agrees with it in the essential requisites of simplicity and brevity. In the course of time, the word parable came to lose its significance of figurative speech, and to mean speech generally. From the *parabola* of the Latin Vulgate, came the medieval Latin *parabolare*, whence the modern French *parler* and *parole*. An excellent work on the parables of the New Testament—probably the best in the English language—is that by Archbishop Trench.

PARA′BOLA, one of the conic sections, is produced by a plane not passing through the vertex, which cuts the cone in a direction parallel to that of a plane touching the convex surface of the cone. A little consideration will show that a section so produced cannot be a closed curve, but its two branches, though continually widening out from each other, do not diverge so rapidly as in the Hyperbola (q. v.). The nearer the cutting plane is to that which touches the cone, the less do the two branches diverge; and when the two planes coincide, the branches also coincide, forming a straight line, which is therefore the limit of the parabola. It may otherwise be considered as a curve, every point of which is equally distant from a fixed straight line and a given point; the fixed straight line is called the *directrix*, and the given point the *focus*. Thus (see fig.) PAP′ is a parabola, any point P in which is equally distant from the focus S and the directrix CB, or PS = PD. If, from S, a perpendicular, SE, be drawn to the directrix, and produced backwards, this line, AO, is the *axis* or *principal diameter* of the parabola, and the curve is symmetrical on both sides of it. As A is a point in the parabola, AS = AE, or the *vertex* of a parabola bisects the perpendicular from the focus to the directrix. All lines in a parabola which are parallel to the axis cut the curve in only one point, and are called *diameters*.



All lines, such as PP′, which cut the curve in two points, are ordinates, and the diameter to which they are ordinates, is that one which bisects them; the portion of this diameter which is intercepted between the ordinate and the curve, is the corresponding abscissa. From the property of the parabola that PS = PD, the equation to the curve may be at once deduced; for PS = PD = EN, therefore PS^2 (which = $PN^2 + NS^2$) = EN^2; hence $PN^2 = EN^2 - NS^2 = (ES + SN)^2 - NS^2 = ES^2 + 2ES \cdot SN$ = (since ES = 2AS) $4AS^2 + 4AS \cdot SN = 4AS\ (AS + SN) = 4AS \cdot AN$; and calling PN, the semiordinate, y; AN, the abscissa, x; and AS, a; the equation to the parabola becomes $y^2 = 4ax$, where a (the distance of the vertex from the focus) remains the same for all points in the same curve. It is evident from the equation, as well as from the geometrical derivation of the parabola, that it must have two, and only two branches, and that the further it is extended the nearer its branches approach to the condition of straight lines parallel to the axis, though they never actually become so. The parabola has no asymptotos, like the hyperbola, but it possesses many properties which are common to it with that curve and the ellipse. In fact, the parabola is nothing more than an ellipse, whose major axis is infinitely long.

If parallel rays of light or heat fall upon the concave surface of a paraboloidal (see PARABOLOID) mirror, they are reflected to the focus, and conversely, if a light be placed in the focus of a paraboloidal reflector, its rays will be reflected in parallel directions, and would appear equally bright at all distances did light move without deviation, and unabsorbed. Also, if a body be projected in a direction not vertical, but inclined to the direction of gravity, it would, if undisturbed by the resisting force of the atmosphere, describe accurately a parabola whose axis is vertical, and whose vertex is the highest point reached by the body (see PROJECTILES).

The term parabola is used in analysis in a general sense, to denote that class of curves in which some power of the ordinate is proportional to a lower power of the abscissa. Thus, the curve we have just described, and which is distinguished as the *common* or Apollonian parabola, has the square of its ordinate proportional to its abscissa; the *cubical* parabola has the cube of its ordinate proportional to its abscissa; and the *semi-cubical* parabola has the cube of its ordinate proportional to the square of its abscissa.

PARABOLA′NI (Gr. *parabolos*, a desperate person), a class of functionaries in the early church, by some writers reckoned as members of the clergy, and included in the ranks of the minor orders, but more probably religious associations, whose duty it was to assist the clergy, especially in the more laborious and the menial offices of religion or of charity. The etymology of the name is somewhat curious, being derived or applied from that of those desperate adventurers of the arena who hired themselves for the wild-beast fights of the amphitheater. The chief duty of the parabolani was the tending of the sick, whether in ordinary diseases or in times of pestilence. By some, the association is believed to have originated at Alexandria, and perhaps to have been peculiar to that church; but although the parabolani were certainly very numerous at Alexandria, amounting to some 500 or 600, it is beyond all question that they were also enrolled in other churches. We find them at Ephesus, at the time of the council in 449. They held the same place in regard of ministrations to the living, that the *Fossores* of Rome or the *Kopiatai* of the Greeks did in relation to the burial of the dead. The parabolani are made the subject of formal legislation by Theodosius the younger. At first they were subject to the Præfectus Augustalis, but a later decree placed them directly under the authority of the bishop.

The name parabolani must not be confounded with the epithet *parabolarius*, which the pagans applied to the Christian martyrs, from the recklessness with which they gave their lives for their faith.

PARA′BOLOID, a sold figure traced out by a Parabola (q.v.) revolving round its principal axis. Sections of this solid parallel to the principal axis are parabolas, and those perpendicular to it, circles. The term 'paraboloidal,' for which 'parabolic' is frequently but improperly substituted, is applied either to bodies having the form of a paraboloid, or to concave surfaces which seem to have taken their peculiar hollow shape from the impress of a paraboloidal body.

PARACE′LSUS. About the end of the 15th c. there lived in the small town of Marien-Einsedeln, near Zurich in Switzerland, William Bombast von Hohenheim, a physician and chemist; he was married to the lady-superintendent of the hospital attached to the convent of Einsedeln; they had an only son, Philip Aureolus Theophrastus, born, it is thought, about 1493. The name Paracelsus, by which he is now known, is a rude rendering into Greek and Latin of his patronymic. It seems doubtful if he ever attended any regular school, but he received from his father the rudiments of Latin, and whatever else he could teach. He soon took to roaming, and even pursued his travels into Asia and Africa. How he maintained himself during his pilgrimage is unknown; probably by necromancy and quack cures—that is, proclaiming he had certain specifics, and bargaining for the amount he was to receive if he performed a cure. He was a diligent chemist, investigating the processes of the preparation of metals, and making experiments as to their medicinal virtues; also to discover the philosopher's stone. As a chemist he lived with Sigismund Fugger, one of a family celebrated for its patronage of art

and science. His cures, real or pretended, became noised abroad, and he was called to prescribe for all the great men of his day.

When he was thirty-three, he boasted of having cured thirteen princes, whose cases had been declared hopeless. He was then at his zenith, and at the recommendation of Ecolampadius was appointed professor of physic and surgery at Basel. He commenced his academic career by publicly burning Galen's works, exclaiming Galen did not know as much as *his* shoe-latchets. 'Reading never made a physician,' he said; 'countries are the leaves of nature's code of laws—patients his only books.' His class-room at first was full to overflowing, but was soon deserted, and he fell into habits of excessive intemperance; indeed his secretary asserts he was drunk every day; never undressed, and went to bed with his famous sword by his side, which he would draw, and flourish about the room. The reason of his departure from Basel was, that a certain dignitary, suffering from gout, in his agony sent for Paracelsus, and promised to give him 100 florins if he cured him. Paracelsus gave him three *laudanum* pills; the canon felt comfortable, and the doctor claimed his fee, but the churchman refused to pay. Paracelsus took him into court, but the judge decided against the professor, who lost his temper, and abused the legal functionary in such a manner that the matter was taken up by the town council, and ended in the expulsion of Paracelsus. He recommenced his wanderings. Wherever he went he excited the regular faculty to a state of violent hatred, not wholly undeserved. At Salzburg he had given offence in the usual way, and the result was, 'he was pitched out of the window at an inn by the doctor's servants, and had his neck broken by the fall.' This took place in 1541.

That a man whose life was such an incoherent medley should exert an influence for centuries after his death, may well be a matter of surprise, but he and the age were fitted for each other. He struck the weak point of the prevailing system of medicine; he appealed to the public as to whether it were not a false system that could only lead to failure, and he proposed a system of his own, which, though shrouded in absurdity and obscurity, inaugurated a new era of medicine. The prominent idea of his system is, that disease does not depend upon an excess or deficiency of bile, phlegm, or blood, but that it is an actual existence, a blight upon the body subject to its own laws, and to be opposed by some specific medicine. See the works of Paracelsus; also of Schulz (1831); Lessing (1839); Mook (Würzb. 1876); and Russell (*History and Heroes of Medicine*, 1861).

PA'RACHUTE (Fr. *chute*, a fall), a machine invented for the purpose of retarding the velocity of descent of any body through the air, and employed by aëronauts as a means of descending from balloons. It is a gigantic umbrella, strongly made, and having the outer extremities of the rods, on which the canvas is stretched, firmly connected by ropes or stays to the lower part of the handle. The handle of the parachute is a hollow iron tube, through which passes a rope connecting the balloon above with the car (in which are the aëronauts and their apparatus) beneath, but so fastened, that when the balloon is cut loose, the car and parachute still remain connected. When the balloon ascends, the parachute collapses like an umbrella; but when the balloon rope is severed, and the car begins to descend, the parachute is extended by the action of the air, and prevents the car from acquiring a dangerous velocity of descent; the final velocity in those cases where the machine is of a size proportioned to the weight it has to support, being no more than would be acquired by a person leaping from a height of between two and three feet. But the slightest derangement of the parachute's equilibrium, such as might be caused by a breath of wind, or the smallest deviation from perfect symmetry in the parachute itself, immediately produces an oscillatory motion of the car, having the apex of the parachute as a center, and the oscillations becoming gradually greater and more rapid, the occupants of the car are in most cases either pitched out, or are along with it dashed on the ground with frightful force.

This defect in the parachute has been attempted to be remedied in various ways, but hitherto without success. The first successful experiment with the parachute was made by Blanchard at Strasburg in 1787, and the experiment has been often repeated by Garnerin and others; very frequently, however, with fatal results.

The parachute was employed by Captain Boxer, R.N., as an essential part of his patent light-ball, for discovering the movements of an enemy at night, and was so arranged as to open up when the lighted ball had attained its greatest elevation, so as to keep it for a considerable period almost suspended in the air.

PARA'DE (from *parare*) signified in its original sense a prepared ground, and was applied to the courtyard of a castle, or to any enclosed and level plain. From the practice of reviewing troops at such a spot, the review itself has acquired the name of parade. In its modern military acceptation, a *parade* is the turning out of the garrison, or of a regiment in full equipment, for inspection or evolutions before some superior officer. It is the boast of British troops that their line and discipline are as perfect under an enemy's fire as on the parade ground.

PA'RADISE. See EDEN.

PARADISE, BIRD OF. See BIRD OF PARADISE.

PARADOS—another name for Traverse—is an intercepting mound, erected in various parts of a fortification for the purpose of protecting the defenders from a rear or ricochet-fire. See FORTIFICATION.

PA'RADOX (Gr. *para*, beside, or beyond, and *doxa*, an opinion), a term applied to whatever is contrary to the received belief. Cicero, in his book on paradoxes, states that the Stoics called by this name all those unusual opinions which contradict the notions of the vulgar. It follows from this that a paradox is not necessarily an opinion contrary to truth. There have been bold and happy paradoxes whose fortune it has been to overthrow accredited errors, and in the course of time to become universally accepted as truths. It is, perhaps, even one of the prerogatives of genius to bring such into the world, and thereby to alter the character of an art, a science, or a legislation; but this, the highest form of paradox, which is only another name for originality of thought, or for novelty of scientific discovery, is rare. The paradox which springs from a passion for distinction, and which, in its efforts to achieve it, despises good sense and the lessons of experience, is far more frequent. It may not be at bottom a positive error in thought, but it is so exaggerated in expression, that if taken literally it actually does mislead. This is the besetting sin of the brilliant and epigrammatic class of writers, abundant examples of which are to be found in modern French literature.

PA'RAFFIN is the name given to several closely-allied substances, which are composed of mixtures of polymeric hydrocarbons, of the olefiant gas series (that is to say, of the formula $C_{2n}H_{2n}$), and are obtained from the dry distillation of wood, peat, bituminous coal, wax, &c. P. is particularly abundant in beech tar, but according to Reichenbach, to whom its name (which is formed from *parum affinis*, 'little allied,' in consequence of its resisting the action of the strongest acids and alkalies) is due, and who may be regarded as its discoverer; it is also found in the tar of both animal and vegetable substances. At ordinary temperatures paraffin is a hard, white, crystalline substance, devoid of taste or odor, and resembling spermaceti, both to the touch and in appearance. The paraffin obtained from wood fuses at about 111°, but the varieties obtained from other substances have considerably higher boiling-points. When carefully heated, it sublimes unchanged at a little below 700°. It dissolves freely in hot olive oil, in oil of turpentine, in benzol, and in ether, but it is only slightly soluble in boiling alcohol, and is quite insoluble in water. It does not burn readily in the air, unless with the addition of a wick, when it evolves so brilliant and smokeless a flame that it has been applied to the manufacture of candles, which rival those made of the finest wax. The main supply of the paraffin of commerce is obtained in this country, from the Boghead cannel-coal, and from the bituminous shale of West Calder. See NAPHTHA. A bituminous shale near Bonn supplies much of the continental demand.

PARAFFIN OIL is the term applied to the oily matter which is given off in large quantity in the distillation of Boghead cannel-coal. By rectification it may be separated into three portions, one of which remains liquid at very low temperatures, boils at about 420°, and is much used under a variety of names for illuminating purposes, while a mixture of the two less volatile portions (which may be regarded as composed of paraffin dissolved in a mixture of hydrocarbons of nearly the same composition as paraffin) is largely employed for the purpose of lubricating machinery, for which it is admirably adapted by its power of resisting the oxidizing action of the atmosphere, and by its very slow evaporation. See NAPHTHA.

PARAGUAY', a republic of South America. Its frontiers, previous to the war of 1865—1870, were not well defined, but on its conclusion were fixed by treaty. P. now extends from 22° to 27° 30′ S. lat., and from 54° 32′ to 58° 40′ W. long., forming the peninsula between the rivers Paraguay and Parana. It is bounded N. and N.E. by Brazil, S.E., S., and S.W. by the Argentine Confederation, and N.W. by Bolivia. Its area previous to the war was about 103,148 square miles, and is now variously estimated at from 57,000 to 90,000 square miles. Before the war, the population was variously estimated at from 450,000 to 1,300,000, consisting of whites of Spanish descent, native Indians, negroes, and a mixture of these several races. In 1873, it had fallen to 221,079; in 1876, it was 293,844. A mountain-chain called Sierra Amambay, running in the general direction of from north to south, and bifurcating to the east and west towards the southern extremity, under the name of Sierra Maracayu, divides the tributaries of the Parana from those of the Paraguay, none of which are very

considerable, although they are liable to frequent and destructive overflows.

The northern portion of P. is in general undulating, covered by low, gently-swelling ridges, separated by large grass plains, dotted with palms. There are mountains in the north-east and north-west corners. The southern portion is one of the most fertile districts of South America, consisting of hills and gentle slopes richly wooded, of wide savannahs, which afford excellent pasture-ground, and of rich alluvial plains, some of which, indeed, are marshy, or covered with shallow pools of water (only one lake, that of Ypoao, deserving special notice), but a large proportion are of extraordinary fertility and highly cultivated. The banks of the rivers Parana and Paraguay are occasionally belted with forest; but, in general, the low lands are destitute of trees. The climate, for a tropical country, is temperate, the temperature occasionally rising to 100° in summer, but in winter being usually about 45°. In geological structure, the southern part belongs generally to the tertiary formation; the north and east presenting greywacke rocks in some districts. The natural productions are very varied, although they do not include the precious metals or other minerals common in South America. Much valuable timber is found in the forests, and the wooded districts situated upon the rivers possess a ready means of transport. Among the trees are several species of dye-wood, several trees which yield valuable juices, as the India-rubber and its cognate trees; and an especially valuable shrub called the *Máté* (q. v.), or Paraguay tea-tree, which forms one of the chief articles of commerce, being in general use throughout La Plata, Chili, Peru, and other parts of South America. The tree grows wild in the north-eastern districts, and the gathering of its leaves gives employment in the season to a large number of the native population. Many trees also yield valuable gums. Wax and honey are collected in ambundance, as is also cochineal, and the medicinal plants are very numerous.

The chief cultivated crops are maize, rice, coffee, indigo, mandioc, tobacco, sugar-cane, and cotton. Nearly three-fourths of the land is national poperty, consisting partly of the lands formerly held by the Jesuit missions, partly of lands never assigned to individuals, partly of lands confiscated in the course of the revolutionary ordeal through which the country has passed. The national estates have, for the most part, been let out in small tenements, at moderate rents. Under the dictator Francia (1814—1840), agriculture made considerable progress, and the breed of cattle and horses was much improved, and the stock increased. The few manufactures are sugar, rum, cotton, and woollen cloths, and leather. The commerce of the country is chiefly in the hands of the government, which holds a monopoly of the export of P. tea. In 1880, the total value of the exports was £252,000; of imports somewhat less. The chief exports were mâté, tobacco, hides, oranges, and bark for tanning; imports, cotton goods, wine, grain, rice, linen, silk, petroleum, &c. Till the war of 1865—1870, P. had no national debt, but its terrible losses compelled it then to contract obligations amounting to upwards of £47,000,000. Three millions were contracted in England on the security of the public lands of P., estimated at upwards of £19,000,000; but payment of interest and sinking fund ceased in 1874, and prior to that was paid directly out of the capital. The military force, which, during the five years' war, was raised to 60,000 men, has now been reduced to 500. The established religion is the Roman Catholic, the ecclesiastical head of which is the Bishop of Asuncion. Education is very widely diffused; and it is said that there are but few of the people who are not able to read and write.

The history of P. is highly interesting. It was discovered by Sebastian Cabot in 1526, but the first colony was settled in 1535 by Pedro de Mendoza, who founded the city of Asuncion, and established P. as a province of the viceroyalty of Peru. The warlike native tribe of the Guaranis, however, a people who possessed a certain degree of civilization, and professed a dualistic religion, long successfully resisted the Spanish arms, and refused to receive either the religion or the social usages of the invaders. In the latter half of the 16th c., the Jesuit missionaries were sent to the aid of the first preachers of Christianity in P.; but for a long time they were almost entirely unsuccessful, the effect of their preaching being in a great degree marred by the profligate and cruel conduct of the Spanish adventurers, who formed the staple of the early colonial population. In the 17th c. the home government consented to place in their hands the entire administration, civil as well as religious, of the province; which, from its not possessing any of the precious metals, was of little value as a source of revenue; and in order to guard the natives against the evil influences of the bad example of European Christians, gave to the Jesuits the right to exclude all other Europeans from the colony. From this time forward the progress of civilization as well as of Christianity was rapid. The legislation, the administration, and the social organization of the settlement were shaped according to the model of a primitive Christian community; or rather of many communities under one administration; and the accounts which have been preserved of its condition, appear to present a realization of the ideal of a Christian Utopia.

On the expulsion of the Jesuits from P. in 1768, the history of which is involved in much controversy, the province was again made subject to the Spanish viceroys. For a time the fruits of the older civilization maintained themselves; but as the ancient organization fell to the ground, much of the work of so many years was undone; the communities lapsed into disorganization, and by degrees much of the old barbarism returned. In 1776, P. was transferred to the newly-formed viceroyalty of Rio de la Plata; and in 1810 it joined with the other states in declaring its independence of the mother kingdom of Spain, which, owing to its isolated position, it was the earliest of them all to establish completely. In 1814, Dr. Francia (q. v.), originally a lawyer, and the secretary of the first revolutionary junta, was proclaimed dictator for three years; and in 1817, his term of the office was made perpetual. He continued to hold it till his death in 1840, when anarchy ensued for two years; but, in 1842, a national congress elected two nephews of the dictator, Don Alonso and Don Carlos Antonio Lopez, joint consuls of the republic. In 1844, a new constitution was proclaimed, and Don Carlos was elected sole president, with dictatorial power which he exercised till his death in 1862, when he was succeeded by his son, Don Francisco Solano Lopez, whose name has become notorious in connection with the tragic struggle of 1865—1870, in which the Paraguayans made a heroic but unavailing fight against the combined forces of Brazil, the Argentine Confederation, and Uruguay. The war was brought to a close by the defeat and death of Lopez at the battle of Aquidaban, March 1st 1870. In June 1870, a congress voted a new constitution, which was proclaimed on the 25th Nov. It is modelled on that of the Argentine Confederation, the legislative authority being vested in a congress of 2 houses, and the executive in a president, elected for 6 years. P. was till 1876 partially occupied by Brazilian troops, and was virtually a Brazilian province.

The central department, in which the capital, Asuncion, is situated, contains nearly one-third of the whole inhabitants; and the capital itself, 10,000 to 20,000. Asuncion is connected by railway with Paraguari. The inhabitants of the towns consist chiefly of whites, or of half-breeds, speaking Spanish. The native population of the provinces are chiefly Guaranis, speaking the Guarani language.

PARAGUAY, an important river of South America, an affluent of the Parana (q. v.), rises in the Brazilian province of Matto Grosso, on a plateau of red sandstone, in lat. 13° 30′ S., long. about 55° 50′ W., 9535 feet above sea-level. The sources of the river are a number of deep lakes, and eight miles from its source the stream already has considerable volume. Pursuing a south-west course, and after flowing through a level country covered with thick forests, the P. is joined from the west by the Jauru, in lat. 16° 30′ S. It then continues to flow south through the Marsh of Xarayes, which, during the season when the stream rises, is an expansive waste of waters, stretching far on each side of the stream, and extending from north to south over about 200 miles. The river still pursues a circuitous but generally southward course, forming from 20° to 22° S. the boundary-line between Brazil and Bolivia, thence flowing south-south-west through the territories of Paraguay to its junction with the Parana, in lat. 27° 17′ S., a few miles above the town of Corrientes. Its chief affluents are the Cuayba, Tacoary, Mondego, and Apa on the left, and the Jauru, Pilcomayo, and Vermejo on the right. Except in the marshy districts, the country on both banks of the river is rich and fertile, and abounds in excellent timber. The entire length of the river is estimated at 1800 miles; it is on an average about half a mile in width, and is navigable for steamers to the mouth of the Cuyaba, 100 miles above the town of Corumba. The waters of the P., which are quite free from obstructions, were declared open to all nations in 1852; and now Brazilian mail-steamers ply monthly between Monte Video and Cuyaba on the river of the same name, one of the head-waters of the P.; and there are several lines of steamers between Buenos Ayres and Asuncion.

PARAGUAY TEA. See MATÉ.

PARAHI'BA, one of the most eastern maritime provinces of Brazil, bounded on the N. by Rio Grande do Norte, on the S. by Pernambuco, on the W. by Ceara, and on the E. by the Atlantic. Area, 31,500 sq. m.; pop. (1872) 376,226. It is traversed by a river of the same name, by a number of smaller streams, and by mountainous ridges, between which are valleys, the soils of which are, for the most part, dry and sandy. Cotton of excellent quality, mandioc, and tobacco are grown; and cotton, sugar, and timber are exported. Capital, Parahiba (q. v.).

PARAHIBA, a seaport of Brazil, capital of the province, and situated on the river of the same name, about 10 miles from the sea. Besides the cathedral, it contains a number of religious houses, two colleges, and other educational institutions. The

port is good for small vessels, and the coasting-trade is large. Pop. 15,000.

PA'RALLAX is the apparent displacement of an object caused by a change of place in the observer. When an object at M is looked at from P, it appears in line with some object, S; but after the observer has moved to E, M has apparently retrograded to a position in line with S'; this apparent retrogression is denominated *parallax*. The angle PME is called the 'angle of parallax,' or the 'parallactic angle,' and is the measure of the amount of



Fig. 1.

parallax. To astronomers, the determination of the parallax of the heavenly bodies is of the utmost importance, for two reasons —first, from the necessity of referring all observations to the earth's center, i. e., so modifying them as to make it appear as if they had been actually made at the earth's center; and secondly, because parallax is our only means of determining the magnitude and distance of the heavenly bodies. The *geocentric* or *daily* parallax—as the apparent displacement of a heavenly body, due to its being observed from a point on the surface of the earth instead of from its center, is called—is determined as follows: Let P and P' be two stations on the surface of the earth (fig. 2), E its center, M the

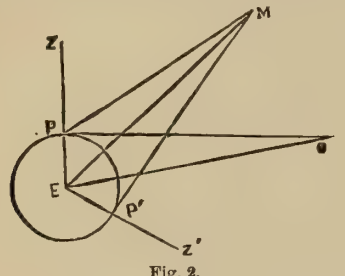


Fig. 2.

object to be observed, and Z and Z' the zeniths respectively of the observers at P and P' (points which, if possible, should be on the same meridian exactly); then at P and P' let the *zenith distances*, ZPM and Z'P'M, be observed simultaneously, and since the latitudes of P and P', and consequently their difference of latitude, or the angle PEP', is known, from these three the angle PMP' (the sum of the parallaxes at P and P') is at once found; and then, by a trigonometrical process, the separate angles or parallaxes PME and P'ME.

When the parallax of M, as observed from P, is known, its distance from E, the center of the earth, can be at once found. When the heavenly body is on the horizon, as at O, its parallax is at a maximum, and is known as the *horizontal* parallax. The geocentric parallax is of use only in determining the distances of those heavenly bodies at which the earth's radius subtends a considerable angle; and as the moon and Mars (when in opposition) are the only such bodies, the parallax of the other celestial bodies must be determined in a different manner. The parallax of the Sun (q. v.) is found by observation of the *transit* of Venus across his disk, a much more accurate method than that above described. The parallaxes of the other planets are easily determined from that of Mars.

In the case of the fixed stars, at which the earth's radius subtends an infinitesimal angle, it becomes necessary to make use of a much larger base-line than the earth's radius, and as the largest we can employ is the radius of the earth's orbit, it accordingly is made use of, and the displacement of a star, when observed from a point in the earth's orbit instead of from its center, the sun, is called the *annual* or *heliocentric* parallax. Here the base-line instead as in the former case, of being 4000 miles, is about 92,000,000 miles, and the two observations necessary to determine the parallactic angle are made from two points on opposite sides of the earth's orbit, at an interval as nearly as possible of half a year. Yet, notwithstanding the enormous length of the base-line, it bears so small a proportion to the distances of the stars, that only in three or four cases have they been found to exhibit any parallactic motion whatever, and in no case does the angle of parallax amount to 1" (see STARS). The geocentric horizontal parallax of the moon is about 57' 4"·2 ; that of the sun, about 8"·6; and of the double star, 61 *Cygni*, the heliocentric parallax has been determined by Bessel to be ·348", equivalent to about 15 millionths of a second of geocentric horizontal parallax. Parallax affects every observation of angular measurement in the heavens, and all observations must be corrected for parallax, or, in astronomical phrase, referred to the earth's center before they can be made use of in calculation. The position of a body, when noted from the surface of the earth, is called its *apparent* position; and when referred to the center, its *real* position.

PA'RALLEL FORCES are those forces which act upon a body in directions parallel to each other. Every body, being an assemblage of separate particles, each of which is acted on by gravity, may thus be considered as impressed upon by a system of parallel forces. The following demonstration will exhibit the mode in which the amount and position of the resultant force are found: Let P and Q be two parallel forces acting at the points A and B respectively, either in the same (fig. 1) or in opposite (fig. 2) directions; join AB, and in this line, at the points A and B,

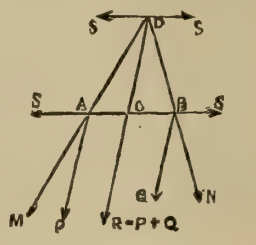


Fig. 1.

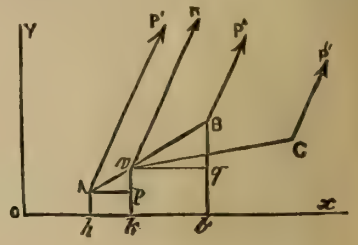


Fig. 2.

apply the equal and opposite forces S and S, which counterbalance each other, and therefore do not affect the system. Find M and N (see COMPOSITION AND RESOLUTION OF FORCES), the resultants of P and S, and Q and S respectively, and produce their directions till they meet in D, at which point let the resultants be resolved parallel to their original directions; then there are two equal forces, S and S, acting parallel to AB, but in opposite directions, and thus, as they counterbalance each other, they may be removed. There then remain two forces, P and Q, acting at D, in the line DC, parallel to their original directions, and their sum (fig. 1) or difference (fig. 2), represented by R, is accordingly the resultant of the original forces at A and B. To find the position of C, the point in AB, or AB produced, through which the resultant passes, it is necessary to make use of the well-known property denominated the *Triangle of Forces* (q. v.), according to which three forces S, M, and P are proportional to the lengths of AC, AD, DC, the sides of the triangle ADC; then S : P : : AC : CD, similarly Q : S : : DC : CB, therefore Q : P : : AC : BC, and Q ± P or R : P : : AC ± BC or AB : BC, from which proportions we derive the principle of the lever, $P \times AC = Q \times BC$, and also that $R \times BC = P \times AB$, whence $BC = \frac{P}{R} \times AB$, and the point C is found. The failing case of this proposition is when P and Q acting in opposite parallel directions at different points are equal, in which case the resultant $R = Q - P = Q - Q = 0$.

In all other cases there is a progressive motion, such as would be caused by the action of a single force R(=Q ± P) acting at the point C in the direction CR; but in the failing case, since R = 0, there is no progressive motion, but a rotatory movement round the center of AB. See COUPLE. It is of no consequence whether

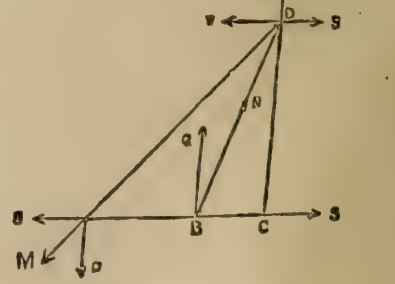


Fig. 3.

A and B be the true points of application of the forces P and Q, provided their directions when produced pass through these points, and the point of application of the resultant need not be in the line joining the points of application of the component forces, but its direction must when produced pass through C. If there be more than two parallel forces, the resultant of the whole is found by compounding the resultant of the first two with the third in the way given above, thus obtaining a new resultant, which is similarly combined with the fourth force; and so on till the final resultant is found. The center of gravity is only a special name for the point of application of the final resultant of a number of parallel forces.

PARALLELEPI'PED (Gr.), frequently, but improperly written *Parallelopiped*, is a solid figure having six faces, the faces being invariably parallelograms, and any two opposite faces equal, similar, and parallel. If the faces are all squares, and consequently equal, the parallelepiped becomes a cube. The volume of a parallelepiped is found by multiplying the area of one face by its distance from the opposite one.

PARALLE'LOGRAM, in Mathematics, is a quadrilateral rectilineal figure which has its opposite sides parallel; the opposite sides are therefore equal, and so are the opposite angles. If one angle of a parallelogram be a right angle, all its angles are right angles, and the figure is then called a *rectangular parallelogram*, or shortly, a *rectangle;* and if at the same time all the sides are equal, the figure is a *square*, otherwise it is an *oblong*. If the angles are not right angles, but all the sides are equal, it is called a *rhombus;* and if the opposite sides only are equal, a *rhomboid*. The two lines which connect the opposite corners of a parallelogram are called its *diagonals*, each bisects the parallelogram, and they bisect each other; the sum of their squares also is equal to the sum of the squares of the sides of the parallelogram.

All parallelograms which have equal bases and equal altitudes are equal in area, whether they be similar in shape or not, and the area of a parallelogram is found by multiplying its base by the height.

PARALLELOGRAM OF FORCES. See COMPOSITION OF FORCES.

PARALLELS, in Military language, are trenches cut in the ground before a fortress, roughly parallel to its defences, for the purpose of giving cover to the besiegers from the guns of the place. The parallels are usually three, with zigzag trenches leading from one to another. The old rule used to be to dig the first at 600 yards distance, but the improvements in artillery have rendered a greater distance necessary; and at Sebastopol, the allies made their first trench 2000 yards from the walls. The third trench is very near to the besieged works, and from it saps and zigzag approaches are directed to the covertway.—The bearing of parallels in the general conduct of a SIEGE will be found described under that head.

PARALLELS or CIRCLES OF LATITUDE are circles drawn round the surface of the earth parallel to the equator. They may be supposed to be the intersections with the earth's surface of planes which cut the earth at right angles to its axis. The greatest of these circles is the equator, which has the center of the earth for its center, the radius for its radius, and is equally distant at all points from each pole. It is evident that of the others, those next the equator are greater than those more remote, and that they become less and less till at the poles they vanish altogether. The radius of any one circle is evidently equal to the earth's radius multiplied into the cosine of its latitude or distance from the equator. The rotary velocity of the earth's surface, which is about 17½ miles per minute at the equator, is only 8¾ miles in lat. 60°, in lat. 82½° (the most northerly point yet reached) is only 2½ miles; and in lat. 89½° (within 35 miles of the pole) is not more than 267 yards per minute.

The most important parallels of latitude are the *Tropics of Cancer* (23° 28′ N. lat.) and *Capricorn* (23° 28′ S. lat.), and the *Arctic* (66° 32′ N. lat.) and *Antarctic Circles* (66° 32′ S. lat.).

PARA'LYSIS (Gr., a loosing or relaxing), or PALSY, is a loss, more or less complete, of the power of motion; but by some writers the term is employed to express also loss of sensation. When the upper and lower extremities on both sides, and more or less of the trunk, are involved, the affection is termed *General Paralysis*. Very frequently only one-half of the body laterally is affected, the other side remaining sound; to this condition the term *Hemiplegia* is given. When the palsy is confined to all parts below an imaginary transverse line drawn through the body, or to the two lower extremities, the condition is termed *Paraplegia*. When one part of the body, as a limb, one side of the face, &c., is exclusively attacked, the affection is known as *local palsy*. In some cases the loss of sensation and the power of motion in the paralyzed part is entire, while in others it is not so. In the former the paralysis is said to be *complete*, in the latter, *partial*.

In most cases, but not invariably, sensibility and motion are simultaneously lost or impaired. When motion is lost, but sensation remains unimpaired, the affection has received the name of *akinesia* (Gr. *a*, not, and *kinesis*, motion). More rarely, there is a loss of sensibility while the power of motion is retained; and to such cases the term *anæsthesia* (Gr. *a*, not, and *aisthesis*, sensation) is applied. This affection occurs most frequently in the organs of sense; and in the tongue, for example, in which the sense of taste may be lost, without any defect of movement.

Paralysis is in most cases a mere symptom of disease existing in some other part than that apparently affected; as, for example, in the brain or spinal cord, or in the conducting nerves between either of these organs and the palsied organ. Sometimes, however, it is a purely local affection, depending upon a morbid condition of the terminal extremities of the nerves. The varieties in the condition of the brain and spinal cord which occasion paralysis are somewhat numerous; as, for example, congestion, hemorrhagic and serous effusion, softening, fatty degeneration, fibrinous exudation, suppuration, hydatids, various morbid growths, depressed bone from external violence, &c. It is highly probable, also, that palsy may sometimes result from mere functional disorder of the nervous centers—a view which is confirmed by the fact that a *post mortem* examination of a patient who has suffered from this affection sometimes fails to detect any apparent lesion. Paralysis may originate in a nervous trunk, if it is compressed by a tumor, or otherwise mechanically affected, or if it is the seat of morbid action tending in any way to disorganize it; or it may be due to an abnormal condition of the terminations of the nerves, which may be rendered unfit for receiving impressions either from the external world or from the brain by prolonged disuse, by continuous or severe pressure, by exposure to cold, by disorganization of their own tissue, or by the depressing action of various metallic poisons, especially lead.

We shall briefly notice the symptoms and causes of the most important forms of paralysis, before offering any remarks on the general principles of treatment. *Hemiplegia* (Gr. *hemi*, half, *plesso*, I strike) affects one *lateral half* of the body, and is that form of palsy to which the term *paralytic stroke* is commonly applied. The parts generally affected are the upper and lower extremities, the muscles of mastication, and the muscles of the tongue on one side. In a well-marked case the patient when seized falls to the ground, all power of motion in the affected arm and leg being lost. The palsy of the face which accompanies hemiplegia is usually quite distinct from the affection known as *facial palsy*, which is an affection of the facial nerve or *portio dura*. See NERVOUS SYSTEM. It is the motor branches of the fifth or trifacial nerve going to the muscles of mastication which are generally involved in hemiplegia, and consequently the cheek is flaccid and hangs down, and the angle of the mouth is depressed on the affected side. The tongue when protruded points towards the paralyzed side, and there is often imperfect articulation, in consequence of the lesion commonly affecting the hypoglossal nerve. Hemiplegia may arise from lesions of various kinds, as, for example, (1) from hemorrhage, or some other morbid change in the brain, in which case the palsy is on the side of the body opposite to the lesion, in consequence of the decussation or crossing over of nervous fibres from one side to the other that occurs at the upper part of the Spinal Cord (q. v.); (2) from spinal disease below the point of decussation just noticed; in this case the palsy, and the lesion causing it, are on the same side of the body. It is also sometimes associated with hysteria, epilepsy, and chorea, but in these cases it usually disappears in a few hours.

Paraplegia (Gr.) is usually confined to the two lower extremities, but the muscles of the lower part of the trunk and of the bladder and rectum are sometimes affected. There are at least two distinct forms of paraplegia, viz. (1) Paraplegia dependent on primary disease of the spinal cord or its membranes, and especially on Myelitis (q. v.); and (2) Reflex Paraplegia, i. e., paraplegia consequent on disease of the kidneys, bladder, urethra, prostate womb, &c. These two forms of paraplegia differ in many of their phenomena, and the most important of these points of difference have been arranged in a tabular form by Dr. Brown Sequard, in his *Lectures on Paralysis of the Lower Extremities*, to which we must refer for the best information on this form of palsy. Paraplegia usually comes on slowly, with a gradual increase of its symptoms. The reflex form is, of course, by far the most favorable, as it usually abates spontaneously on the subsidence of the primary disease.

Facial Palsy, although locally affecting only a small part of the body, is a disorder of sufficient importance to require a definite notice. In this affection there is a more or less perfect loss of power over all the muscles supplied by the *portio dura*, or facial nerve. The following graphic account of the appearance of the patient is condensed from Dr. Watson's *Lectures on the Practice of Physic*. From one-half of the countenance all power of expression is gone; the features are blank, still, and unmeaning; the eyelids apart and motionless. The other half retains its natural cast, except that, in some cases, the angle of the mouth on that side seems drawn a little awry, in consequence of the want of counterpoise from the corresponding muscular fibres of the palsied side. The patient cannot laugh, or weep, or frown, or express any feeling or emotion with one side of his face, while the features of the other may be in full play, nor can he spit or whistle properly. One-half of the aspect, with its unwinking eye, its fixed and solemn stare, might be that of a dead person; the other half is alive and merry.

To those who do not comprehend the possible extent of the misfortune, the whimsical appearance of the patient is a matter of mirth and laughter; while on the other hand, his friends imagine that he has had a stroke, and that he is in a very dan-

gerous state. The nerve may be unable to discharge its duties in consequence of disease within the cavity of the skull, and in that case there is very serious danger; but in the great majority of cases the nervous function is interrupted in that part of the *portio dura* which lies encased in the temporal bone, or in the more exposed part which issues in front of the ear; and hence this form of palsy is generally unattended with any danger to life. It may arise from various causes. Sometimes it is the consequence of mechanical violence, sometimes of tumors pressing on it in the region of the parotid gland, and it very frequently arises from the mere exposure of the side of the face for some time to a stream of cold air.

It yet remains to notice certain kinds of paralysis which differ either in their characters, or in their causes, from those which have been already described—viz., *Shaking Palsy*, or *Paralysis Agitans;* and the palsies induced by various poisons. *Shaking Palsy* has been defined as 'involuntary tremulous motion, with lessened muscular power in parts not in action, and even when supported; with a propensity to bend the trunk forwards, and to pass from a walking to a running pace; the senses and intellect being uninjured.' It is chiefly an affection of old age, and often goes no further than to cause an unceasing nodding and wagging of the head in all directions. Somewhat analogous to this form of palsy is that peculiar kind of trembling which is often noticed in persons who are much exposed to the vapor of mercury; *Mercurial Tremor*, as it is termed by the physicians, and *The Trembles*, as the patient usually calls it. It consists in a convulsive agitation of the voluntary muscles, especially when an attempt is made to cause them to act under the influence of the will; a patient with this affection walks with uncertain steps, his limbs trembling and dancing as if they had been hung upon wires.

When sitting down he exhibits little or no indication of his disease, but on rising he cannot hold his legs steady, nor direct them with precision; and in severe cases he falls to the ground if not supported. The arms are similarly agitated, and the tongue is usually so tremulous as to render the articulation hurried and unnatural. The disease is especially common in artisans employed in the gilding of metals, and particularly of silver, by means of heat; it is also frequent among the workers of quicksilver mines, in which the crude metal is purified by heat. The time required for the production of the disease varies extremely in different cases (according to Dr. Watson, from two years to five-and-twenty). The duration of the complaint is considerable; it may last two or three months, or longer, but it is seldom fatal.

The palsy arising from the absorption of lead has been already noticed in the article LEAD-POISONING.

A specific form of paralysis of the lower extremities, consequent on the use of flower from the beans of the *Lathyrus sativus*, is common in certain parts of India and in Thibet. The ripe bean is an ordinary article of food when made into flour, but it is generally used with wheat or barley flour; it is only when it exceeds one-twelfth part that it is at all injurious, and when it exceeds one-third that the paralysis sets in. Other species of *Lathyrus* have been known occasionally to induce similar symptoms in European countries.

We shall enter into no details regarding the treatment of hemiplegia and paraplegia, as the management of these serious affections should be exclusively restricted to the physician. When a patient has an attack of hemiplegia (or a *paralytic stroke*) all that should be done before the physician arrives is to place him in a horizontal position, with the head slightly raised, and to remove any impediments presented by the dress to the free circulation of the blood. Should the physician not arrive in an hour or two, it may be expedient to give the patient a sharp purge (half a scruple of calomel, followed in a few hours by a black draught, if he can swallow; and two drops of croton oil, mixed with a little melted butter, and placed on the back of his tongue, if the power of deglutition is lost), and without waiting for its action, to administer an injection (or clyster) consisting of half an ounce of oil of turpentine suspended (by rubbing it with the yoke of an egg) in half a pint of thin gruel; and cold lotions may be applied to the head, especially if its surface be hot. The question of blood-letting—the universal treatment a quarter of a century ago—must be left solely to the physician. It should, however, be generally known, that if the patient be cold and collapsed; if the heart's action be feeble and intermittent, if there be an anæmic state; if the patient be of advanced age; if there is evidence of extensive disease of the heart or arterial system; or lastly, if there is reason, from the symptoms, to believe that a large amount of hemorrhage has already taken place in the brain; these singly, and *a fortiori* conjointly, are reasons why blood should not be abstracted.

Facial palsy, unless the seat of the disease be within the cavity of the cranium, will usually yield in the course of a few weeks to cupping, and blistering behind the ear of the affected side, purgatives, and small doses of corrosive sublimate (one-twelfth of a grain three times a day, combined with a little of the compound tincture of bark), which must be stopped as soon as the gums are at all affected. Exposure to cold air must be carefully avoided during treatment.

Little or nothing can be done to cure *Paralysis Agitans*. In the treatment of *Mercurial Tremor*, the first step is to remove the patient from the further operation of the poison, while the second is to remove the poison already absorbed into the system, which is effected by the administration of iodide of potassium. This salt combines with the metallic poison in the system, and forms a soluble salt (a double iodide of mercury and potassium), which is eliminated through the kidneys. Good food and tonics (steel or quinia, or the two combined) should be at the same time freely given.

The writer of this article has no personal knowledge of the treatment that should be recommended in the paralysis produced by the use of *Lathyrus sativus*, but cases are reported which seem to have been benefited by good diet, tonics, strychnia, and the application of blisters to the loins.

PARAMAGNETISM, as opposed to Diamagnetism. See DIAMAGNETISM.

PARAMA'RIBO, the capital of Dutch Guiana, is situated on the western bank of the river Surinam, about 10 miles from its mouth, in 5° 45′ N. lat., and 55° 15′ W. long. It forms a rectangle of nearly a mile and a half in length by three-quarters in breadth. The streets are broad, covered with shell-sand, and planted on both sides with orange, lemon, tamarind, and other trees. Near the river, the houses, which are chiefly of wood, stand somewhat closely together, but in the remoter parts each is surrounded by its own garden. The rooms are wainscoted with the choicest woods, and elegantly furnished.

In approaching P. from the sea, Fort Zeelandia is first reached; then the Bureau of Finance and Court of Justice on the Government Plain, which is surrounded by stately cabbage-palms; the governor's house, with shady double avenue of tamarind-trees; and lastly, the business streets stretching along the river side. There are a Dutch Reformed, a Lutheran, Moravian, two Roman Catholic churches, and two synagogues. Fort Zeelandia has a large and beautiful barrack, with several roomy houses for the officers. P. has a neat, pleasant, and picturesque appearance, the white painted houses, with bright-green doors and windows, peeping out from the shady trees, and the river being thronged with the tent-boats and canoes which are constantly arriving and departing.

On 1st January 1875, the population amounted to 21,755. By royal decree of 6th February 1851, the flogging of slaves in the Netherlands West Indies was forbidden, except through officers appointed for the purpose, and the number of lashes was limited. This check, however, was frequently evaded, and the greatest barbarities practised, so that the feeling in favor of emancipation increased in the Netherlands, and a bill was passed, 8th August 1862, for emancipating the slaves on the 1st July 1863.

P. is the only port, except Nickerie Point, at the mouth of the Corentyn. In 1870—1880, the number of ships entering the ports of Dutch Guiana varied from 190 to 230 a year, and the tonnage from 20,000 to 25,000 tons. By far the largest number were British. About a fourth part cleared at Nickerie, a very productive portion of the colony, in which sugar, molasses, and rum are manufactured in large quantities.

The climate of D. Guiana is not healthy. From this and other causes the deaths annually exceed the births. Elephantiasis Arabum and Lepra are fearfully prevalent among the black population of P. and neighborhood. The rainfall (67 inches) varies much, being smallest at Nickerie, in the west, and largest at Montbyou in the east of the colony (128 inches). In Georgetown, British Guiana, the average fall is 100.50 inches.

As to religion, about 40,000 of the inhabitants of the colony are reckoned Christians, of whom 22,000 are Moravians (mostly converts by missionary agency), 5000 Dutch Reformed (mainly in Paramaribo), 13,000 Catholics. There are about 700 Jews. The Moravian missionaries have missions in the interior, especially amongst the bush-negroes, who speak a language based on broken English, with Dutch, Portuguese, and Indian additions. The colony possesses 60 schools and 5000 pupils, of whom 1300 are in the capital. The great proportion of the births in the colony are illegitimate. The influx of immigrants in 1870–80 varied from 2720 in 1873 to 43 in 1876. The immigrants are mostly from British India.

The coast of Dutch Guiana is an alluvial deposit formed by the rivers and equatorial stream which flows eastwards. Further inland, the soil is diluvial loam, bearing the finest timber trees; and south of this line are extensive savannahs of white sand, stretching towards the hills and mountains of the interior, which are chiefly of gneiss and granite.

The Bank of Surinam, which is the only one in the colony, has its headquarters at P. It has a capital of $400,000.

PARAMA'TTA is a light worsted twilled fabric for female dress. It was invented at Bradford, in Yorkshire, and has become an important manufacture of that place. The weft consists of combed merino wool, and the warp of cotton. It resembles in texture the Coburg and Orleans cloths.

PARAMATTA, a pleasantly situated town of New South Wales, stands near the west extremity of Port Jackson, on a small river of the same name, and is 15 miles by land west-north-west of Sydney, with which it is connected both by steamer and railway. The houses are mostly detached, and the streets are wide and regular, the principal one being about a mile in length. The institutions comprise churches, schools, an orphan and a lunatic asylum, and a prison. There was formerly an observatory here; but it was removed to Sydney in 1858. 'Colonial tweeds,' 'Paramatta cloths' (first made from wool exported hence) and salt are manufactured. Pop. (1871) 6103; (1881) 8433.

The town of P., formerly called Rosehill, is, after Sydney, the oldest in the colony. It is now always spelt *Parramatta* by Australian authorities.

PARA'METER, or LATUS RECTUM, a term used in conic sections, denotes in the case of the parabola, a third proportional to the abscissa of any diameter and its corresponding ordinate; in the ellipse and hyperbola, a third proportional to a diameter and its conjugate. The parameter of any diameter is, in the case of the parabola, the same as the double ordinate of that diameter which passes through the focus, and is four times as long as the distance between the diameter's vertex and the directrix. The term parameter was also at one time used to denote *any* straight line about a curve, upon which its form could be made to depend, or any constant in its equation, the value of which determined the individual curve; but its employment in this sense is now discontinued, except in the theory of homogeneous differential equations, where the constants for the purpose of aiding the solution, are supposed to vary; and the method is consequently denominated the 'Variation of the Parameters.' In the application of this method to determine the orbital motions of the planets, the 'seven necessary data' (see ORBIT) were called parameters, but for this the term 'elements' is now substituted.

PARANA', a province in the south of Brazil, is bounded on the N. by the province of Sao Paula, on the E. by the Atlantic, S.E. by Santa Catherina, S. by Rio Grande do Sul, W. by Paraguay and Matto Grosso. Area stated at 72,000 sq. m. Pop. (1872) 126,722, one sixth of whom are slaves. The capital is Curitiba, and previously to 1852 this province formed a territory called the Comarca of Curitiba, included in the province of Sao Paulo. It fully commenced its provincial career in 1853. The sea coast is indented by several bays, but the chief and almost the only port as yet is Paranagua. A line of mountains run parallel to the coast at a distance of about 80 miles inland, and throws out spurs and branches westward. The streams flowing east from this water-shed, though numerous, are inconsiderable; while the rivers flowing westward, into the Parana (q .v.), which forms the western boundary of the province, are all about or upwards of 400 miles in length. The principal are the Paranapanema, Ivay, Piquery, and Yguassu. The climate is unusually healthy; the soil is fertile; and agriculture, rearing cattle and swine, and gathering *mâté* or Paraguay tea are the chief employments. The capital, Curitiba, has manufactures of coarse woollens, and with its agricultural surroundings has a pop. of 12,000.—The chief port, Paranagua, on a bay of the same name, is about 400 miles south-west of Rio de Janeiro. It contains about 3000 inhabitants, and exports *mâté* to the value of 1,000,000 dollars annually.

PARANA, an important river of Brazil, rises in the province of Minas Geraes, about 100 miles north-west of Rio de Janeiro. It flows west for upwards of 500 miles, through the provinces of Minaes, Geraes and São Paulo. In the latter it is joined by the Parnahiba, after which its course alters, and it flows south-south-west to Candelaria. Passing this town, it flows west for 200 miles to its confluence with the Paraguay (q. v.), and then bending southward, passes Sante Fe, below which its channel frequently divides and encloses numerous islands. After passing Santa Fe, it rolls onward in a south-east direction, and unites with the Uruguay in forming the Rio de la Plata. Entire length about 2400 miles. It draws a number of considerable tributaries from the province of Parana (q. v.); and of the others, the chief are the Paraguay, Uruguay, Pardo, Tiete, and Parnahiba. For vessels drawing 16 feet it is navigable to Corrientes, upwards of 600 miles from its mouth.

PA'RAPET (Ital. *para-petto*, from *parare*, to protect, and *petto*, the breast), a wall raised higher than the gutter of a roof for protection; in military works, for defence against missiles from without (see FORTIFICATION); in domestic buildings, churches, &c., to prevent accident by falling from the roof. Parapets are of very ancient date. The Israelites were commanded to build 'a battlement' round their flat roofs. In classic architecture, balustrades were used as parapets. In Gothic architecture, parapets of all kinds are used. In early work they are generally plain, but in later buildings they are pierced and ornamented with tracery, which



Ornamented Gothic Parapet.

is frequently of elaborate design, especially in French Flamboyant work. Shields and little arcades are also used as ornaments to parapets; and the battlements of castles are imitated in the parapets of religious and domestic buildings.

PA'RAPH (Gr. *para*, beside, and *hapto*, to touch), an addition to the signature formed by a flourish of the pen, which, during the middle ages, constituted some sort of provision against forgery. Its use is not altogether extinct in diplomacy, and in Spain the paraph is still a usual part of a signature.

PARAPHERNA'LIA (Gr. *para*, beside, or beyond; *pherne*, dower), is a term borrowed from the Roman law to denote certain articles of personal adornment and apparel belonging to a married woman. According to the usual rule in the law of England, all the personal property of a woman becomes the property of her husband when the marriage takes place, unless there is a marriage settlement; but there is an exception as regards the trinkets and dress of the wife so far as suitable to her rank in life, and which she continues to use during the marriage. In such a case the property in these articles does not vest absolutely in the husband. He cannot bequeath them by his will to a third person, but if he gave them to the wife, he may pawn, or sell, or give them away, and they can be seized in execution to pay his debts, except so far as they constitute necessary clothing. And if he were to die insolvent, they may, except that part which is necessary clothing, be taken by the husband's creditors. If the paraphernalia were given, not by the husband but by a third party before or during marriage, then they are presumed to be given for the wife's separate use, and the husband or his creditors cannot in any way interfere with them. In the law of Scotland, the paraphernalia of a married woman include not merely personal clothing and trinkets, but articles of furniture, such as a chest of drawers. The husband there can neither pawn, nor pledge, nor give away the paraphernalia, nor can his creditors attach them either during his life or after his death.

PA'RAPHRASE (Gr. *para*, beside, and *phrazein*, to speak) is the name given to a verbal expansion of the meaning either of a whole book, or of a separate passage in it. A paraphrase consequently differs from Metaphrase, or strictly literal translation, in this, that it aims to make the sense of the text clearer by a lucid circumlocution, without actually passing into commentary. The versified passages of Scripture, forming part of the Psalmody of the Scottish Church, are popularly known as 'the Paraphrases.'

PARAPLE'GIA. See PARALYSIS.

PARAS'ARA is the name of several celebrated personages of ancient India, met with in the *Mahâbhârata* (q. v.), the *Purân'as* (q. v.), and other works. Of one personage of this name, the *Mahâbhârata* relates that he was the son of S'akti, who was the son of the patriarch Vasisht'ha. King Kalmâshapâda once meeting with S'akti in a narrow path in a thicket, desired him to stand out of the way. The sage refused; on which the Râja beat him with his whip, and S'akti cursed him to become a Râkshasa, or demon. The Râja, in this transformation, killed and ate S'akti, together with the other sons of Vasisht'ha. S'akti, however, had left his wife, Adris'yantî, pregnant, and she gave birth to Parâs'ara, who was brought up by his grandfather. When he grew up, and was informed of his father's death, he instituted a sacrifice for the destruction of all the Râkshasas, but was dissuaded from its completion by Vasisht'ha and other sages. The same legend is referred to by the *Vishn'u-Purân'a*, where P. is introduced as relating, himself, part of this story, and adding, that the saint Pulastya, one of the mind-born sons of Brahmâ, in reward of the clemency he had shown even towards such beings as the Râkshasas, bestowed on him the boon of becoming the author of a compendium, or rather the compiler, of the *Purân'as*, and of the *Vishn'u-Purân'a* in particular. 'This tradition,' Professor Wilson observes (*Vishn'u-Purân'a*, ed. Hall, vol. i. p. 10), 'is incompatible with the general attribution of all the *Purân'as* to Vyâsa;' but it may perhaps point to a later recension when, to the native mind, Vyâsa would still remain the reputed author of the older *Purân'as*, although, of course, even this assumption has little claim to historical truth.

A P., probably different from the one named, is the author of a

celebrated code of laws; he is mentioned by Yâjnavalkya in his standard work, and often quoted by the commentaries.—A probably third P. is the reputed author of a Tantra (q. v.); and a fourth, the author of an astronomical work.—Parâs'aras (in the plural) designates the whole family to which the different Parâs'aras belong.

PARASI'TA, or ANOPLU'RA, an order of insects, to all of which the name Louse is popularly given. All live as parasites on quadrupeds and birds. The characters of the order are noticed in the article LOUSE. It remains, however, to be added that the order is divided into two sections; in the first of which, *Pediculidea*, the mouth is small and quite suctorial; whilst in the second, *Nirmidea*, it is furnished with mandibles and hooked maxillæ. The species of the first section are found only on man and mammals; those of the second section, almost exclusively on birds, although one infests the dog. The *Nirmidea* show much greater activity than the *Pediculidea*. When a bird dies, the bird-lice congregate near the beak, and seem disquieted, apparently anxious to change their abode.

PA'RASITE (Gr. from *para*, beside; *sitos*, food; one who eats with another; hence one who eats at the expense of another), a common character in the Greek comedies; a low fellow, who is ready to submit to any indignity, that he may be permitted to partake of a banquet, and who lives as much as possible at the expense of others.

PARASI'TIC ANIMALS are numerous. Some of them are Entozoa, and some are Epizoa. See these heads. They belong to different classes, and even to different divisions of the animal kingdom; all, however, are invertebrate. Many are of the division *Articulata*, and many of the division *Radiata*. Besides *worms* of various kinds, there are among parasites not a few crustaceans, as the Lernæans, &c., and not a few insects, as the Louse. These insects constitute the order *Parasita* or *Anoplura*. Some of the cirrhapods which live in the skin of large marine animals, as whales, can scarcely be regarded as parasitic animals, but rather bear to them a relation such as *Epiphytes* do to parasitical plants, not deriving their food from the animal on which they live. Tape-worms, ascarides, and other intestinal worms, do not directly draw sustenance from the animal in which they live, by extracting its juices, but they live at its expense, by consuming its food, after the food has undergone, in great part, the process of digestion.

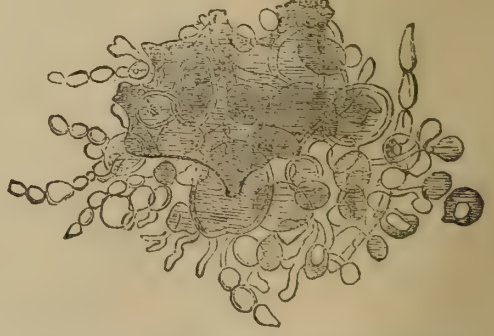
PARASITIC DISEASES constitute one of the recognized orders of disease in Dr. Farr's classification. See NOSOLOGY. In these diseases, certain morbid conditions are induced by the presence of animals or vegetables which have found a place of subsistence within some tissue or organ, or upon some surface of the body of man or of other animals. Even plants are not exempt from disorders of this nature (see PARASITIC PLANTS). The forms of animal life giving rise to parasitic diseases are described in articles ASCARIDES, CESTOID-WORMS, ENTOZOA, EPIZOA, GUINEA-WORM, ITCH-INSECT, LOUSE, NEMATELMIA, STRONGYLUS, TAPEWORMS, TRICHINA, &c. With the vegetable structures which give rise to special diseases we are less accurately acquainted, in consequence of the limited knowledge of cryptogamic botany possessed by many writers who have recorded their experience of these cases. These parasites are either *fungi* or *algæ*, and are composed of simple sporules, germs, or cells, or of cells arranged in rows or groups, which are so minute as to require the microscope for their recognition. Fungi are the most numerous of all plants in regard to genera and species, and their growth is associated with serious injury both to animal and vegetable life. It is not, however, always easy to determine whether they are the direct cause of disease, or whether the diseased tissue has merely afforded a suitable nidus for their development. 'It is certain,' says Dr. Aitken, who has entered more fully into this subject than any other English writer on the practice of medicine, 'that wherever the normal chemical processes of nutrition are impaired, and the incessant changes between solids and fluids slacken, then, if the part can furnish a proper soil, the cryptogamic parasites will appear. The soil they select is, for the most part, composed of epithelium or cuticle, acid mucus or exudation. Acidity, however, though favorable to their growth, is not indispensable, since some of the vegetable parasites grow upon alkaline or neutral ground, as on ulcerations of the trachea, or in fluid in the ventricles of the brain.

'Certain atmospheric conditions seem favorable to the occurrence of these vegetable parasites. For example, *Tinea tonsurans* may be quite absent for years in places such as workhouses, where it commonly exists, and then for several months every second or third child in the place gets the disease.'

There is undoubted evidence from the observations and experiments of Devergie, Von Bärensprung, and others, that these parasitic diseases may be transmitted by contagion from horses, oxen, and other animals to man; while conversely, Dr. Fox mentions an instance of a white cat which contracted the *mange* from *Tinea tonsurans* (ringworm of the scalp), which affected the children of the family to which it belonged—the fungus of the mange in the cat being the same fungus as that of *Tinea* in the human subject, viz., the *Tricophyton* (Gr. *tric* (tric-), of a hair, and *phyton*, a plant).

The principal vegetable parasites associated in man with special morbid states are arranged by Aitken (*The Science and Practice of Medicine*, 1863, 2d edit. vol. ii. p. 177) as follows: 1. *Tricophyton tonsurans*, which is present in the three varieties of *Tinea tondens*—viz., *T. circinatus* (ringworm of the body), *T. tonsurans* (ringworm of the scalp), and *T. sycosis menti* (ringworm of the beard). 2. The *Tricophyton sporuloides*, which, together with the above, is present in the disease known as *Plica Polonica*. 3. The *Achorion Schönleinii* and *Puccinia favi*, which are present in *T. favosa*, known also as *Favus* (q. v.), and *Porrigo scutulata* (the honeycomb ringworm). 4. The *Microsporon Mentagrophyta*, which is present in *Mentagra*. 5. The *Microsporon furfur*, which occurs in *Pityriasis versicolor*. 6. The *Microsporon Audouini*, which is present in *Porrigo decalvans*. 7. The *Mycetoma* or *Chionyphe Carteri*, which gives rise to the disease known as the 'fungus foot of India,' &c. 8. The *Oidium albicans* of diphtheria and aphtha. 9. The *Cryptococcus Cerevisiæ*, or *Yeast Plant*, occurring in the urine and contents of the stomach, if there is saccharine fermentation. 10. The *Sarcina Goodserii*, or *Merispœdia ventriculi* (of Robin), found in vomited matters and in the urine. There are strong grounds, based partly on botanical and partly on clinical observation, for believing that the various fungi already described are mere varieties of two or more species in various phases of development.

We shall conclude this article with a brief notice of the most dangerous of all the parasitic diseases—the *Fungus Foot* or *Fungous Disease of India*. It occurs in many parts of India, and the north-east shores of the Persian Gulf. It is a disease which occurs among natives only, so far as has been yet observed, and is undoubtedly due to the presence of a fungus which eats its way into the bones of the foot and the lower ends of the tibia and fibula, penetrating by numerous fistulous canals through the tissue of the entire foot, and tending to cause death by exhaustion, unless amputation is performed in due time. Dr. Carter has described three forms of this disease, in which both the symptoms and the fungoid material differ considerably from each other. A few remarks on the first of these forms will suffice as an illustration of parasitic disease. In this form, the bones of the foot and the lower ends of the leg-bones are perforated in every direction with roundish cavities, varying in size from that of a pea to that of a pistol-bullet, the cavities being filled with the fungoid matter. The surrounding muscles, and subsequently the tendinous and fatty structures, are converted into a gelatiniform mass, in consequence of which the foot presents a peculiar turgid appearance. The structure of the globular fungoid masses is shown in the accompanying figure, which was drawn by Dr. H. J. Carter from a



specimen which he examined immediately after amputation. Examined under the microscope, the fungoid mass is found to consist of short, beaded, tawny threads or filaments, arising from a common center, and having at their tips large spore-like cells.

Further notice of the parasitic diseases of the skin will be found in the articles PITYRIASIS (var. *versicolor*), RINGWORM, SCALD-HEAD, &c. The application of the Germ-Theory of disease would lead to the inclusion of many other diseases amongst parasitic disorders, in the wider sense of the word. Even specific fevers are by some so ranked. For diseases caused by the presence of the organisms known as bacteria, bacilli, &c, in the system, see GERM-THEORY.

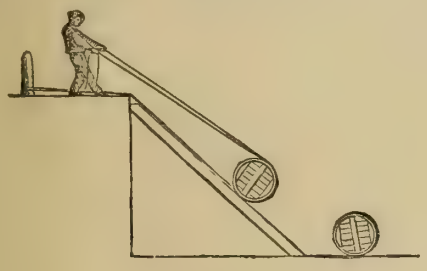
PARASITIC PLANTS are plants which grow on other plants, and derive subsistence from their juices; the plants which live parasitically on animal tissues being generally called Entophytes (q. v.), although the distinction between these terms is not always preserved. Epiphytes (q. v.) differ from parasitical plants in not subsisting on the juices of the plant which supports them, but merely on decayed portions of its bark, &c., or drawing all their

nourishment from the air. Parasitical plants are numerous and very various; the greater number, however, and the most important, being small fungi, as Rust, Brand, Bunt, Smut, &c., the minute spores of which are supposed, in some cases, to circulate through the juices of the plants which they attack. Concerning some minute fungi, as the Mildews, it is doubted if they are truly parasitical, or if their attacks are not always preceded by some measure of decay. But among parasitic plants are not a few phanerogamous plants, some of which have green leaves; and some are even shrubby, as the Mistletoe, Loranthus, &c., whilst the greater number have brown scales instead of leaves, as Dodder, Broom-rape, Lathræa, &c., and the whole of that remarkable order or class of plants called *Rhizantheæ* or *Rhizogens*, of which the genus *Rafflesia* is distinguished above all other plants for the magnitude of its flowers. Some parasitic plants, as the species of Dodder, begin their existence by independent growth from the ground; but when they have found suitable plants to take hold of and prey on, the connection with the ground ceases. Not a few, as Broom-rape and Lathræa, are root-parasites, generally attaching themselves to the roots of trees or shrubs; whilst some, as the Eyebright (*Euphrasia officinalis*), Yellow Rattle (*Rhinanthus crista galli*), Cow-wheat (*Melampyrum arvense*), &c., are parasitical only occasionally and partially, and are chiefly found on neglected grass lands. Root-parasites generally attach themselves by means of little tubercles, which bury themselves under the bark.

PARATY′, a seaport town of Brazil, in the province of Rio de Janeiro, on the west coast of the Bay of Angra, 90 miles south-west of Rio de Janeiro city. It has extensive commerce, and numerous distilleries. Pop. said to be 10,000.

PARAY-LE-MONIAL, a town of Burgundy, department of Saône-et-Loire, celebrated for its Benedictine Abbey, founded in 973, which contains the tomb of Mary Margaret Alocque, the center of recent pilgrimages by the confraternities of the Sacred Heart (q. v.). Pop. of town and commune (1876), 3627; of town alone, 2895.

PA′RBUCKLE is a mode of drawing up or lowering down an inclined plane any cylindrical object, as a barrel or a heavy gun, without the aid of a crane or tackle. It consists in passing a stout rope round a post or some suitable object at the top of the incline,



Parbuckle.

and then doubling the ends under and over the object to be moved. This converts the cask or gun into a pulley in its own behalf, and limits the pressure at each end of the rope to one-fourth the weight of the object moved, as felt on the incline. By hauling in the ends equally, the cask ascends, or *vice versâ*.

PA′RCÆ (from the root *pars*, a part), the name given by the Romans to the goddesses of Fate or Destiny, who assigned to every one his 'part' or lot. The Greek name, *Moiræ*, has the same meaning (from *meros*, a share). They are only once mentioned by Homer, who in every other instance speaks of Fate (Moira) in the singular, and whose Fate was not a deity but a mere personification, the destinies of men being made by him to depend upon the will of the gods; whilst, according to the later Greeks and the Romans, the gods themselves were subject to the control of the P. or Moiræ.

Hesiod, however, who is almost contemporary with Homer, speaks of three Fates, whom he calls daughters of Night—Clotho, the spinner of the thread of life; Lachesis, who determines the lot of life; and Atropos, the inevitable. They were usually represented as young women of serious aspect; Clotho with a spindle, Lachesis pointing with a staff to the horoscope of man on a globe, and Atropos with a pair of scales, or sun-dial, or an instrument to cut the thread of life. In the oldest representations of them, however, they appear as matrons, with staffs or sceptres. They had places consecrated to them throughout all Greece, at Corinth, Sparta, Thebes, Olympia, &c.

PARCELS, in the law of England, is the technical word for the article in a conveyance describing the lands, &c. conveyed.

PA′RCENER. See COPARCENARY.

PA′RCHIM, a town of the grand-duchy of Mecklenburg-Schwerin, stands on the Elde, which is here divided into two arms, 23 miles south-east of Schwerin. It is very old, is irregularly built, surrounded by beautiful gardens, and has a gymnasium and two churches. Pop. (1880) 9063, employed in agriculture, in the manufacture of tobacco, cloth, leather, and brandy, and in weaving.

PA′RCHMENT, one of the oldest inventions of writing materials was known at least as early as 500 years B.C. Herodotus speaks of books written upon skins in his time. Pliny, without good grounds, places the invention as late as 196 B.C., stating that it was made at Pergamos (hence the name *Pergamena*, corrupted into Eng. parchment) in the reign of Eumenius II., in consequence of Ptolemy of Egypt having prohibited the exportation of papyrus. Possibly the Pergamian invention was an improvement in the preparation of skins which had certainly been used centuries before. The manufacture rose to great importance in Rome about a century B.C., and soon became the chief material for writing on; and its use spread all over Europe, and retained its pre-eminence until the invention of paper from rags, which from its great durability proved a fortunate circumstance for literature.

There are several kinds of parchment, prepared from the skins of different animals, according to their intended uses. The ordinary writing parchment is made from those of the sheep and of the she-goat; the finer kind, known as *vellum*, is made from those of very young calves, kids, and lambs; the thick common kinds, for drums, tambourines, battle-dores, &c., from those of old he-goats and she-goats, and in Northern Europe from wolves; and a peculiar kind is made from asses' skins, the surface of which is enamelled. It is used for tablets, as blacklead writing can be readily removed from it by moisture. The method of making parchment is at first the same as in dressing skins for leather. The skins are limed in the lime-pit until the hair is easily removed. They are then stretched tightly and equally, and the flesh side is dressed as in currying, until a perfectly smooth surface is obtained. It is next *ground* by rubbing over it a flat piece of pumice-stone, previously dressing the flesh side only with powdered chalk, and slaked lime sprinkled over it. It is next allowed to dry, still tightly stretched on the frame. The drying process is an important one, and must be rather slowly carried on, for which purpose it must be in the shade. Sometimes these operations have to be repeated several times, in order to insure an excellent quality, and much depends upon the skill with which the pumice-stone is used, and also upon the fineness of the pumice itself. When quite dried, the lime and chalk are removed by rubbing with a soft lamb-skin with the wool on.

PARCHMENT, VEGETABLE. This remarkable substance was made known by Mr. W. E. Gaine in 1854, and again by the Rev. J. Barlow in 1857. It resembles animal parchment so closely, that it is not easy to distinguish the difference. It is made from the water-leaf, or unsized paper, by immersing it only for a few seconds in a bath of oil of vitriol, diluted with one-half its volume of water. The exactness of this dilution is one of the greatest importance to the success of the results. The dilute acid must not be used immediately after mixing, but must be suffered to cool to the ordinary temperature; without attention to these apparently trifling points, the operator will not succeed.

The alteration which takes place in the paper is of a very remarkable kind. No chemical change is effected, nor is the weight increased; but it appears that a molecular change takes place, and the material is placed in a transition state between the cellulose of woody fibre and dextrin. Vegetable parchment is in some respects preferable to the old kinds, for insects attack it less, and it can be made so thin as to be used for tracing paper, and bears wet without injury. Messrs. De la Rue have the credit of giving practical effect to the invention.

PARDUBITZ, a town of Austria, in Bohemia, 61 m. E. of Prague. It has copper, iron, and paper manufactures. P. was the headquarters of the king of Prussia, 7th June 1866. Pop. (1880) 10,010.

PARÉ, AMBROISE, a renowned French surgeon, and the father of modern surgery, was born about the beginning of the 16th c., at Laval, department of Mayenne, France. His father, who was a trunk-maker, was unable to afford him a literary education, and apprenticed him to a barber and surgeon. P., after a brief term of service, acquired such a fondness for surgery and anatomy, that, abandoning his master, he went to Paris to prosecute his studies. His means for doing so were very limited; he could afford to obtain instruction from only the more obscure teachers; few books were within his reach, yet by dint of perseverance and the exercise of a rare discrimination, combined with the valuable practice in the Hôtel de Dieu of Paris, he laid a solid foundation for future eminence. In 1536, P. was received as a master barber-surgeon, and joined in this capacity the army of Marshal

René de Monte-Jean, which was on the point of starting for Italy. During this campaign he improved the mode of treatment of gun-shot wounds, which had up to this time been of the most barbarous kind—namely, cauterization with boiling oil. His reputation as well as his skill were greatly heightened during this campaign, and as he himself says: 'If four persons were seriously wounded I had always to attend three of them; and if it were a case of broken arm or leg, fractured skull, or fracture with dislocation, I was invariably summoned.' In 1539, he returned to Paris, whither his high renown had preceded him, and was received with distinction by the Royal College of Chirurgery, of which he was subsequently appointed president. On the war being renewed, he was again attached to the army under the Vicomte de Rohan, afterwards under Antoine de Bourbon, Duke of Vendôme. It was during this campaign that he cured François, the second Duke of Guise, of the wound which conferred upon him the sobriquet of *Balafré*, and that he substituted ligature of the arteries for cauterization with a red-hot iron after amputation. The idea of this mode of repressing hemorrhage had long been in existence, but he was the first to show that it could safely be applied to practice. Many other important improvements in surgery were introduced by him at this time.

In September 1552 he was appointed surgeon to King Henry II., and in the following year was taken prisoner at Hesdin; he was however released, in consideration of his having cured Colonel de Vaudeville, after rejecting the brilliant offers made him by the Duke of Savoy to remain in his service. Returning to Paris, honors were showered upon him; and though he was ignorant of Latin, the *conditio sine qua non* of a liberal education at that time, no hesitation was shown in conferring upon him learned titles and degrees. He attended Francis II. on his death-bed, and continued to hold the office of king's surgeon to his successors, Charles IX. and Henry III. The former of these monarchs, whose life had been gravely threatened by an injury inflicted by his physician Portail, and who had been preserved by P., testified for him the greatest esteem, and saved him during the massacre of St. Bartholomew by locking him up in his own chamber. During the latter part of P.'s life, he was much employed in the publication of his various writings, and suffered considerable annoyance from the envious spirit displayed towards him by his professional brethren, who showered obloquy upon him for having, as they said, 'dishonored science by writing in the vulgar tongue.' P. died at Paris, December 22, 1590. His writings have exercised a great influence on the practice of surgery in all countries to which they have penetrated, and are held of the highest authority on the subject of gun-shot wounds. The first complete edition of them appeared at Lyon in 1562, and the last, edited by M. Malgaigne, at Paris (1840—1841, 3 vols.). Besides these are 8 Latin editions, and more than 15 translations into English, Dutch, German, &c. As an instance of his great popularity in the army, it may be mentioned that the soldiers of the garrison of Metz, of their own accord, gave him a triumphal reception on his entering that town.

PAREGO'RIC, or PAREGORIC ELIXIR (from the Gr. *paregoricos*, soothing), the *Compound Tincture of Camphor* of the London, and the *Camphorated Tincture of Opium* of the British Pharmacopœia, consists of an alcoholic solution of opium, benzoic acid, camphor, and oil of anise, every fluid ounce containing two grains of opium and benzoic acid, and a grain and a half of camphor. This preparation is much used both by the profession and the public. In doses of from one to three drachms, it is an excellent remedy for the chronic winter-cough of old people, the opium diminishing the bronchial secretion and the sensibility of the pulmonary mucous membrane, while the benzoic acid and oil of anise act as stimulating expectorants. It has also been found useful in chronic rheumatism.

PAREI'RA-BRA'VA. See CISSAMPELOS.

PARE'LLA (Fr. *parelle* or *perelle*), a name often given to some of those crustaceous lichens which are used to produce Archil, Cudbear, and Litmus; but which more strictly belongs to one species, *Lecanora parella*, resembling the Cudbear, Lichen, but with somewhat plaited warty crust, and shields (*apothecia*) having a concave disk of the same color as the thick tumid even border. Like the Cudbear Lichen—to which it is far superior in the quality of the dye-stuff obtained from it—it grows on rocks in mountainous districts both in Britain and on the continent of Europe, being particularly abundant in Auvergne and other parts of France.

PARE'NCHYMA. See CELLULAR TISSUE.

PARENT AND CHILD. The legal relation between parent and child is one of the incidents or consequences of the relation of husband and wife, and flows out of the contract of marriage. The legal is to be distinguished from the natural relation, for two persons may be by the law of nature parent and child, while they are not legally or legitimately so. Hence a radical distinction exists between natural or illegitimate and legitimate children, and their legal rights as against their parents respectively are very different. Legitimate children are the children of two parents who are recognized as married according to the laws of the country in which they are domiciled at the time of the birth; and according to the law of England, if a child is illegitimate at the time of the birth, nothing that can happen afterwards will ever make it legitimate, the maxim being 'once illegitimate always illegitimate'—a maxim which, as will be stated, has some exceptions in Scotland. In treating of the laws affecting the mutual relation of parent and child, the laws of England and Ireland, which differ from the law of Scotland in material respects, will first be stated.

1. *As to Legimitate Children.*—These laws relate first to the liability of the parent to maintain the child, and the rights of the child in the event of the parent's death. As regards the maintenance of the child, it is somewhat singular that, according to the law of England, there is no duty whatever on the parent to support the child, and consequently no mode of enforcing such maintenance. The law of nature was probably considered sufficient to supply the motives which urge a parent to support the child, but the municipal law of England has not made this duty compulsory. This defect was to some extent remedied when what is called the Poor-Law was created by statute in the reign of Elizabeth, by which law parents and children are compellable to a certain small extent, but only when having the pecuniary means to do so, to support each other, or rather to help the parish authorities to do so. But apart from the Poor-Law statutes, there is no legal obligation on the parent to support the child, nor on the child to support the parent. Hence it follows, that if the child is found in a destitute state, and is taken up, fed, and clothed, and saved from starvation by a stranger, such stranger cannot sue the parent for the expense, or any part of it, however necessary to the child's existence.

In order to make the father liable for maintenance, there must in all cases be made out against him some contract, express or implied, by which he undertook to pay for such expense; in other words, the mere relationship between the parent and child is not of itself a ground of liability. But when the child is living in the father's house, it is always held by a jury or court that slight evidence is sufficient of, at least, an implied promise by the father to pay for such expenses. As, for example, if the child orders clothes or provisions, and the father see these in use or in process of consumption, it will be taken that he assented to and adopted the contract, and so will be bound to pay for them. So if a parent put a child to a boarding-school, very slight evidence of a contract will be held sufficient to fix him with liability. Nevertheless, in strictness of law, it is as necessary to prove a contract or agreement on the part of the parent to pay for these expenses as it is to fix him with liability in respect of any other matter. When it is said that a parent is not compellable by the common law to maintain his child, it must, at the same time, be observed that if a child is put under the care and dominion of an adult person, and the latter wilfully neglect or refuse to feed or maintain such child, whereby the child dies or is injured, such adult will incur the penalties of misdemeanor; but this offence does not result from the relationship of parent and child, and may arise between an adult and child in any circumstances, as where a child is an apprentice or servant.

The change as to the liability of parents to maintain their children created by the Poor-Laws amounts merely to this, that if a person is chargeable to the parish, that is, not able to work as well as destitute, and if the overseers or guardians are bound to support him or her, then the parish authorities may reimburse themselves this outlay, or part of it, by obtaining from justices of the peace an order commanding the parent or child of such pauper to pay a certain sum per week towards the relief. This is, however, only competent when the relative is able to pay such sum, and in all cases the sum is of necessity very small. Not only parents, but grand-parents, are liable under the Poor-Law Act to the extent mentioned. Another provision in the Poor-Law and other kindred acts is, that if a parent runs away and deserts his children, leaving them destitute and a burden on the parish, the overseers are entitled to seize and sell his goods, if any, for the benefit and maintenance of such children; and if the parent, so deserting the children, is able by work or other means to support them, such parent may be committed to prison as a rogue and vagabond. Not only, therefore, is a parent during life not bound to maintain his or her child (with the above exceptions), but also after the parent's death the executors or other representatives of the parent, though in possession of funds, are not bound. It is true that if the parent die intestate, both the real and personal property will go to the children; but the parent is entitled, if he choose, to disinherit the children, and give away all his property to strangers, provided he execute his will in due form, which he may competently do on death-bed if in possession of his faculties.

Another important point of law, affecting the mutual relation of parent and child, is the right of the parent to the custody of

the child. At common law it is the father who has the right to the custody of the child until majority at least, as against third parties, and no court will deprive him of such custody except on strong grounds. Whenever the child is entitled to property, the Court of Chancery so far controls his parental right, that if the father is shown to act with cruelty, or to be guilty of immorality, a guardian will be appointed. A court of common law also has often to decide in cases of children brought before it by *habeas corpus*, when parties have had the custody against the father's will. In such cases, if the child is under fourteen, called the age of nurture, and the father is not shown to be cruel or immoral, the court will order the child to be delivered up to him; but if the child is above fourteen, or, as some say, above sixteen, the court will allow the child to choose where to go. So the father is entitled by his will to appoint a guardian to his children while they are under age. The mother had, at common law, no right as against the father to the custody of the children, however young; but under a statute of 36 and 37 Vict. c. 12, she is entitled to the custody of the child while under sixteen years of age, or rather she is entitled to apply to the Court of Chancery for leave to keep the children, while under that age, provided she is unobjectionable in point of character; and access may be allowed to the father or guardian. If the parents separate by agreement, no stipulation will be enforced which is prejudicial to the child. In case of divorce or judicial separation, the Court of Divorce has power to direct who is to have the custody of the children.

2. *Illegitimate Children.*—It has been already stated that, at common law, the parent of a legitimate child is not bound to maintain it, and this is equally true of an illegitimate child—i. e., a child born not in wedlock. In strictness of law, an illegitimate child has no father, which means practically that in case of the death of the father without making a will, the law will not treat such child as entitled to the ordinary legal rights of a legitimate child—i. e., to a share of the father's property. The child is not legally related to the father in this sense. With regard to the mother, she also is not bound to maintain her child according to the common law; but the Poor-Law acts have made an important qualification of her rights and duties. As between the father and mother of the child, the law is this: The father is not bound even by the Poor-Laws to maintain the child, and the parish officers cannot now institute any proceeding whatever against him for this purpose; but the mother can, to a certain extent, enforce against him a contribution towards the child's maintenance and education, or the guardians may do so. It is entirely discretionary on the mother to take any proceeding against the father, but if she chooses she can do so; and the first step is to go before a justice of the peace and obtain a summons of affiliation. The father is thus cited before the magistrate, and if the mother swears that he is the father of the child, and is corroborated in some material part of this statement by a third party, the magistrate may make an order against the father to pay the expenses of lying-in, and a weekly sum not exceeding five shillings till the child attains the age of sixteen. The mother may make this application either a few months before the birth, or within twelve months after the birth; and even after that time, provided she can prove that the putative father paid her some money on account of the child within such twelve months. The putative father, in these cases, is a competent and compellable witness.

The utmost, therefore, that the father can be made to contribute towards the child's maintenance is only a portion of the whole, the chief burden being thrown on the mother, who is assumed to be the more blameable party. Though she is not bound by the common law to maintain her child, yet the Poor-Laws make her liable to maintain the child till it attains sixteen; and not only is she bound, but any man who marries her is also by statute bound to support all her illegitimate (and also legitimate) children till they attain sixteen. The result is, that illegitimate children under sixteen are better provided for by the present state of the law than legitimate children, inasmuch as the mother is positively bound to support her illegitimate child, and only to a less extent her legitimate child. As regards the custody of illegitimate children, the mother is the party exclusively entitled, for the father is not deemed, in point of law, to be related to such child. Yet if the father has, in point of fact, obtained the custody of such child, and the child is taken away by fraud, the courts will restore the child to his custody, so as to put him in the same position as before. Though illegitimate children will not succeed to the father's property in the event of his dying without a will, there is nothing to prevent him making his will in their favor, provided he expressly name and identify them, and not leave it to them by the description of 'his children,' which in point of law they are not.

Scotland.—The law of parent and child in Scotland differs materially from the law of England and Ireland. In Scotland, a child may be born a bastard, and yet if the parents afterwards marry, this will legitimize the child, and give the child the right to succeed to the father's property. A difficulty sometimes arises where, before the father and mother of a bastard marry, the father has had a legitimate family by another woman, in which case it is held that the bastard, though oldest in point of age, does not take precedence of the legitimate children. The law of Scotland also differs from that of England as regards the obligation of parent and child to maintain each other. There is a legal obligation on both parties to maintain each other if able to do so, and either may sue the other for aliment at common law; but this obligation extends only to what may be called subsistence money, and does not vary according to the rank of the party. Thus an earl is bound to pay no more for the aliment of his son than any other father. As regards all maintenance beyond mere subsistence, the law does not materially differ from that of England, and a contract must be proved against the father before he can be held liable to pay. The legal liability as between parent and child is qualified in this way by the common law, that if a person has both a father and a child living and able to support him, then the child is primarily liable, and next the grandchild, after whom comes the father, and next the grandfather. Not only are parent and child liable to support each other while the party supporting is alive, but if he die, his executors are also liable; and this liability is not limited by the age of majority, but continues during the life of the party supported. Such being the common law of Scotland, it was scarcely necessary, as in England, for the Poor-Law to supply any defect; but the Scotch Poor-Law supplements the common law, by imposing a penalty on a father or mother (though not *vice versa*) who neglects to support a child.

Another advantage which a Scotch child has over an English child is, that the father cannot disinherit it—at least so far as concerns his movable property; and even in case of heritable property, the rights of the child were so protected, that unless the father made away with his heritable property sixty days before his death, or while in sound health, it was too late to prejudice his heir-at-law; this rule was, however, abolished in 1870 by 34 and 35 Vict. c. 81. This was called the Law of Deathbed (q. v.); but as regards the father's movable property, he cannot by any will he can make at any time of his life deprive the children of one-third, or, if their mother is dead, of one-half of such property. This is called the children's right to Legitim (q. v.), a right which they can vindicate, whatever may be their age when their father dies. With regard to the custody of children in Scotland, the rule is, that the father is entitled to the custody as between him and the mother; but the Court of Session has power to regulate the custody in case the children are entitled to property, and the father is of an immoral or cruel character; and the court will also interfere to allow to the mother access to the children at certain times and seasons. Another important difference between a Scotch and English child is this, that whereas in England the father or guardian, or the Court of Chancery, has power to control the custody of the person of the child to a certain extent, until the child attains the age of 21, in Scotland such power entirely ceases when the child attains the age of 14 or 12, according as such child is male or female. At the age of 14, a boy, and at 12, a girl, in Scotland, is entire master or mistress of his or her movements, and can live where he or she pleases, regardless of any parent or court. They can marry at that age at their own uncontrolled discretion, and act in all respects with the same freedom as adults. As regards the disposition of their property there are some restrictions, but as regards the disposal of their persons there are none, after the ages of 14 and 12 respectively.

2. *Illegitimate Children.*—The law of Scotland as to illegitimate children also differs in some respects from that of England. Both the father and mother of a bastard are bound by law to support such child, and the obligation transmits to the personal representatives of the father or mother. Moreover, by the Poor-Law statute both are liable to a penalty for neglecting to support the child. The mother of illegitimate children is entitled to their custody till the age of ten, if daughters, and if sons, till the age of seven; but the limit is not clearly defined. If the father support the child after the above age, he is entitled to the custody. The mother does not apply to a magistrate for a summons of affiliation in order to fix the paternity; but she may bring an action of filiation and aliment, in which the question of paternity is settled. The father may be judicially examined, and is a competent witness; and it is usual for the court to decree an aliment, varying from £4 per annum against laborers, up to £10 against persons in better circumstances. In Scotland, as in England, the father of a bastard child is not deemed related, in point of law, to such child; and if he desires to provide for such child, it must be done by deed or will, in which the child is identified, and not merely described under the general designation of 'child,' which he is not.

PARE'NTHESIS, a term originally Greek, and signifying *insertion* or *intercalation*, is in composition a clause, or part of a sentence or argument, not absolutely essential to the sense, but

generally serving either for explanation or confirmation, sometimes chiefly for rhetorical effect. A parenthesis is usually included between the marks ( ), instead of which the dash (—) at the beginning and end of the parenthesis is frequently but improperly employed.

PARHELION. See HALOS.

PA'RIAH DOG. See CUR.

PARIAN CHRONICLE. See ARUNDEL MARBLES.

PA'RIAS is the name given to the lowest class of the population of India—to that class which, not belonging to any of the castes of the Brahminical system, is shunned even by the lowest Hindu professing the Brahminical religion, as touching a Paria would render him impure. The P. seem to belong to a negro race, as appears from their short woolly hair, flat nose, and thick lips; they are, besides, of short stature, and their propensities are of the coarsest kind. Despised by the Hindus, and ill used by the conquerors of India, they have, in some parts of India, gradually sunk so low that, to judge from the description which is given of their mode of living by different writers, it is scarcely possible to imagine a more degraded position than that which is occupied by these miserable beings.

PA'RIDÆ AND PARUS. See TIT.

PARING AND BURNING consists in cutting off the surface of the soil in thin slices, which are then dried and burned. This is the most effectual way of reclaiming peat and other waste land, the surface of which is matted with coarse plants, difficult of decay. It is also applied advantageously to cold clay soils, apt to produce rank weeds and coarse grasses, which are to be broken up after lying for some time in grass. The ashes of the plants, consisting of potash and other salts, act as a powerful manure; while the clay being reduced to the state of brick-dust, both improves the texture of the soil, and acts as an absorbent for retaining moisture and nutritive gases, and giving them out to the roots of growing plants. On thin light soils the operation is rarely advisable, for much of the scanty volatile vegetable matter is dissipated; however if care is taken to make the turfs merely smoulder without flame, so that the plants are rather charred than burned, it is doubtful whether more dissipation takes place than if the plants were ploughed down, and allowed slowly to decay. The plot to be reclaimed should, if necessary, be dried by stone or tile drains; and all large stones grubbed up, and carted or conveyed off upon sledges. The paring is to be done, if possible, in the months of April and May, in order to have the most favorable part of the year for drying the parings well before burning.

There are ploughs specially made for paring, with a very flat share; but the best method is to employ the *breast-plough* or *paring-spade*, as the surface is in most cases very irregular, and it is desirable to have the slices very thin. The parings should be burned directly they are sufficiently dry, as, after laying a month or six weeks, they begin to unite with the ground, and imbibe moisture from the young grass vegetating beneath them. Sometimes they can be burned as they lie, without being collected into heaps; and in this way, the fire, in consuming the lingy side, which is undermost, chars the surface of the soil at the same time. If burned in heaps, the heaps should be very small, in order to secure a good black ash, instead of the hard lumps of red ash produced by large fires. The weeds or refuse organic matters are thus only charred, instead of being entirely burned away; whilst the mineral matters are left in a soluble state instead of being reduced, as it is too apt to be the case where the operation is carelessly conducted, into an insoluble semi-vitrified slag. To attain these desirable results a smouldering fire must be maintained, by keeping the outside layer of sods so close as to prevent the fire from kindling into flame. The ashes should be spread, care being taken to clear the bottoms of the heaps well out, so that the first crop may be free from patches. The cost of thus paring, burning, and spreading is about £1 per acre.

PA'RIS, a genus of plants of the small endogenous or dictyogenous natural order *Triliaceæ*, of which one species, *P. quadrifolia*, called HERB PARIS, is not uncommon in moist shady woods in some parts of Britain. It is rarely more than a foot high, with one whorl of generally four leaves, and a solitary flower on the top of the stem, followed by a berry. The berry is reputed narcotic and poisonous, but its juice has been employed to cure inflammation of the eyes. The root has been used as an emetic.

PARIS, also called ALEXANDER, was, according to Homer, the second son of Priam and Hecabe, sovereigns of Troy. His mother dreamed during her pregnancy that she gave birth to a firebrand, which set the whole city on fire, a dream interpreted by Æsacus or Cassandra to signify that P. should originate a war which should end in the destruction of his native city. To prevent its realization, Priam caused the infant to be exposed upon Mount Ida by a shepherd named Agelaus, who found him, five days after, alive and well, a she-bear having given him suck. Agelaus brought him up as his own son, and he became a shepherd on Mount Ida, distinguishing himself by his valor in protecting the other shepherds from their enemies—whence his name, Alexander, 'the defender of men.' An accident having revealed his parentage, old Priam became reconciled to his son, who married Œnone, daughter of the river-god Cebren. But his mother's dream was to come true for all that. He was appealed to, as umpire, in a strife which had arisen among the three goddesses, Hera (Juno), Athene (Minerva), and Aphrodite (Venus), as to which of them was the most beautiful, the goddess Eris (Strife) having revengefully flung among them, at a feast to which she had not been invited, a golden apple (of discord) inscribed *To the Most Beautiful*. Each of the three endeavored to bribe him. Hera promised him dominion over Asia and wealth; Athene, military renown and wisdom; Aphrodite, the fairest of women for his wife—to wit, Helene, the wife of the Lacedæmonian king, Menelaus. P. decided in favor of Aphrodite, hence the animosity which the other two goddesses displayed against the Trojans in the war that followed. P. now proceeded to seek Helene, whom he carried away from Lacedæmon in her husband's absence. 'The rape of Helen' is the legendary cause of the Trojan war, on account of which P. incurred the hatred of his countrymen. He deceitfully slew Achilles in the temple of Apollo. He was himself wounded by a poisoned arrow, and went to Mount Ida to be cured by Œnone, who possessed great powers of healing; but she avenged herself for his unfaithfulness to her by refusing to assist him, and he returned to Troy, and died. He was often represented in ancient works of art generally as a beardless youth, of somewhat effeminate beauty.

PARIS (the ancient *Lutetia Parisiorum*), the metropolis of France, is situated in 48° 50′ N. lat., and 2° 20′ E. long., on the Seine, about 110 miles from its mouth. Pop. (1869) 1,875,000; (1872) 1,799,250; (1876) 1,988,806; and at the end of 1881, 2,269,-023. Its circumference is upwards of 25 miles. It lies in a hollow about 200 feet above the level of the sea, and is surrounded by low hills, which in their highest ranges to the north only attain an elevation of 290 or 300 feet, as at Montmartre and Belleville. These hills, which are separated by narrow valleys or plateaux, as those of St. Denis to the north, Ivry to the east, Montrouge to the south, and Grenelle to the south-west, are encircled at a distance of from two to five miles by an outer range of heights, including Villejuif, Meudon, St. Cloud, and Mont-Valérien, the highest point in the immediate vicinity of the city. The Seine, which enters P. in the south-east at Bercy, and leaves it at Passy in the west, divides the city into two parts, and forms the two islands of La Cité and St. Louis, which are both covered with buildings.

The earliest notice of P. occurs in Julius Cæsar's *Commentaries*, in which it is described under the name of Lutetia, as a collection of mud huts, composing the chief settlement of the Parisii, a Gallic tribe, conquered by the Romans. The ruins of the Palatium Thermarum (Palais des Thermes), and of ancient altars, aqueducts, and other buildings, show that even in Roman times the town extended to both banks of the Seine. Lutetia began in the 4th c. to be known as Parisia, or P., from the Celtic tribe of the Parisii, to whom it belonged. In the 6th c., P. was chosen by Clovis as the seat of government; and after having fallen into decay under the Carlovingian kings, in whose time it suffered severely from frequent invasions of the Norsemen, it finally became in the 10th c. the residence of Hugh Capet, the founder of the Capetian dynasty, and the capital of the Frankish monarchy.

From this period, P. continued rapidly to increase, and in two centuries it had doubled in size and population. In the middle ages, P. was divided into three distinct parts—La Cité, on the islands; the Ville, on the right bank; and the Quartier Latin, or University, on the left bank of the river. Louis XI. did much to enlarge P., and to efface the disastrous results of its hostile occupation by the English during the wars under Henry V. and Henry VI. of England; but its progress was again checked during the wars of the last of the Valois, when the city had to sustain several sieges. On the accession of Henri IV. of Navarre, in 1589, a new era was opened to Paris. The improvements commenced under his reign were continued under the minority of his son, Louis XIII. Louis XIV. converted the old ramparts into public walks or *boulevards*, organized a regular system of police, established drainage and sewerage works, founded hospitals, alms-houses, public schools, scientific societies, and a library, and thus gave to P. a claim to be regarded as the focus of European civilization. The terrible days of the Revolution caused a temporary reaction. The improvement of P. was recommenced on a new and grander scale under the first Napoleon, when new quays, bridges, markets, streets, squares, and public gardens were created. All the treasures of art and science which conquest placed in his power were applied to the embellishment of P., in the restoration of which he spent more than £4,000,000 sterling in twelve years. His downfall again arrested progress, and in many respects P. fell behind other European cities.

Renovation of various sorts was recommenced under Louis-Philippe; but as lately as 1834, much of the old style of things remained; the gutters ran down the middle of the streets, there was little underground drainage from the houses, oil-lamps were suspended on cords over the middle of the thoroughfares, and, except in one or two streets, there were no side-pavements. It was reserved for Napoleon III. to render P. the most commodious, splendid, and beautiful of modern cities. When he commenced his improvements, P. consisted, in the main, of a labyrinth of narrow, dark, and ill-ventilated streets. He resolved to pierce broad and straight thoroughfares through the midst of these, to preserve and connect all the finest existing squares and boulevards; and in lieu of the old houses pulled down in the heart of the town, to construct, in a ring outside of it, a new city in the most approved style of modern architecture. With the assistance of Baron Haussman, the Prefect of the Seine, his schemes were carried out with rare energy and good taste. Two straight and wide thoroughfares, parallel to and near each other, crossed the whole width of Paris from north to south through the Cité; a still greater thoroughfare was made to run the whole length of the town, north of the Seine, from east to west. The old boulevards were completed so as to form outer and inner circles of spacious streets—the former chiefly lying along the outskirts of the old city, the latter passing through and connecting a long line of distant suburbs. In the year 1867, when the international exhibition was opened, P. had become in all respects the most splendid city in Europe; and in that year it was visited by upwards of a million and a half of foreigners. Many further improvements were then contemplated. New botanical and zoological gardens were to be formed; the museums and class-rooms of the Jardin des Plantes were to be rebuilt; an underground railway was to be formed, crossing P. from east to west; Montmartre was to be levelled, and the Seine was to be deepened up to Grenelle, the point where it leaves the town; and there a harbor was to be formed for sea-going ships, which was to convert P. into a *port de mer*. Financial and political difficulties were, however, at hand (see FRANCE), and these great schemes had to be postponed.

The siege of P. by the Germans, which lasted from 19th September 1870 to 28th January 1871, caused much less injury to the city than might have been expected—it was reserved for a section of the Parisian population to commit an act of Vandalism without a parallel in modern times. On the 18th of March, the Red Republicans, who had risen against the government, took possession of Paris. On the 27th March, the Commune was declared the only lawful government. Acts of pillage and wanton destruction followed. On the 15th of May, the column erected to the memory of Napoleon and the Great Army, in the Place Vendôme, one of the principal squares of P., was solemnly pulled down as a 'monument of tyranny.' The government troops under Marshal McMahon attacked the insurgents, and kept them from doing further mischief. The former succeeded in entering Paris on the 20th of May, and next day the Communists began systematically to set fire with petroleum to a great number of the chief buildings of P., public and private. The fire for a time threatened to destroy the whole city. It raged with the greatest fury on the 24th, and was not checked until property had been lost to the value of many millions sterling, and historical monuments were destroyed which never can be replaced. The horror inspired by the Commune for a time drove the wealthy classes from Paris, and it was feared that it would lose its prestige as a European capital. This, however, has not proved to be the case. In the autumn of 1873, all the private houses burnt had been rebuilt—the monuments only partially injured had been restored, and the streets and public places were as splendid and gay as in the best days of the Empire. There remained, however, to recall the Commune, the blackened ruins of the Tuileries, the Hôtel de Ville, and two or three other buildings to which we are about to refer.

The Seine, in passing through P., is spanned by 28 bridges. The most celebrated and ancient are the Pont Notre-Dame, erected in 1500, and the Pont-Neuf, begun in 1578, completed by Henri IV. in 1604, and thoroughly renovated in 1852. This bridge, which crosses the Seine at the north of the Ile-de-la-Cité, is built on 12 arches, and abuts near the middle on a small peninsula, jutting out into the river, and planted with trees, which form a background to the statue of Henri IV. on horseback, which stands in the central open space on the bridge. Among the other bridges, the handsomest are the Pont de la Concorde, 160 yards long, built in 1787—1790; the Pont du Carrousel, Pont d'Austerlitz, and the Pont d'Jéna, both of the time of the First Empire; and the Pont des Invalides, Pont de l'Alma, and Pont de Solférino—all handsome structures, adorned with military and naval trophies, commemorative of events and victories connected with the Second Empire. These bridges all communicate directly with the spacious quays, planted with trees, which line both banks of the Seine, and which, together with the Boulevards, give special characteristic beauty to the city. Although the most ancient quays—as those des Augustins and de la Mégisserie—date from the 14th c., the greater part of these magnificent embankments measuring 12 miles in extent, is due to the first Napoleon and the late emperor.

Before speaking in detail of the streets, boulevards, and places or squares of P., it is proper to mention that the private houses as well as the public buildings are built of a light-colored kind of limestone, easily wrought and carved ornamentally. With this material, they are reared in huge blocks, rising to a height of six or seven stories; each floor constituting a distinct dwelling; access to all the floors in a tenement being gained by a common stair, which is usually placed under the charge of a porter at the entrance.

Very frequently, the tenements surround an open quadrangle, to which there is a spacious entry, the gate of which is kept by a porter for the whole inhabitants of the several stairs. In these respects, therefore, P. differs entirely from London; for instead of extending rows of small brick buildings of a temporary kind over vast spaces, the plan consists of piling durable houses on the top of each other, and confining the population to a comparatively limited area. In the great new streets which were formed in the time of the late emperor, this general plan has been adhered to, but with this difference, that instead of being narrow and crooked, they are wide and straight. Among the finest of them are the Rue de Rivoli, two miles in length, the Rue de la Paix, the Rue du Faubourg St. Honoré, and the Rue Royale. The Boulevards, which extend in a semicircular line on the right side of the Seine, between the nucleus of the city and its surrounding quarters, present the most striking feature of Paris life. In all the better parts of the city they are lined with trees, seats, and little towers called *Vespasiennes*, covered with advertisements. Restaurants, cafés, shops, and various places of amusement succeed one another for miles, their character varying from the height of luxury and elegance in the western Boulevard des Italiens, to the homely simplicity of the eastern Boulevards Beaumarchais and St. Denis. Among the public squares or *places*, the most noteworthy is the Place de la Concorde, which connects the Gardens of the Tuileries with the Champs-Elysées, and embraces a magnificent view of some of the finest buildings and gardens of Paris. In the center is the famous obelisk of Luxor, covered over its entire height of 73 feet with hieroglyphics. It was brought from Egypt to France, and in 1836 placed where it now stands. On the site of this obelisk stood the revolutionary guillotine, at which perished Louis XVI., Marie Antoinette, Philippe Egalité, Danton, Robespierre, and a host of other victims.

Of the other squares, the following are some of the most handsome: the Place du Carrousel, between the Tuileries and Louvre; the Place Vendôme, already referred to, with Napoleon's Column of Victory; the Place de la Bastille, where once stood that famous prison and fortress; the Place Royale, with its two fountains and a statue of Louis XIII.; the Place de l'Hôtel de Ville, formerly Place de la Grève, for many ages the scene of public executions, and the spot at which some of the bloodiest deeds of the Revolution were perpetrated. The Porte St. Martin and Porte St. Denis, which were erected by Louis XIV. to commemorate his victories in the Low Countries, and are adorned with bas-reliefs representing events of these campaigns, marked the ancient limits of the most turbulent quarters of the Paris of the past; while the Arc de l'Etoile, begun by Napoleon in 1806, and completed in 1836 at a cost of more than £400,000, may be said to form the extreme western boundary of the aristocratic quarters. This arch, which bounds the Champs-Elysées, has a total height of 152 feet, and a breadth of 137. It is profusely adorned with bas-reliefs and alto-reliefs, representing victories of Napoleon, which were injured during the bombardment of Paris, but which have since undergone a complete restoration. The great streets which radiate from the Arc de Triomphe were among the most magnificent of those constructed during the recent improvements, and they still form the finest quarter of Paris. A great avenue runs east from it to the Palace of the Tuileries, in the heart of the city.

The Palace of the Tuileries (q. v.) was begun in 1566 by Catharine de' Medici, and enlarged by successive monarchs, while used as a royal residence, until it formed a structure nearly a quarter of a mile in length, running at right angles to the Seine. To the east of the Tuileries, at a distance of more than a quarter of a mile, was erected the palace of the Louvre, forming a square of 576 feet by 538 feet, remarkable, especially the eastern façade, for its architectural beauty. The Louvre long since ceased to be a royal residence, and has been converted into a public museum of antiquities. It was connected with the Tuileries by a great picture gallery overlooking the Seine, and 1456 feet in length. North of the picture gallery, and between the two palaces, lay the Place du Carrousel, into the northern side of which, at the accession of Napoleon III., there intruded a mass of poor and narrow streets. One of the emperor's earliest improvements was to remove these buildings, and connect the Tuileries and Louvre on the northern side, throwing them into one vast building, forming the most

magnificent palatial structure in the world. The Tuileries continued to be occupied as the residence of the imperial family; but the Louvre proper formed a series of great galleries filled with pictures, sculptures, and collections of Egyptian, Greek, and Roman antiquities. The Communists attempted to burn the whole pile, but only succeeded in destroying the Tuileries (of which the main part is not to be rebuilt), and a corner of the Louvre. The library of the Louvre, with its contents, was burned, but the rest of the building and its priceless treasures were saved. A large sum was voted by the government for the restoration of the Louvre, and this work was at once undertaken and carried forward with the utmost despatch. North of the injured part of the Louvre is the Palais Royal (q. v.), the most valuable part of which, fronting the Rue St. Honoré, was set fire to by order of the Commune in 1871. The Palace of the Luxembourg, on the south side of the Seine, was built by Marie de' Medici in the Florentine style. It contains many magnificent rooms, some of which have been employed as picture galleries for the works of modern artists.

The Luxembourg was formerly the House of the Peers, after 1871 was used as the Prefecture of the Seine, and in 1879 became the meeting-place of the French Senate. On the north bank of the Seine, opposite the island of the Cité, stood the old Hôtel de Ville, which, before its destruction by the Commune, was one of the most magnificent buildings in Paris. It was the residence of the Prefect of the Seine, who held a sort of court there, and it included all the offices for the transaction of the municipal business of Paris. It was commenced under Francis I., but had been trebled in extent by recent additions. The statues and rich ornaments with which it was decorated were almost entirely destroyed, but steps were immediately taken to have the Hôtel carefully rebuilt in the style of its predecessor. On the island of the Cité stands the Palais de Justice, a vast building, also set fire to by the Commune; some parts of it date from the fourteenth century, and others are modern. It is the seat of some of the courts of law, as the Courts of Cassation, of Appeal, and of Police. The old Palace was not much injured by the fire; but the new portion (again rebuilt) which was constructed during the reign of Napoleon III., and much admired for its architecture, was left in ruins. Within the precincts of this palace are the Sainte Chapelle, and the noted old prison of the Conciergerie, in which Marie Antoinette, Danton, and Robespierre were successively confined.

The Conciergerie, just mentioned, in which prisoners are lodged pending their trial, constitutes one of the eight prisons of P., of which the principal is La Force. The Nouveau Bicêtre is designed for convicts sentenced to penal servitude for life; St. Pélagie receives political offenders, St. Lazare is exclusively for women, the Madelonnettes for juvenile criminals, and Clichy for debtors.

The number of the institutions of benevolence is enormous. The largest of the numerous hospices or alms-houses is La Salpétrière, probably the largest asylum in the world, extending over 78 acres of land, and appropriated solely to old women, 1300 of its 4500 inmates being insane patients; Bicêtre, with nearly 3600 beds, receives only men. The Hospice des Enfans Trouvés, or Foundling Hospital, provides for the infants brought to it till they reach the age of maturity, and only demands payment in the event of a child being reclaimed. The Crèches, or public nurseries, first established in 1844, of which there are now 18, receive the infants of poor women for the day at the cost of 20 centimes. Besides institutions for the blind, deaf and dumb, convalescents, sick children, &c., P. has 17 general and special hospitals. Of these the oldest and most noted are the Hôtel Dieu, receiving annually 13,000 patients; La Charité, and La Pitié.

The chief institutions connected with the University of France, and with education generally, are still situated in the Quartier Latin. The Sorbonne (q. v.), a large building erected by Cardinal Richelieu for the faculties of the old university of Paris, contains lecture-halls and class-rooms, and an extensive library open to the public. There degrees are granted by the University of France in the faculties of science, letters, and theology, and gratuitous public lectures are delivered, which are attended by a large number of students. Near Sorbonne is the Collège de France, where gratuitous lectures are also delivered by eminent scholars and men of letters. The Ecole Polytechnique, the School of Medicine and the School of Law, the Observatory, and the Jardin des Plantes, with its great museum of natural history, lecture-rooms, and botanical and zoological gardens, are situated in the same quarter of Paris.

The principal of the public libraries are those of the Rue Richelieu, now called the Bibliothèque Nationale, which contains about 2,000,000 volumes, 190,000 manuscripts, 5000 portfolios of engravings, and a great collection of coins and medals (see LIBRARIES), which originated in a small collection of books placed by Louis XI. in the Louvre. No city on this side of the Alps is richer than P. in fine-art collections, and among these the museums at the Louvre stand pre-eminent. The Palais des Beaux-Arts is used as an exhibition of art, manufactures, and architectural models. The Hôtel Cluny, connected underground with the Palais des Thermes, in addition to its being in itself a most interesting monument of medieval art, contains curious relics of the arts and usages of the French people, from the earliest ages of their history to the Renaissance period. The Mint deserves notice for the perfection of its machinery. The Gobelins, or tapestry manufactory, may be included under the fine arts, as the productions of its looms are all manual, and demand great artistic skill. The Conservatoire des Arts et Métiers, in the Rue St. Martin, contains a great collection of models of machinery, and class-rooms for the instruction of workmen in all departments of applied science. The Palace of Industry, built in 1854 for the Universal Exhibition, now forms a permanent exhibition. The spacious building in which the Exhibition of 1878 took place was named Palace of the Trocadéro.

Among the parish churches of P. (upwards of 60 in number), the grandest and most interesting, in an historical point of view, is the cathedral of Notre-Dame, which stands on a site successively occupied by a pagan temple and a Christian basilica of the time of the Merovingian kings. The present building was constructed between the 12th and 15th centuries; and in its present state of restored magnificence, it may rank as one of the noblest specimens of Gothic architecture. St.-Germain-des-Prés, which is probably the most ancient church in P., was completed in 1163; St. Etienne du Mont and St. Germain l'Auxerrois, both ancient, are interesting—the former for its picturesque and quaint decorations, and for containing the tomb of St. Geneviève, the patron saint of P.; and the latter for its rich decorations and the frescoed portal, restored at the wish of Margaret of Valois. The Sainte Chapelle, built by St. Louis in 1245—1248, for the reception of the various relics which he had brought from the Holy Land, is one of the most remarkable buildings in Paris, profusely decorated in all parts with brilliantly colored materials. Its present beauty is entirely due to the restorations completed by the late emperor at a cost of £50,000. It was threatened by the Commune, but saved. Among modern churches are the Madeleine, built in imitation of a Greek temple, and gorgeous with gildings, frescoes, carvings, marbles, and statues; and the Pantheon, which was begun as a church, but converted by the Constituent Assembly of republican France into a temple dedicated to the great men of the nation—it was restored to the church by the late emperor, and re-dedicated to St. Geneviève; Notre-Dame de Lorette, erected in 1823, a flagrant specimen of the meretricious taste of the day; and St. Vincent de Paul, completed in 1844, somewhat less gaudy and more imposing in style; &c. Among the few Protestant churches, l'Oratoire is the largest and the best known.

P. abounds in theaters and places of amusement suited to the tastes and means of every class. The leading houses, as the Opéra, Théâtre Français—chiefly devoted to classical French drama—Odéon, Théâtre Italien, &c., receive a subvention from government, and all are under strict police supervision. The new opera-house, completed in 1875, is a wonderfully magnificent building, costing, exclusive of the site, £1,120,000. Cheap concerts, equestrian performances, and public balls, held in the open air in summer, supply a constant round of gaiety to the burgher and working classes at a moderate cost, and form a characteristic feature of P. life; while, in addition to the noble gardens of the various imperial palaces, the most densely-crowded parts of the city have public gardens, shaded by trees, and adorned with fountains and statues, which afford the means of health and recreation to the poor. Beyond the fortifications at the west of P. is the Bois de Boulogne, converted by the late emperor from a wood covered with stunted trees into one of the most beautiful gardens in Europe. That part of it which skirted the fortifications was cut up and destroyed during the siege, but since then it has been replanted, and is now as attractive to visitors as it has ever been.

P. has three large and twelve lesser cemeteries, of which the principal one is Père-la-Chaise, extending over 200 acres, and filled in every part with monuments erected to the memory of the countless number of celebrated persons who have been buried here. The Morgue is a building in which the bodies of unknown persons who have met with a violent death are placed, and which, if not claimed within three days, are buried at the public expense. The southern parts of the city are built over beds of limestone, rich in fossils, which have been so extensively quarried as to have become a mere network of vast caverns, which in some cases scarcely afford sufficient support to the houses above. These quarries were first converted in 1784 into catacombs, in which are deposited the bones of the dead, collected from the ancient cemeteries of Paris.

P. was surrounded, under Louis-Philippe, with fortifications extending 30 miles round, and costing £5,500,000 sterling, and, in addition to these, 16 detached forts have been erected at definite distances from one another. The Champ-de-Mars is a vast sandy plain near the Quai d'Orsay, on which reviews and other military displays and national festivals are held. Close to it stands the Ecole Militaire, founded in 1752, and used as barracks for in-

fantry and cavalry, of which it can accommodate 10,000 men, with space for 800 horses. The Hôtel des Invalides, founded in 1670 for disabled soldiers, is situated on the left bank of the river. The crypt of the church contains the sarcophagus, hewn from a huge block of Russian granite, in which lie the remains of Napoleon, deposited there in 1840.

P. is divided into 20 arrondissements. The prefect of the Seine is the chief of the municipal government, and is appointed by the government. There is a large municipal council, chosen by popular election. Each arrondissement has a maire and two assistant councillors. The prefect of police is at the head of the civic guard or gensdarmes, the fire-brigade, and the sergents de ville or city police, who are armed with a sword. The cleaning, sewerage, and water supplies of P. are under the charge of the prefect. P. is now abundantly supplied with pure and wholesome water; since 1854, the length of vaulted sewers has been doubled, and now amounts to upwards of 250 miles. The same may be said in regard to the paving of the city, and the street lighting is effected by some 15,000 gas jets, and numerous electric lights. In 1818, public slaughter-houses, or abattoirs, were established at different suburbs, where alone animals are allowed to be slaughtered. Large cattle-markets are held near the licensed *Abattoirs* (q. v.). There are in the heart of the city numerous *halles*, or wholesale, and *marchés*, or retail markets. The principal of these is the Halles Centrales, near the church of St. Eustache, covering nearly 20 acres. Among the older markets are the Halle aux Vins, in which 500,000 casks of wine can be stowed, and the Marché aux Fleurs.

For an account of P., see *Le Nouveau Paris*, by Labedolière; Moriac's *Paris sous la Commune* (Paris, 1871); G. A. Sala's *Paris Herself again;* and the recent editions of Hachette's, Baedeker's, and Murray's guide-books. A great work, which was to include all the principal documents connected with the history of P., was commenced during the late empire, under the supervision of M. Haussman. Seven large quarto volumes had appeared when the work was interrupted by the events of 1871.

PARIS BASIN, the collective name of the beds of Eocene age, which rest in a hollow of the chalk in the district around Paris, where they occupy an oblong area measuring 180 miles in greatest length from north to south, and 90 miles in breadth from east to west. The different sections into which the series has been divided are given under Eocene (q. v.). The beds are chiefly remarkable for the rich harvest of organic remains which they supplied to Cuvier, and which led to the foundation of the modern science of Palæontology. The strata from which these were principally obtained consist of a series of white and green marls with subordinate beds of gypsum; they are largely developed at Montmartre, where the gypsum has been extensively quarried for the manufacture of plaster of Paris. The fossils consist of land and fluviatile shells, fresh-water fish and crocodiles, and the bones of birds and quadrupeds, besides a few land-plants, among which are some palms. The mammals, of which about 50 species have been described, belong to the order Pachydermata. The Paris Basin has for some time almost ceased to supply the remains of vertebrate animals.

PARIS, MATTHEW, the best Latin chronicler of the 13th c., was born in 1195, and in 1217 entered the Benedictine monastery of St. Albans. After the departure of Roger of Wendover, in 1235, P. was chosen to succeed him as annalist of the monastery. He discharged his functions with veracity and boldness, in consequence of which he greatly displeased some of his contemporaries. The principal external incident of his life was his voyage to Norway, whither he was invited by King Hakon, to repair the financial disorders in the Benedictine monastery of Holm. P. landed at Bergen, 10th July 1248, was courteously received by the Norwegian monarch, and settled the business about which he came in a satisfactory manner. After his return to England, he stood high in favor of Henry III., who used to converse with him in the most familiar manner, and from whose lips he derived not a little information that makes his *Chronicle* so valuable. He had also a wide circle of influential friends and acquaintances among the clergy from whom he obtained materials for his work. His death occurred in 1259. P. had a great reputation in his day for his virtues and abilities. He was considered a universal scholar, and is said by his laudatory biographers to have been versed in mathematics, poetry, oratory, divinity, history, painting, and architecture. One thing about him long kept his memory green in the hearts of his countrymen—he was a patriotic Englishman, and though a sincere Catholic (like all good men of his age), yet he loved his country better than the pope, and wrote so fiercely against the encroachments of the court of Rome in ecclesiastical matters, that his *Chronicle* became, in after times, a great favorite with the Reformers.

P 's principal work is his *Historia Major*, which begins with the Norman Conquest, and extends to the year of the author's death. It was continued by William Rishanger, also a monk of St. Albans, till the death of Henry III. in 1272. The first edition was published at London by Archbishop Parker, in 1571, and was reproduced at Zürich in 1606; later and more complete editions are those of London in 1640—1641, and in 1684. The only portion of the *Historia Major*, however, which is properly the work of P., is that extending from 1235 to 1259; the previous part being nearly a transcription from the *Flores Historiarum*, attributed to Roger of Wendover, whence some critics have supposed that P. is really the author of that work too. But this opinion is strenuously contested by the most recent editor of the *Flores Historiarum*, the Rev. H. O. Coxe (4 vols. 1841—1842). Translations both of P.'s Chronicle and that of Reger of Wendover have been published by Bohn in his Antiquarian Library. The British Museum, and the library of Corpus Christi College at Cambridge, contain manuscript abridgments of *Historia Major*, made by P. himself, and entitled *Chronica Majora Sancte Albani;* a second abridgment is known as the *Historia Minor*. Other works of P.'s are *Duorum Offarum Merciorum Regum Vitæ; Viginti trium Abbatum, S. Albani Vitæ;* and *Additamenta*, being explanatory additions to his *Historia Major*.

PA'RISH (Gr. *paroikia*, habitations, from *para*, near, and *oikeomai*, I dwell; Lat. *parochia*), the district assigned to a particular church, where the inhabitants of the district may attend at public worship, and receive the sacramental or other ministrations of the clergy. The name originally seems to have been interchangeable with *diœcesis*, 'diocese,' and to have been applied to the district subject to the spiritual jurisdiction of a bishop; and, on the other hand, at a later period, *diœcesis* was sometimes used to signify a parochial church or district. The distribution into parishes appears to be comparatively modern. Originally, all the clergy were (in the opinion of the Episcopalian churches) but coadjutors of the bishop, and served in his church, at which all the faithful assembled. At Alexandria, and afterwards at Rome, a number of minor churches were opened (called at Rome *tituli*), which were served by clergy, originally not permanently attached to them, but sent from the principal or bishop's church, but in progress of time fixed permanently in the charge. This, however, was not common; and we find churches, with clergy permanently attached, much earlier in rural districts than in cities. The institution does not appear to have become general till the 9th or 10th century. In England, the first legislation on the subject occurs in the laws of Edgar, about 970. The parochial division of districts seems in great measure to have followed the civil distribution into manors, or other feudal divisions of territory; and it is probable that it is to the same state of things we owe the practice of lay patronage, the priest officiating in a manorial church being chosen, with the bishop's consent, by the lord of the manor. The parochial revenue, however, by no means followed the same rules which now prevail.

At first, all ecclesiastical income, from whatever district, was carried into a common fund, which was placed at the disposal of the bishop, and was generally divided into four parts—for the bishop, for the clergy, for the poor, and for the church. By degrees, however, beginning first with the rural parishes, and ultimately extending to those of the cities, the parochial revenues were placed at the disposal of the parish clergy (subject to the same general threefold division, for the clergy, for the poor, and for the church); and in some places an abusive claim, which was early reprobated, arose upon the part of the lord of the manor to a portion of the revenue. Properly, a parish has but one church; but when the district is extensive, one or more minor (*succursal*) churches, sometimes called 'chapels of ease,' are permitted.

In the law of England, a parish is an important subdivision of the country, for purposes of local self-government, most of the local rates and taxes being confined within that area, and to a certain extent self-imposed by the parties who pay them. The origin of the division of England into parishes is not very clearly ascertained by the authorities. Some have asserted that the division had an ecclesiastical origin, and that a parish was merely a district sufficient for one priest to attend to. But others have asserted that parishes had a civil origin long anterior to ecclesiastical distinctions, advantage being merely taken to ingraft these on so convenient an existing subdivision of the country; and that a parish was a subdivision of the ancient hundred, known as a vill or town, and through its machinery the public taxes were anciently collected. Hobart fixes the date of the institution of civil parishes in 1179, and his account has been generally followed. Much difficulty has occasionally arisen in fixing the boundaries of parishes.

Blackstone says the boundaries of parishes were originally ascertained by those of manors, and that it very seldom happened that a manor extended itself over more parishes than one, though there were often many manors in one parish. Nevertheless, the boundaries of parishes are often intermixed, which Blackstone accounts for by the practice of the lords of adjoining manors obliging their tenants to appropriate their tithes towards the

officiating minister of the church, which was built for the whole. Even in the present day, these boundaries often give rise to litigation, and the courts have always decided the question according to the proof of custom. This custom is chiefly established by the ancient practice of perambulating the parish in Rogation-week in each year. See PERAMBULATION. There are some places as to which it is uncertain whether they are parishes or not, and hence it has been usual to call them reputed parishes. There are also places called extra-parochial places, which do not belong to any parish, such as forest and abbey lands. In these cases, the persons inhabiting were not subject to the usual parochial rates and taxes, and other incidents of parochial life. But in 1857, a statute was passed which put extra-parochial places upon a similar footing to parishes, by giving power to justices, and in some cases to the Poor-Law Board, to annex them to adjoining parishes, after which they are dealt with in much the same way as other places. One of the chief characteristics of a parish is, that there is a parish church, and an incumbent and churchwarden attached to it, and by this machinery the spiritual wants of the parishioners are attended to. These several parish churches, and the endowments connected therewith, belong in a certain sense to the nation, and the incumbents are members of the Established Church of England, and amenable to the discipline of the bishops and the spiritual courts.

The private patronage, or right of presenting a clergyman to an incumbency, is technically called an advowson, and is generally held by an individual as a saleable property, having a market value. The patron has an absolute right (quite irrespective of the wishes of the parishioners) to present a clerk or ordained priest of the church of England to a vacant benefice, and it is for the bishop to see to his qualifications. The bishop is the sole judge of these qualifications, and if he approves of them, the clerk or priest is instituted into the benefice, which ceremony completes his legal title to the fruits of the benefice. The incumbents of parish churches are called rectors, or vicars, or perpetual curates, the distinction being chiefly founded on the state of the tithes. When the benefice is full, then the freehold of the church vests in the rector or parson, and so does the churchyard; but he holds these only as a trustee for the use of the parishioners. There are certain duties which the incumbent of the parish church is bound by law to perform for the benefit of the parishioners. He is bound, as a general rule, to reside in the parish, so as to be ready to administer the rites of the church to them. See NON-RESIDENCE. The first duty of the incumbent is to perform public worship in the parish church every Sunday, according to the form prescribed by the Book of Common Prayer, which is part of the statute-law of England. He must adhere strictly to the forms and ceremonies, and even to the dress prescribed by the Book of Common Prayer and Canons. The incumbent is also bound to baptize the children of all the parishioners, and to administer the rite of the Lord's Supper to the parishioners not less than three times each year. The incumbent is also bound to allow the parishioners to be buried in the churchyard of the parish, if there is accommodation, and to read the burial-service at each interment. He is also bound to marry the parishioners on their tendering themselves, and complying with the marriage acts, within the parish church and during canonical hours, and it is said he is liable to an action of damages if he refuse.

In respect of burials and marriages, certain fees are frequently payable by custom; but unless such a custom exists, no fee is exigible for performance of these duties. In many cases, where one church had become insufficient for the increased population, the old parish has been subdivided under the Church Building Acts, the first of which was passed in 1818, into two or more ecclesiastical districts or parishes, for each of which a new church was built, and an incumbent appointed. The incumbents in these ecclesiastical parishes have generally been provided for by the incumbent of the mother-parish or by voluntary benefactors, and by the aid of pew-rents. But these ecclesiastical parishes, so far as the poor and other secular purposes are concerned, make no change on the old law. Another incident of the parish church is, that there must be churchwardens appointed annually, who are accordingly leading parochial officers, and whose duty is partly ecclesiastical and partly civil. Their civil duties consist chiefly in this, that they must join the overseers in many of the duties arising out of the management of the poor, and incidental duties imposed by statute. But their primary duty is to attend to the repair and good order of the fabric of the church. The common law requires that there should be two churchwardens, one of whom is appointed by the incumbent, and the other is chosen by the parishioners in vestry assembled, but sometimes this rule is varied by a local custom. This appointment and election take place in Easter-week of each year. In electing the people's churchwarden, there is often much local excitement, and it is common to poll the parish, all those who pay poor-rates being entitled to vote, the number of votes varying according to the rent, but no person having more than six votes. See CHURCHWARDENS; CHURCH RATES.

The next most important business connected with the parish is that which concerns the poor, the leading principle being, that each union is bound to pay the expense of relieving its own poor. See OVERSEERS; GUARDIAN; POOR.

Another important feature of the parish is, that all the highways within the parish must be kept in repair by the parish, i. e., by the inhabitants who are rated to the poor. For this purpose, the inhabitants of each parish, in vestry assembled, appoint each year a surveyor of highways, whose duty it is to see that the highways are kept in good repair; and he is authorized, by the General Highway Act, to levy a rate on all the property within the parish. The office of a surveyor of highways is, like those of churchwarden, overseer, and guardian, a compulsory and gratuitous office. When a highway is out of repair, the mode of enforcing the repair is by summoning the surveyor of highways before justices, to show cause why he has not repaired the road; and if the facts are not disputed, the justices either fine him, or order an indictment to be laid against the inhabitants of the parish. This indictment is tried, and the expense of it is defrayed out of the highway-rate, which is subsequently made. The highways of each parish being thus exclusively under the control of the ratepayers and their officers, it happened that great inequality prevailed in the standard of repairs which each parish set up for itself. This led to the late Highway District Acts, first passed in 1862, the object of which is to enable the justices of the peace of the district to combine several parishes into one district, and thus secure more uniformity in the repairs of the highways. A way-warden is now appointed to represent each parish at the Highway Board, instead of the old highway surveyor; but the expenses of maintaining the highways is still ultimately paid by the parish in which they are situated, the only change being, that the expenses are ordered to be incurred by the Highway Board, instead of the parochial officer.

The above duties in reference to the parish church, the poor, and the highways, are the leading duties attaching to the parish as a parish; but over and above these, many miscellaneous duties have been imposed on the parish officers, particularly on the overseers and churchwardens, which will be found specified under the head of OVERSEERS. In nearly all cases where the parish as a parish, is required to act, the mode in which it does so is by the machinery of a vestry. A vestry is a meeting of all the inhabitant householders rated to the poor. It is called by the churchwardens, and all questions are put to the vote. Any ratepayer who thinks the majority of those present do not represent the majority of the whole parishioners, is entitled to demand a poll. At these meetings, great excitement often prevails, especially when there existed church-rates. Wherever a parish improvement is found to be desirable, the vestry may meet and decide whether it is to be proceeded with, in which case they have powers of rating themselves for the expense. Such is the case as to the establishment of baths and wash-houses, watching, and lighting. Returns are made of all parish and local rates to parliament every year. The parish property, except the goods of the parish church, which are vested in the churchwardens, is vested in the overseers, who hold and manage the same, requiring the consent of the Poor-law Board in order to sell it. For the elementary education system, and for school-boards as local authorities of districts (not necessarily parishes), see NATIONAL EDUCATION.

In Scotland, the division into parishes has existed from the most ancient times, and is recognized for certain civil purposes relative to taxation and otherwise, as well as for purposes purely ecclesiastical. The Court of Sessions, acting as the Commission of Teinds, may unite two or more parishes into one; or may divide a parish, or disjoin part of it, with consent of the heritors (or landholders) of a major part of the valuation; or apart from their consent, if it be shown that there is within the disjoined part a sufficient place of worship, and if the Titulars of Teinds (q. v.), or others who have to pay no less than three-fourths of the additional stipend, do not object. By Act. 7 and 8 Vict. c. 44, any district where there is an endowed church may be erected into a parish *quoad sacra*, for such purposes as are purely ecclesiastical. Endowed Gaelic congregations in the large towns of the Lowlands may similarly be erected into parishes *quoad sacra*.

The principal application of the parochial division for civil purposes relates to the administration of the poor-law. Under the old system the administrators of the poor law were the kirk-session in county parishes, and the magistrates, or certain managers selected by them, in burghal parishes. The Act 8 and 9 Vict. c. 83, which remodelled the poor-law of Scetland retained the old administrative body so long as there was no assessment; but, on a parish being assessed, substituted for it a new one, consisting in rural parishes of the owners of heritable property of £20 yearly value, of the magistrates of any royal burg within the bounds, of the kirk-session, a certain number of members chosen by the persons assessed; and in burghal parishes of members, not exceeding 30, chosen by the persons assessed, four members named by the magistrates, and not above four by the kirk-session or ses-

sions. The Board of Supervision may unite two or more parishes into a combination for poor-law purposes. There is not the same extensive machinery for parochial self-government that exists in England.

The burden of supporting the fabric of the church falls on the heritors, and there are no churchwardens. Highways are not repairable by the parish, and there are no elections of surveyors or way-wardens. The meeting of the inhabitants in vestry, which so often takes place in England, is unknown in Scotland, and hence the ratepayers do not interest themselves so much in local affairs. Many of the duties which in England are discharged by parochial officers, are in Scotland discharged by the sheriff-clerk, a county-officer. The system of having a Parish School (q. v.) in every parish (a system extended by the Education Act of 1872) has long prevailed in Scotland, though unknown in England till the year 1870.

PARISH CLERK, in England, is an officer of the parish of some importance, his duty being to lead the responses during the reading of the service in the parish church. He is appointed by the parson, unless some other custom of a peculiar kind exists in the parish. He must be 20 years of age, and has his office for life, but is removable by the parson for sufficient cause. By the statute 7 and 8 Vict. c. 59, a person in holy orders may be elected a parish clerk. Under some of the Church Building Acts governing the new churches built in populous parishes, he is annually appointed by the minister. The salary of the parish clerk is paid out of the church-rate.

PARISH SCHOOL. In England, prior to the recent Education Act, there was no such thing as a parish school—that is, a school existing for the benefit of the parishioners, endowed by the state, or supported by taxes on the parishioners. Every school beyond charity schools was more or less voluntary in its character, and endowed, if at all, by private benefactors. In Scotland, however, it was essential that in every parish there should be a parish school, for a statute of 1696 made it compulsory on the heritors—i. e., the chief proprietors—to provide a school-house, and to fix a salary for the teacher. If the heritors neglected to supply a school-house, the presbytery was empowered to order one at the expense of the heritors. The schoolmaster's salary was fixed according to a certain proportion, half of the rate or cess being paid by the landlord, and half by the tenant.

In 1803, a statute was passed to regulate the salaries, and to give a right to the schoolmaster to have a house and garden. The office was further regulated by a later act, 24 and 25 Vict. c. 107. The salary was fixed to be from £35 to £70 per annum, to be varied and fixed by the heritors and minister of the parish, in the case of future vacancies. The qualification of the schoolmaster consisted in passing an examination conducted by the examiners of parochial schoolmasters, who were professors of the universities, who made regulations as to the time and mode of examination. For this purpose, Scotland was divided into four districts, each in connection with one of the Scotch universities. When examined, the person obtained a certificate of fitness from these examiners. The schoolmaster, who had formerly, before admission to office, been required to sign the Confession of Faith and the formula of the Church of Scotland, and to profess that he would submit to its government and its discipline, had by this act merely to make a declaration that he would not, in his office, endeavor, directly or indirectly, to teach or inculcate opinions opposed to the divine authority of the Holy Scriptures, or to the doctrines contained in the Shorter Catechism, agreed upon by the Assembly of Divines at Westminster, and approved by the General Assembly of the Church of Scotland, and that he would not exercise the functions of his office to the prejudice or subversion of the Church of Scotland as by law established. In case of misconduct, the Presbytery might complain to the Secretary of State, who would institute a commission to inquire and report, and to censure, suspend, or deprive such schoolmaster accordingly. The sheriff of the county was made the sole judge of charges of immorality, or cruel or improper treatment of the scholars, offences formerly cognizable by the Presbytery; and the heritors and minister might permit or require him to resign, and allow him a retiring allowance. Notwithstanding all these improvements, however, it continued to be apparent that the system of parish schools, however well adapted to Scotland at the Revolution, had fallen behind the requirements of the country, when the population had tripled, and large manufacturing villages and towns had sprung up in rural districts. But for denominational and other schools, vast numbers of children would have been left without the rudiments of education.

By the Education (Scotland) Act, 35 and 37 Vict. c. 62 (1872), the parish schools were placed under the management of the School Board of each parish, the jurisdiction of heritors, ministers, and church courts were abolished, and every school under the management of the School Board was declared to be equally a parish school. Teachers in office before the act are not to be prejudiced by its provisions; those whom the School Boards appoint are to have such salaries assigned them as the Boards think fit, and to hold office at pleasure of the Board.

PARK (Fr. *parc*), a term still employed in some parts of Britain in its original sense, to denote a field or enclosure, but more generally applied to the enclosed grounds around a mansion, designated in Scotland by another term of French origin, *policy*. The park, in this sense, includes not only the lawn, but all that is devoted to the growth of timber, pasturage for deer, sheep, cattle, &c., in connection with the mansion, wherever pleasure-walks or drives extend, or the purpose of enjoyment prevails over that of economieal use. *Public parks* are those in the vicinty of towns and cities, open to the public, and intended for their benefit. An increase of public parks is a pleasing feature of the present age, and not a few towns enjoy parks recently bestowed by wealthy persons somehow connected with them.

PARK, MUNGO, a celebrated African traveler, was the son of a Scottish farmer, and was born 10th September 1771 at Fowlshiels near Selkirk. He studied medicine in Edinburgh, and afterwards went to London, where he obtained the situation of assistant-surgeon in a vessel bound for the East Indies. When he returned in 1793, the *African Association* of London had received intelligence of the death of Major Houghton, who had undertaken a journey to Africa at their expense. P. offered himself for a similar undertaking, was accepted, and sailed from England 22d May 1795. He spent some months at the English factory of Pisania on the Gambia in making preparations for his further travels, and in learning the Mandingo language,

Leaving Pisania on the 2d of December he traveled eastward; but when he had nearly reached the place where Houghton lost his life, he fell into the hands of a Moorish king, who imprisoned him, and treated him so roughly, that P. seized an opportunity of escaping (1st July 1796). In the third week of his flight, he reached the Niger, the great object of his search, at Sego (in the kingdom of Bambarra), and followed its course downwards as far as Silla; but meeting with hindrances that compelled him to retrace his steps, he pursued his way westwards along its banks to Bammakoe, and then crossed a mountainous country till he came to Kamalia, in the kingdom of Mandingo (14th September), where he was taken ill, and lay for seven months. A slave-trader at last conveyed him again to the English factory on the Gambia, where he arrived 10th June 1797, after an absence of nineteen months. He published an account of his travels after his return to Britain, under the title of *Travels in the Interior of Africa* (Lond. 1799), a work which at once acquired a high popularity. He now married and settled as a surgeon at Peebles, where, however, he did not acquire an extensive practice; so that, in 1805, he undertook another journey to Africa, at the expense of the government. When he started from Pisania, he had a company of 45, of whom 35 were European soldiers; but when he reached the Niger in August, his attendants were reduced to seven, so fatal is the rainy season in those regions to Europeans. From Sansanding on the Niger, in the kingdom of Bambarra, he sent back his journals and letters in November 1805 to Gambia; and built a boat, in which he embarked with four European companions, and reached the kingdom of Houssa, where he and they are believed to have been murdered by the natives, or drowned as they attempted to sail through a narrow channel of the river.

The fragments of information and other evidence picked up among the natives by Clapperton and Lander (q. v.), strongly confirm this view of the fate of P. and his companions. An account of P.'s second journey was published at London in 1815. P.'s narratives are of no inconsiderable value, particularly for the light which they throw upon the social and domestic life of the negroes, and on the botany and meteorology of the regions through which he passed; but he was unfortunately cut off before he had determined the grand object of his explorations—the discovery of the course of the Niger.

PARK OF ARTILLERY is the whole train of great guns with equipment, ammnnition, horses, and gunners for an army in the field. It is placed in a situation whence rapid access can be had to the line of the army in any part; and at the same time where the divisions of the force can easily mass for its protection. The horses of the park are picketed in lines in its rear.

PA'RKA, the name given by Fleming to a fossil from the Old Red Sandstone, about which there has been considerable difference of opinion. The quarrymen call them 'berries,' from their resemblance to a compressed raspberry. They were compared by Fleming to the panicles of a Juncus, or the globose head of a Sparganium. Lyell thinks they resemble the egg-cases of a Natica, while Mantel suggested that they were the eggs of a batrachian. The opinion now most generally entertained is that they are the eggs of the Pterygotus.

PARKER, a family of distinction in the annals of the British navy. The founder of the family was SIR HUGH PARKER, an

alderman of London, who received a baronetcy in 1681.—His grand-nephew, SIR HYDE PARKER, commanded the British fleet in the action off the Dogger Bank, 5th August 1781, in which three Dutch ships were destroyed, and the rest of the Dutch fleet compelled to retreat into harbor. In 1783, he was appointed to the command of the British fleet in the East Indies; but the ship in which he sailed thither was lost, with all on board.—His second son, SIR HYDE PARKER, distinguished himself in the American war; blockaded the Dutch harbors with a small squadron in 1782; commanded the British fleet in the West Indies in 1795; and in 1801 was appointed to the chief command of the fleet which was sent to the Baltic to act against the armed coalition of the three northern states of Russia, Sweden, and Denmark. He had no share in the battle of Copenhagen, in which Nelson engaged contrary to his orders; but by his appearance before Carlscrona, he compelled the neutrality of Sweden; and he was on the point of sailing for Cronstadt, when the news of Paul's death put an end to hostilities.—His kinsman, SIR WILLIAM PARKER, was also a British admiral of high repute for his skill and bravery, and contributed to some of the great victories of the close of last century.—SIR PETER PARKER, who was born in 1716, and died in 1811, with the rank of admiral of the fleet, served with distinction during the Seven Years' and the American wars; and in 1782 brought the French admiral, De Grasse, a prisoner to England, for which he received a baronetcy.—SIR WILLIAM PARKER, born in 1781, commanded the frigate *Amazon* in 1806, and took, after a hard fought battle, the French frigate *La Belle Poule*, belonging to the squadron of Admiral Linois; and in 1809 captured the citadel of Ferrol.

In 1841, he succeeded to Admiral Elliot in the command of the fleet in the Chinese seas during the first Chinese war. He took possession of Chusan, Ningpo, and Shapu; forced the entrance of the Yang-tse-kiang; and arrived under the walls of Nanking, where the treaty of peace was agreed upon. For these services, he received a baronetcy in 1844. He was afterwards appointed to the command of the fleet in the Mediterranean, and exerted himself, although in vain, to mediate between the Neapolitan government and the insurgent Sicilians. In autumn 1849, he sailed to the Dardanelles, at the request of Sir Stratford Canning (now Lord Stratford de Redcliffe), to support the Porte against the threatening demands of Austria and Russia concerning political fugitives; and in January 1850 he compelled the Greek government, by a blockade of their ports, to comply with the demands of Britain. Named in 1851 Admiral of the Blue, he resigned the command of the Mediterranean fleet to Admiral Dundas, was created Admiral of the White in 1853, Admiral of the Red in 1858, and Rear-admiral of the United Kingdom in 1862. He died in 1866.

PARKER, MATTHEW, the second Protestant Archbishop of Canterbury, was born at Norwich, August 6, 1504, studied at Corpus Christi College, Cambridge, and was ordained a priest in 1527. At the university, he was a distinguished student, especially of the Scriptures and of the history of the church, even to antiquarian minuteness; yet, in spite of his strong leaning to the past, he was from an early period favorably disposed towards the doctrines of the Reformation, and lived in close intimacy with some of the more ardent reformers. In 1533, he was appointed chaplain to Queen Anne Boleyn, who thought very highly of him, and not long before her death, exhorted her daughter Elizabeth to avail herself of P.'s wise and pious counsel. In 1535, he obtained the deanery of the monastic college of Stoke-Clare in Suffolk—*Roman Catholicism*, it must not be forgotten, being still the professed religion of the land, for Henry had not yet formally broken with the pope—and here the studious clerk continued his pursuit of classical and ecclesiastical literature, and at the same time set himself to correct the prevailing decay of morals and learning in the church, by founding a school in the locality for the purpose of instructing the youth in the study of grammar and humanity. Here, too, he appears for the first time to have definitely sided with the reforming party in the church and state, the sermons which he preached containing bold attacks on different Catholic tenets and practices.

In 1538, P. took the degree of D.D.; and in 1544, after some minor changes, became master of Corpus Christi College, Cambridge, which he ruled admirably. Three years later, he married Margaret Harlstone, the daughter of a Norfolkshire gentleman. It was probably about this time that he drew up his defence of the marriage of priests, entitled *De Conjugio Sacerdotum*. In 1552, he was presented by King Edward VI. to the canonry and prebend of Covingham, in the church of Lincoln. On the accession of Queen Mary, he refused to conform to the re-established order of things, and was (like many others of the new school of divines) deprived of his preferments, and even obliged to conceal himself. It does not appear, however, that he was eagerly sought after by the emissaries of Mary; for he was no fanatic or iconoclast, but, on the contrary, though sincerely attached to the common Protestant doctrines, very unwilling to disturb the framework of the church. P. spent at least some portion of his compulsory seclusion from public life in the enlargement of his *De Conjugio Sacerdotum*, and in translating the Psalms into English meter. The death of Mary, and the accession of Elizabeth, called him from that learned retirement of which he seems to have been sincerely fond. Sir Nicholas Bacon, now Lord-keeper of the Great Seal, and Sir William Cecil, Secretary of State, both old Cambridge friends, knew what a solid and sure judgment, what a moderate and equable spirit, and above all, what a thorough faculty for business, ecclesiastical and secular, P. had, and by their recommendation he was appointed, by the queen, archbishop of Canterbury. The consecration took place in Lambeth chapel, December 17, 1559.

'The subsequent history of Archbishop Parker,' it has been justly remarked, 'is that of the Church of England.' The difficulties that beset him were very great. Elizabeth herself was much addicted to various 'popish' practices, such as the idolatrous use of images, and was strongly, we might even say, violently, in favor of the celibacy of the clergy. She went so far as to insult P.'s wife on one occasion. But his greatest anxiety was in regard to the spirit of sectarian dissension within the bosom of the church itself. Already the germs of *puritanism* were beginning to spring up, and there can be no doubt that their growth was fostered by the despotic caprices of the queen. P. himself was manifestly convinced that if ever Protestantism was to be firmly established in the land at all, some definite ecclesiastical forms and methods must be sanctioned, to secure the triumph of order over anarchy, and so he vigorously set about the repression of what he thought a mutinous individualism incompatible with a catholic spirit. That he always acted wisely or well, cannot be affirmed; he was forced, by virtue of his very attitude, into intolerant and inquisitorial courses, and as he grew older, he grew harsher, the conservative spirit increasing with his years. To forbid 'prophesyings,' or meetings for religious discourse, was something very like persecution, though probably enough something very like treason to the church was talked in these pious conventicles. Fuller (who must have his pun, however bad) says of him: 'He was a Parker indeed, careful to keep the fences.' Yet it must not be forgotten that it is to P. we owe the *Bishops' Bible*, undertaken at his request, carried on under his inspection, and published at his expense in 1568. He had also the principal share in drawing up the *Book of Common Prayer*, for which his skill in ancient liturgies peculiarly fitted him, and which strikingly bears the impress of his broad, moderate, and unsectarian intellect. It was under his presidency, too, that the *Thirty-nine Articles* were finally reviewed and subscribed by the clergy (1562). P. died May 17, 1575.

Among other literary performances, P. published an old *Saxon Homily on the Sacrament*, by Ælfric of St. Albans, to prove that Transubstantiation was not the doctrine of the ancient English church; edited the histories of Matthew of Westminster and Matthew Paris (q. v.); and superintended the publication of a most valuable work, *De Antiquitate Britannicæ Ecclesiæ*, probably printed at Lambeth in 1572, where the archbishop, we are told, had an establishment of printers, engravers, and illuminators. He also founded the 'Society of Antiquaries,' and was its first president; endowed the university of Cambridge, and particularly his own college, with many fellowships and scholarships, and with a magnificent collection of MSS. relating to the civil and ecclesiastical condition of England, and belonging to nine different centuries (from the 8th to the 16th). Of this collection, Fuller said that it was 'the sun of English antiquity before it was eclipsed by that of Sir Robert Cotton.'

PARKER, THEODORE, an American clergyman and scholar, was born at Lexington, Massachusetts, August 24, 1810. His grandfather was captain of a militia company at the battle of Lexington, his father a farmer and mechanic, and his own boyhood was spent at the district school, on the farm, and in the workshop. At the age of 17, he taught a school, and earned money to enter Harvard College in 1830. During his collegiate course, he supported himself by teaching private classes and schools, and studied metaphysics, theology, Anglo-Saxon, Syriac, Arabic, Danish, Swedish, German, French, Spanish, and modern Greek. Entering the divinity class, at the end of his collegiate course, he commenced to preach in 1836, was an editor of the *Scriptural Interpreter*, and settled as Unitarian minister at West Roxbury in 1837.

The naturalistic or rationalistic views which separated him from the more conservative portion of the Unitarians, first attracted wide notice, in consequence of an ordination sermon, in 1841, on *The Transient and Permanent in Christianity*. The contest which arose on the anti-supernaturalism of this discourse, led him to further develop his theological views in five lectures, delivered in Boston, and published (1841) under the title of *A Discourse of Matters Pertaining to Religion*, which was followed by *Sermons for the Times*. Failing health induced him to make an extended tour in Europe. In 1845, he returned to Boston, preached to large

audiences at the Melodeon, and wrote for the *Dial*, *Christian Register*, *Christian Examiner*, and *Massachusetts Quarterly*. He became also a popular lecturer, and was active and earnest in opposition to slavery, the Mexican war, and the Fugitive Slave Law, for resisting which, by more than words, he was indicted. In the midst of his work, he was attacked, in 1859, with bleeding from the lungs, and made a voyage to Mexico, where he wrote his *Experience as a Minister*, whence he sailed to Italy, where he died at Florence, May 10, 1860. His works, consisting chiefly of miscellanies, lectures and sermons, have been collected and published in America and England, in which his peculiar views in theology and politics are sustained with great force of logic and felicity of illustration. His learning was equal to his energy and philanthropy, and his influence was also great. His library of 13,000 volumes he bequeathed to the Boston Free Library. See P.'s *Life and Correspondence*, by Weiss (1864).

PA'RKESINE, the name given to a substance introduced for manufacturing purposes by Mr. Parkes of Birmingham. In that town, where so many kinds of small objects are made in countless thousands daily, it is of great importance to get hold of a cheap material which will in some measure partake of the properties of ivory, bone, horn, tortoiseshell, hardwood, India-rubber, or other natural subsjances. There are a number of artificial compositions which to some extent do this, and Parkesine is one of these. It is said to be a mixture of pyroxyline (gun-cotton) and oil, hardened with chloride of sulphur. The pyroxyline is made from any vegetoble fibre, as cotton and flax waste, or rags. According to another account, it is composed of castor oil, collodion, and wood spirit. For large and cheap objects other materials and solvents can be used, to which saw-dust, cork-dust, or pigments may be largely added.

P. does not soften, like gutta-percha, by heat; it may be made either opaque or transparent, plain or colored; it will make a very strong joint after fracture; it will resist most of the common acids. In its hard form, the surface can be so treated as to imitate marble, tortoiseshell, amber, or malachite. It may be moulded, pressed, turned, sawn, planed, carved, rolled, engraved, inlaid, or polished, according to the consistency given to it in the course of manufacture; or it may be made thin enough to use, when melted, as a varnish or waterproofing. It may be made into knife-handles, combs, brush-backs, shoe-soles, umbrella handles, buttons, tubes, galvanic-battery cells, waterproof fabrics, surgical implements, and telegraphic insulators.

PARKHURST, JOHN, an English Biblical scholar, the second son of John Parkhurst, Esq., of Catesby, in Northamptonshire, was born in June 1728, educated at Rugby and at Clare Hall, Cambridge, where he took his degree of M.A. in 1752, and in 1753 published *A serious and Friendly Address to the Rev. John Wesley, in Relation to a Principal Doctrine advanced and maintained by him and his Assistants*. The doctrine assailed in P.'s pamphlet was the favorite Wesleyan doctrine of 'Assurance.' In 1762 appeared his principal work—indeed the only thing that has preserved his name—*A Hebrew and English Lexicon, without Points, adapted to the use of Learners*. P. kept mending this Hebrew lexicon all his life. It was a very creditable performance for its time, and long continued to be the standard work on the subject among biblical students in this country; but it is disfigured by its fanciful etymologies, partly the result of his having (like many other divines of his time) adopted the irrational and presumptuous theories of Hutchinson (q. v.), and is now entirely superseded by the works of Gesenius, Ewald, and other critical scholars. P. also wrote a treatise (1787) against Dr. Priestly, to prove the divinity and pre-existence of Jesus Christ. He died at Epsom, in Surrey, March 21, 1797.

PARKINSO'NIA, a genus of plants of the natural order *Leguminosæ*, sub-order *Cæsalpinieæ*.—*P. aculeata* is a West Indian shrub or small tree, which, when in flower, is one of the most splendid objects in the vegetable kingdom. It has pinnated leaves, with winged leaf-stalk, and large yellow flowers spotted with red. It is furnished with strong spines, and is often used for hedges whence it is called the Barbadoes Flower Fence. It is now common in India. The bark yields a beautiful white fibre, which, however, is not very strong; but it has been suggested that it might be found snitable for paper-making.

PA'RLEY, in Milltary Language, is an oral conference with the enemy. It takes place under a flag of truce, and usually at some spot—for the time neutral—between the lines of the two armies.

PA'RLIAMENT (Fr. *parlement*, from *parler*, to talk), the supreme legislature of the United Kingdom of Great Britain and Ireland. The word was first applied, according to Blackstone, to general assemblies of the states under Louis VII. in France about the middle of the 12th c.; but in that country it came eventually to be the designation of a body which performed certain administrative functions, but whose principal duties were those of a court of justice.

The origin of the Parliament of England has been traced to the Saxon great councils of the nation called 'Wittena-gemote,' or meeting of wise men. These had, however, little in common with the parliaments of a later date: among other points of difference, they had a right to assemble when they pleased without royal warrant. Even under the Norman kings, the Great Council formed a judicial and ministerial as well as a legislative body, and it was only gradually that the judicial functions were transferred to courts of justice, and the ministerial to the privy council—a remnant of the judicial powers of parliament being still preserved in the appellate jurisdiction of the House of Lords. Under the Norman kings, the council of the sovereign consisted of the tenants-in-chief of the crown, who held their lands *per baroniam*, lay and ecclesiastic. It was the principle of the feudal system that every tenant should attend the court of his immediate superior; and he who held *per baroniam*, having no superior but the crown, was bound to attend his sovereign in the Great Council or Parliament. In the charter of King John, we for the first time trace the germ of a distinction between the peerage and the lesser nobility, the archbishops, bishops, abbots, earls, and greater barons being required to attend by a writ addressed to each, and the other tenants-in-chief by a general summons by the sheriffs and baliffs. Baronial tenure originally made a man a baron or lord of parliament.

When the offices or titles of Earl, Marquis, or Duke were bestowed on a baron, they were conferred by royal writ or patent, and at length barony came also to be conferred by writ instead of by tenure. During the 13th c., the smaller barons were allowed, instead of personally attending the national council, to appear by representatives; but the principle of representation seems first to have been reduced to a system when permission was also given to the municipalities, which, as corporations, were chief tenants of the crown, to appear by representatives. It is not quite clear when the division of parliament into two Houses took place; but when the representatives of the minor barons were joined by those of the municipalities, the term Commons was applied to both. The Lower House was early allowed to deal exclusively with questions of supply; and seems, in the reign of Richard II., to have established the right to assign the supplies to their proper uses. As the Commons became more powerful, they came to insist on the crown redressing their grievances before they would vote the supplies. The influence of parliament was on the increase during the Tudor period, while the reign of the Stewarts was characterized by a struggle for supremacy between the parliament and the crown, each striving to acquire the control of the military force of the country. The powers of the different estates came to be more sharply defined at the Revolution of 1688. Nineteen years later, on the Union with Scotland, the parliament of England was merged into that of Great Britain.

In its early history, prior to the War of Independence, the Parliament of Scotland had probably not been very unlike that of England; it assembled without warrant, and consisted of bishops, earls, priors, abbots, and barons. At the close of the 13th c., the constitutional history of Scotland diverges from that of England. The addition of the burghs to the national council seems to date from the beginning of the 14th c., but it was not till much later that the lesser barons began to be exempted from attendance. The first act excusing them belongs to the reign of James I., and allows them to choose representatives called Speakers, two for each county, excepting some small counties, which were to have but one, the expenses of the representatives being defrayed by the constituency. The Scottish Parliament was never, like the English, divided into two Houses; all sat in one hall, and though it consisted of three estates, a general numerical majority of members was considered sufficient to carry a measure. The greater part of the business was transacted by the Lords of the Articles, a committee named by the parliament at the beginning of each session, to consider what measures should be passed; and whatever they recommended was generally passed without discussion. It was never held indispensable that the parliament should be summoned by the crown, and it has even been thought that the royal assent to the measures carried was not absolutely essential. The parliament which carried the Reformation had no royal sanction. The Union was adjusted by commissioners for each country selected by the crown, and passed first, after strong and protracted opposition, in Scotland, and afterwards more easily in England.

By the act of union with Ireland in 1800 (Act 39 and 40 Geo. III. c. 67), the Irish Parliament was united with that of Great Britain as the Parliament of the United Kingdom of Great Britain and Ireland. The Parliament of Ireland had been originally formed on the model of that of England about the close of the 13th c., but it was merely the very small portion of Ireland occupied by the English settlers that was represented, which, as

late as the time of Henry VII., hardly extended beyond the counties of Dublin, Louth, Kildare, and Meath, and constituted what was called the Pale. It was only for the last few years of its existence that the Irish Parliament was a supreme legislature; the English Parliament having, down to 1783, had power to legislate for Ireland. By one of the provisions of Poyning's Act, passed in 1495, no legislative proposals could be made to the Irish Parliament until they had received the sanction of the king and council in England. Act 23 Geo. III. c. 28 gave the Irish Parliament exclusive authority to legislate for Ireland, and the abuse of this power so obstructed the machinery of government, as to render the Union of 1800 matter of necessity.

The power of parliament is, according to Sir Edward Coke, so transcendent and absolute, that it cannot be confined either for persons or causes within any bounds. All remedies which transcend the ordinary courts of law are within its reach. It can alter the succession to the throne, the constitution of the kingdom, and the constitution of parliament itself. It has its own law, to be learned from the rolls and records of parliament, and by precedents and experience. One of the most thoroughly established maxims of this law is, that whatever question arises concerning either House of Parliament ought to be discussed and adjudged there, and not elsewhere. The House of Lords will not allow the Commons to interfere in a question regarding an election of a Scotch or Irish peer; the Commons will not allow the Lords to judge of the validity of the election of a member of their House, nor will either House permit courts of law to examine such cases.

The authority of parliament extends to British colonies and foreign possessions. In the ordinary course of government, however, parliament does not make laws for the colonies. For some the Queen in Council legislates; others have legislatures of their own, which propound laws for their internal government, subject to the approbation of the Queen in Council; but these may be repealed and amended by parliament.

The constituent parts of parliament are the sovereign, the House of Lords, and the House of Commons. In the sovereign is vested the whole executive power; the crown is also the fountain of justice, from whence the whole judicial authority flows. To the crown is intrusted the permanent duty of government, to be fulfilled in accordance with the law of the realm, and by the advice of ministers responsible to parliament. The sovereign is also invested with the character of the representation of the majesty of the state. The sovereign's share in the legislature includes the summoning, proroguing, and dissolving of parliament. Parliament can only assemble by act of the sovereign; in but two instances have the Lords and Commons met of their own authority—viz., previously to the Restoration of Charles II., and at the Convention of Parliament summoned at the Revolution of 1688; and in both instances it was considered necessary afterwards to pass an act declaring the parliament to be a legal one. Though the queen may determine the period for assembling parliament, her prerogative is restrained within certain limits. She is bound by statute (16 Chas. II. c. 1; and 6 and 7 Will. and Mary, c. 2) to issue writs within three years after the determination of a parliament; and the practice of voting money for the public service by annual enactments, renders it compulsory for the sovereign to meet parliament every year. Act 43 Geo. III. c. 90 provides that the sovereign shall assemble parliament within fourteen days, whenever the militia shall be drawn out and embodied in case of apprehended invasion and rebellion; and a similar proviso is inserted in Act 15 and 16 Vict. c. 50, in case the present militia force should be raised to 120,000 men, and embodied. The royal assent is necessary before any measure can pass into law.

The crown, as the executive power, is charged with the management of the revenues of the state, and with all payments for the public service; it is therefore the crown that makes known to the Commons the pecuniary necessities of the government, without which no supplies can be granted. The sovereign's prerogative also includes the sending and receiving of ambassadors, entering into treaty with foreign powers, and declaring war or peace. All the kings and queens since the Revolution have taken an oath at their coronation 'to govern according to the statutes in parliament agreed on, and the laws and customs of the same.' The sovereign is further bound to an adherence to the Protestant faith, and the maintenance of the Protestant religion as established by law. By the Bill of Rights (1 Will. and Mary c. 2, s. 6), and the Act of Settlement (12 and 13 Will. III. c. 2, s. 2) a person professing the popish religion, or marrying a papist, is incapable of inheriting the crown, and the people are absolved from their allegiance. This exclusion is further confirmed by the Act of Union with Scotland; and in addition to the coronation oath, every king or queen is required to take the declaration against the doctrines of the Roman Catholic Church prescribed by 20 Chas. II. c. 2, either on the throne in the House of Lords in the presence of both Houses, at the first meeting of the first parliament after the accession, or at the coronation, whichever event shall first happen. The sovereign is bound by similar sanctions to maintain the Protestant religion and Presbyterian church government in Scotland.

The province of the Houses of Parliament is to legislate with the crown, to provide supplies, to exercise a supervision over the ministers of the crown and all other functionaries, and to advise the sovereign on matters of public moment. The Upper House, from its hereditary and aristocratic character, is a check on the popular branch of the legislature and on hasty legislation.

The House of Lords may originate legislative measures of all kinds, except money-bills. Acts of grace and bills affecting the rights of peers must originate in this House. In its judicial capacity, defined by the Appellate Jurisdiction Act, 1876, it forms a court of final appeal from Her Majesty's Court of Appeal in England, from the Court of Session, Scotland, and the superior courts of law and equity of Ireland. It has a judicature in claims of peerage and offices of honor under reference from the crown. Since the union with Scotland and Ireland, it has had the power of deciding disputed elections of representative peers. It tries offenders impeached by the House of Commons, and members of its own body on indictment found by a grand jury. The House of Lords is composed of lords spiritual and temporal. According to a declaration of the House in 1672, the lords spiritual are only lords of parliament, and not peers. They consist of 2 archbishops and 24 bishops for England, who are said to have seats in virtue of their temporal baronies. (By the act of 1869, the Irish Church, which formerly sent 4 bishops, is no longer represented.) The Bishop of Sodor and Man has no seat in parliament. On Manchester being made a see in 1847, it was arranged that one other bishop should have no seat, by a rotation not including the bishops of London, Durham, and Winchester, so as not to increase the number of the lords spiritual. The same rule was applied on the foundation of the new sees, St. Albans, Truro, and Liverpool. The lords temporal consist of—1. The peers of England, of Great Britain, and of the United Kingdom, of whom there were, in 1881, 6 princes of the royal blood, 21 dukes, 20 marquises, 181 earls, 25 viscounts, and 254 barons.

The peers of the United Kingdom may be increased without limit by new creations at the pleasure of the sovereign. 2. Sixteen representatives chosen from their own body by the peers of Scotland for each parliament. As no provision was made at the Union for any subsequent creation of Scottish peers, the peerage of Scotland consists exclusively of the descendants of peers existing before the Union. By order of the House of Lords, an authentic list of the Scottish peers was entered on the roll of peers on 12th February 1708, to which all claims since established have been added; and in order to prevent the assumption of dormant and extinct peerages by persons not having right to them, statute 10 and 11 Vict. c. 52, provides that no title standing in the roll, in right of which no vote has been given since 1800, shall be called over at an election without an order of the House of Lords. 3. Twenty-eight representatives of the Irish peerage, elected for life. Most peerages are still hereditary. Life peerages were in early times not unknown to the constitution; but in 1856, Her Majesty having created Lord Wensleydale a peer for life, the House of Lords decided he could not sit and vote. But in 1876, peers to sit as members of the House while they held the office of Lords of Appeal in Ordinary—i.e., for judicial business, but on ceasing to act as judges to be peers no longer—were created by statute. The House has also power to call to its assistance in legal and constitutional questions the judges of the Supreme Court of Judicature of all the four divisions, who advise what should be done. The House has power also to sit for judicial business during the prorogation of parliament. The votes of spiritual and temporal lords are intermixed, and the joint majority determine every question; but they sit apart on separate benches—the place assigned to the lords spiritual being the upper part of the House on the right hand of the throne.

A lord may, by license from the sovereign, appoint another lord as his proxy to vote for him in his absence; but a lord spiritual can only be proxy for a lord spiritual, and a lord temporal for a lord temporal, and no member of the House can hold more than two proxies at the same time. Proxies cannot vote in judicial questions or in committees of the whole House. There are other rules and restrictions incident to the right of vote by proxy; a Lords' committee in 1867 reported that the practice of using proxies should be discontinued, but no alteration in the rules was agreed to. Peerages are lost by attainder for high treason. Neither the issue of the body of the person attainted, nor, on their failure, the descendants of the person first called to the dignity, will be admitted to it without a removal of the attainder. But where the attainted person is tenant in tail-male, with a remainder in tail-male to another, the dignity becomes vested in the remainder man on failure of the issue of the person attainted. A peerage, whether by patent or writ, is forfeited by attainder for high treason; attainder for felony forfeits a peerage by writ, not one by patent. An attainted peerage cannot be restored by the crown, only by an act of parliament.

The House of Commons, besides its general power to introduce legislative measures, has the sole right to originate bills levying taxes, or affecting the public income and expenditure, and to examine into the validity of elections to its own body. The question whether it has any control over the rights of electors was the subject of a memorable contest between the Lords and Commons in 1704, in the cases of Ashby and White, and of the 'Aylesbury men' (*Hatsell's Precedents*, vol. iii.), a contest ended by the queen proroguing parliament. When inquiring into the conflicting claims of candidates for seats in parliament, the Commons have an undoubted power to determine whether electors have the right to vote. The House of Commons has the right to expel or commit to prison its own members, and to commit other persons who offend by breach of its privileges, contempt of its authority, disobedience of its orders, or invasion of its rights; but this power is limited to the duration of the session. Expulsion does not, however, create any disability to serve again in parliament. The House of Commons has also the power of impeaching offenders, who, however, are tried at the bar of the House of Lords.

The number of members of the House of Commons has varied greatly at different times. In the reign of Edward I., it seems to have been 275; in that of Edward III, 250; and of Henry VI., 300. In the reign of Henry VIII., 27 members were added for Wales, and 4 for the county and city of Chester; 4 were added for the county and city of Durham in the reign of Charles II. Between the reign of Henry VIII. and that of Charles II., 180 new members were added by the granting of royal charters to boroughs which had not previously returned representatives. Forty-five members were assigned as her proportion to Scotland at the Union, and 100 to Ireland, making the whole number of members of the House of Commons of the United Kingdom 658. The Reform Acts of 1832, 2 Will. IV. c. 45 for England, 2 and 3 Will. IV. c. 65 (amended by 4 and 5 Will. IV. c. 88, and 5 and 6 Will. IV. c. 78) for Scotland, and 2 and 3 Will. IV. c. 88 for Ireland, while leaving unaltered the whole number of members of the House of Commons, made great changes in the distribution of their seats. Fifty-six boroughs in England and Wales were entirely disfranchised; 30 which had previously returned two mem-members were restricted to one; while 42 new boroughs were created, of which 22 were each to return two members, and 20 a single member. Several small boroughs in Wales were united to elect one member. Four members were assigned to the city of London, 2 to each of the universities of Oxford and Cambridge, and one to 133 cities and boroughs. The number of members for Scotland was increased from 45 to 53, 30 being county and 23 borough members, some of the latter representing several combined boroughs. The number of members for Ireland was increased from 100 to 105, 64 representing counties, 34 cities and boroughs, and 2 the University of Dublin.

Further extensive changes in the distribution of seats were made by the recent Reform Acts of 1867 and 1868, 30 and 31 Vict. c. 102 for England, and 31 and 32 Vict. c. 48 for Scotland. The English act deprived of its second member each borough of less than 10,000 inhabitants, and altogether disfranchised seven boroughs, giving 45 seats for re-distribution, of which 25 were given to the larger counties, 11 to new boroughs, 8 to boroughs already represented, and 1 to the University of London. The Scotch act united the counties of Selkirk and Peebles into one constituency; gave a member to the universities of Edinburgh and St. Andrews, and another to the universities of Glasgow and Aberdeen, a second member to each of the counties of Lanark, Ayr, and Aberdeen, and to the town of Dundee, and a third member to Glasgow; and constituted Hawick, Galashiels, and Selkirk into a new district of boroughs; the seven new seats required being provided for by a further disfranchisement of small English boroughs. The Irish Reform Act made no change in this. The number of 658 seats was thus left unaltered; but the disfranchisement of 9 English boroughs (7 in 1882) and 2 Irish ones, has reduced the number actually filled. The 652 seats occupied after the election of 1880 were thus distributed:

	Counties.	Boroughs.	Universities.	Total.
England and Wales..	187	295	5	487
Scotland.....	32	26	2	60
Ireland.....	64	39	2	105
	283	360	9	652

In English counties, prior to the act of 1832, the electoral qualification was founded on the holding of freehold property of the yearly value of 40*s.*: by that act every person who at the date was seized for his own life and that of another, or for any lives whatever, of a 40*s.* freehold, or who might be seized subsequently to the act if in occupation, or who might come into such freehold estate by marriage, marriage-settlement, device, or promotion to any benefice or office, could still vote as a freeholder; but a person not included in these classes, acquiring a freehold subsequently to the act, had only the franchise when it was of the clear yearly value of £10, which value was reduced to £5 by the act of 1867. Copyholders holding an estate of £10 a year, leaseholders of that value whose leases were originally granted for 60 years, leaseholders of £50 with 20 years' leases, and tenants at will occupying lands or tenements paying a rent of £50, had the franchise under the act of 1832; and the act of 1867 reduced the franchise of copyholders and leaseholders from £10 to £5, and the occupation franchise from £50 to £12. In boroughs, the old qualifications varied according to local usage, and some of the ancient rights, as that of freemen, were retained in 1832, when the franchise was bestowed on all occupiers of houses of £10 yearly value. The act of 1867 extended the borough franchise to all occupiers of dwelling-houses who have resided for 12 months on the 31st of July in any year, and have been rated to the poor-rates as ordinary occupiers, and have, on or before the 20th July, paid such rates up to the preceding 5th January, and to lodgers who have occupied for the same period lodgings of the annual value, unfurnished, of £12. In Scotland, the old county qualification consisted in being infeft in lands or superiorities holding directly of the crown of 40*s.* old extent (see VALUATION), or £400 Scots valued rent: and the Scotch act of 1832 reserved the rights of persons then on the roll of freeholders, or entitled to be put on it, and extended the franchise to all owners of property of the clear yearly value of £10, and to certain classes of leaseholders.

By the act of 1868, the county franchise was further extended to proprietors of lands of £5 yearly value, and occupiers of the rateable value of £14. The Scottish burghal franchise had, prior to 1832, been vested in the town-councils: the act of 1832 substituted a £10 household franchise, and that of 1868 gave the franchise to all occupiers paying rates, and to lodgers in rooms worth £10 unfurnished.

By the Irish Reform Act of 1832, various classes of freeholders were invested with the county franchise, to whom were added, by 13 and 14 Vict. c. 69, occupiers of land rated for the poor-rate at a net annual value of £12, and persons entitled to estates in fee, or in tail, or for life, at the rated value of £5. The Irish borough qualification was nearly the same as the English, but the abovementioned statute of Victoria added to the constituency the occupiers of land and premises rated at £8. The act of 1868 made no change in the county qualification, but gave the borough franchise to occupiers of houses rated at £4, and of lodgings of the annual value of £10 unfurnished. Certain disqualifications exist from exercising the franchise on the grounds of infamy, alienage, conviction of felony, and the holding of government offices. Peers cannot vote. In the universities of Cambridge and Oxford, the constituency consists of the doctors and masters of arts; in Dublin, of the fellows, scholars, and graduates of Trinity College. In London University, the graduates form the constituency; in the Scotch universities, the chancellor, the members of the university court, the professors, and the members of general council. Under the acts of 1867 and 1868, in London, where four members are returned, each elector has only three votes; and in Glasgow, which returns three members, each elector has but two votes.

The Reform Acts of 1832 introduced a system of registration of voters for the three divisions of the United Kingdom. In England, lists of voters are prepared by the overseers of each parish, and on certain days courts are held by barristers appointed by the chief-justice and the senior judge of each summer circuit to revise these lists, when claims may be made for persons omitted, and objections offered to names standing on the list. If an objection be sustained, the name is struck off the list, there being an appeal from the decision of the revising barrister to the Court of Common Pleas. In Scotland, a register of persons entitled to vote is made up annually in counties and boroughs in terms of the Registration of Voters (Scotland) Act, 24 and 25 Vict. c. 23, which register is printed, and may be had for a small price. Voters are thus put on the roll without trouble to themselves, and, in point of fact, without their consent. Enrolment, however, may be challenged, in which case objections are heard and determined by the sheriffs, subject (under the act of 1868) to appeal to a tribunal composed of three judges of the Court of Session. The registration system of Ireland introduced by the Reform Act resembles that of England; and by 16 and 17 Vict. c. 58, provision is made for the annual revision of the list of voters for the city of Dublin.

A property qualification of £600 a year in candidates for counties, and £300 in candidates for boroughs, which had previously existed in England and Ireland, was left untouched in 1831, but has been abolished by 21 and 22 Vict. c. 26. Scotch peers, though not representative peers, are disqualified from sitting in the House of Commons. Irish peers may represent any constituency in Great Britain, but not in Ireland. A disqualification is also attached to judges (except the Master of the Rolls), clergymen of the Established Church of any of the three kingdoms, Roman Catholic priests, revenue officers, persons convicted of treason and felony, and aliens even when naturalized, unless the right have

been conceded in express terms. Sheriffs cannot sit for their own counties, and government contractors are disqualified, a disqualification which does not extend to contractors for government loans. A member becoming bankrupt is incapacitated from sitting or voting.

When a new parliament has to be assembled, the Lord Chancellor, by order of the sovereign, directs the Clerk of the Crown to prepare and issue, under the Great Seal, writs to the sheriffs of counties, both for the counties and the boroughs. A sheriff, on receiving the writ for a county, appoints a day for the election, and by the practice prior to the Ballot Act, 1872 (35 and 36 Vict. c. 33), on the day fixed, he proclaimed the writ. If no more candidates were then proposed than were to be elected, he declared them duly elected; if there was opposition, a show of hands was asked, and the sheriff declared who had the majority. If a poll was demanded by the opposite party, the election was adjourned. The electors of each district voted at their several polling-places, and at the termination of the poll, the return was transmitted to the sheriff, who proclaimed the successful candidate. In borough elections in England and Ireland, the sheriff, on receiving the writ, issued his precept to the returning officer of the municipality, who superintended the election; in Scotland, the sheriff himself superintended the borough as well as the county elections. The names of the persons elected, both in counties and boroughs, were returned by the sheriff to the Clerk of the Crown. The candidates are now nominated by a writing signed by two electors, as proposer and seconder, and eight others as consenting, and delivered to the returning officer; if on expiry of an hour from the time fixed, there are more candidates than vacancies, the election is adjourned, and a poll taken. The vote is given by Ballot (q. v.), and the result announced by the returning officer, and returned to the Clerk of the Crown in Chancery. Vacancies occurring after a general election are supplied by new writs issued by authority of the House. When it is determined that a writ should be amended, the Clerk of the Crown is ordered to attend the House, and amend it accordingly.

A member of the House of Commons cannot, in theory, resign his seat; but on the acceptance of any office of profit under the crown, his election is, by an act of Queen Anne, declared void, and a new writ issues, he being, however, eligible for re-election. By the Reform Act of 1867, members who already hold certain offices do not vacate their seats on the acceptance of certain other offices enumerated, the list seemingly comprehending all offices usually held by members. The resignation of office is held not to be complete until the appointment of a successor; and on the resumption of office, the seat is held not to have been vacated. A first commission in the army or navy vacates a seat; subsequent commissions do not do so. A member wishing to resign usually applies for the stewardship of the Chiltern Hundreds (q. v.).

Privilege.—Both Houses of Parliament possess extensive privileges for the maintenance of their authority and the protection of individual members. Some of these privileges have well-defined limits; others are so vague in their extent as occasionally to lead to conflicts between parliament and the courts of law. The privilege of speech is claimed of the sovereign by the Speaker of the House of Commons at the opening of every new parliament. At the same time, any member using offensive expressions may be called to the bar to receive a reprimand from the Speaker; or, if the offence be grave, may be committed for contempt, in which case he is sent either to the Tower or to Newgate. Persons not members of the House may also be committed for breach of privilege, and no one committed for contempt can be admitted to bail, nor can the cause of commitment be inquired into by the courts of law.

The publication of the debates of either House has repeatedly been declared a breach of privilege; but for a long time back this privilege has been practically waived, except where the reports are false and perverted. Publication of the evidence before a select committee previously to its being reported is punished as a breach of privilege. Libellous reflections on the character and proceedings of parliament, or of members of the House, come under the same category, as also does assaulting or threatening a member. Wilful disobedience to the orders of the House is punishable as a breach of privilege; but if orders be given beyond the jurisdiction of the House, their enforcement may be questioned in a court of law. The offer of a bribe to, or its acceptance by a member is a breach of privilege; so also is any interference with the officers of the House in the execution of their duty, or tampering with witnesses who are to be examined before the House, or a committee of the House. Members of both Houses are free from arrest or imprisonment in civil matters, a privilege which is permanent in the case of peers, extending also to peeresses, whether by creation or marriage (though the latter lose it by subsequently marrying a commoner), and to peers and peeresses of Scotland and Ireland, whether representative or not. It continues in the case of members of the House of Commons during the sitting of parliament, for 40 days after each prorogation, for 40 days prior to the day to which parliament is prorogued, and for a reasonable time after a dissolution. Witnesses summoned to attend before parliament or parliamentary committees, and other persons in attendance on the business of parliament, are also protected from arrest. Protection is not claimable from arrest for any indictable offence. Counsel are protected for any statements that they may make professionally.

Meeting of a New Parliament,—On the day appointed for the meeting of a new parliament, the members of the two Houses assemble in their respective chambers. In the Lords, the Lord Chancellor acquaints the House that 'her Majesty, not thinking it fit to be personally present here this day, had been pleased to cause a commission to be issued under the Great Seal, in order to the opening and holding of the parliament.' The Lords Commissioners, being in their robes, and seated between the throne and woolsack, then command the Gentleman Usher of the Black Rod to let the Commons know that the 'Lords Commissioners desire their immediate attendance in this House to hear the Commission read.' Meantime, in the Lower House, the Clerk of the Crown in Chancery has delivered to the Clerk of the House a list of the members returned to serve; and on receiving the message from Black Rod, the Commons go up to the House of Lords. The commission having been read in presence of the members of both Houses, the Lord Chancellor opens the parliament by stating 'that her Majesty will, as soon as the members of both Houses shall be sworn, declare the causes of her calling this parliament; and it being necessary that a Speaker of the House of Commons should first be chosen, that you, gentlemen of the House of Commons, repair to the place where you are to sit, and there proceed to the appointment of some proper person as your Speaker, and that you present such person whom you shall so choose here to-morrow at o'clock, for her Majesty's royal approbation.' The Commons immediately withdraw, and, returning to their own House, proceed to elect a Speaker.

Till a Speaker be elected, the clerk acts as Speaker, standing and pointing to members as they rise to speak, and then sitting down. If only one candidate be proposed for the office, the motion, after being seconded, is supported by an influential member, generally the leader of the House of Commons; and the member proposed, having expressed his sense of the honor meant to be conferred on him, is called by the House to the chair, to which he is led by his proposer and seconder. If another member be proposed and seconded, a debate ensues; and at its close, the clerk puts the question, that the member first proposed 'do take the chair of the House as Speaker.' If the House divide, he directs one party to go into the right lobby, and the other into the left, and appoints two tellers for each. If the majority be in favor of the member first proposed, he is led to the chair; if not, a similar question being put regarding the other member, and answered in the affirmative, he is conducted to the chair. The Speaker-elect expresses his thanks for the honor conferred on him, and takes his seat; on which, the mace is laid on the table, where it is always placed during the sitting of the House with the Speaker in the chair. He is then congratulated by some leading member, and the House adjourns. The next day, the Speaker-elect, on the arrival of Black Rod, proceeds with the Commons to the House of Lords, where his election is approved by the Lord Chancellor. He then lays claim, on behalf of the Commons, to their ancient rights and privileges, which being confirmed, he retires with the Commons from the bar. Nearly the same forms are observed on the election of a new Speaker, when a vacancy occurs by death or resignation in the course of the session.

The members of both Houses then take the oath prescribed by law. See OATH; ABJURATION. In the Upper House, the Lord Chancellor first takes the oath singly at the table. The Clerk of the Crown delivers a certificate of the return of the Scottish representative peers, and Garter King-at-arms the roll of the lords temporal, after which the lords present take and subscribe the oath. Peers who have been newly created by letters-patent present their patents to the Lord Chancellor, are introduced in their robes between two other peers of their own dignity, preceded by Black Rod and Garter, and conducted to their places. The same ceremony is observed in the case of peers who have received a writ of summons—a formality necessary when a member of the Lower House succeeds to a peerage; otherwise his seat does not become vacant. A bishop is introduced by two other bishops, without the formalities observed with temporal lords. Peers by descent have a right to take their seats without introduction; peers by special limitation in remainder have to be introduced. In the Commons, the speaker first subscribes the oath, standing on the upper step of the chair, and is followed by the other members. Members on taking the oath are introduced by the Clerk of the House to the Speaker. Members returned on new writs in the course of the session, after taking the oath, are introduced between two members. They must bring a certificate

of their return from the Clerk of the Crown. On the demise of the crown, the oaths must be taken anew in both Houses.

When the greater part of the members of both Houses have been sworn, the causes of calling the parliament are declared by the sovereign either in person or by commission. In the former case, the Queen proceeds in state to the House of Lords, and commands Black Rod to let the Commons know 'that it is her Majesty's pleasure that they attend her immediately in this House.' Black Rod proceeds to the House of Commons, and formally commands their attendance, on which the Speaker and the Commons go up to the bar of the House of Lords, and the queen reads her speech, which is delivered to her by the Lord Chancellor kneeling on one knee. Of late years the practice has been revived of the Lord Chancellor reading the royal speech in the Queen's presence. When parliament is opened by commission, the sovereign not being personally present, the Lord Chancellor reads the royal speech to both Houses. Immediately after the royal speech is read, the House is adjourned during pleasure; but both Houses are resumed in the afternoon, for the purpose of voting an address in answer to the speech from the throne. In each House it is common to begin business by reading some bill *pro formâ*, in order to assert the right of deliberating without reference to the immediate cause of summons. The royal speech is then read, and an address moved in answer to it. Two members in each House are chosen by the ministry to move and second the address. The preparation of the address is referred to a select committee; it is twice read, may be amended, and when finally agreed on, it is ordered to be presented to her Majesty.

Adjournment, Prorogation, and Dissolution.—Adjournment of parliament is but the continuance of the session from one day to another. Either House may adjourn separately on its own authority, with this restriction, introduced by Act 39 and 40 Geo. III. c. 14, that the sovereign, with advice of the privy council, may issue a proclamation appointing parliament to meet within not less than 14 days, notwithstanding an adjournment beyond that period. On reassembling, the House can again take up business which was left unfinished. A prorogation differs from an adjournment in this respect, that it not merely suspends all business, but quashes all proceedings pending at the time, except impeachments by the Commons, and appeals and writs of error in the Lords. William III. prorogued parliament from 21st October to 23d October 1689, in order to renew the Bill of Rights, regarding which a difference had arisen between the two Houses that was fatal to its progress. It being a rule that a bill of the same substance cannot be introduced twice in the same session, a prorogation has sometimes been resorted to, to enable a second bill to be brought in. Parliament can only be prorogued by the sovereign; and this may be done by having her command signified in her presence by the Lord Chancellor to both Houses, by writ under the Great Seal, by commission or by proclamation. Till recently, a proclamation for the prorogation of parliament from the day to which it stood summoned or prorogued to another day, was followed by a writ or commission; but by 30 and 31 Vict. the royal proclamation alone prorogues parliament, except at the close of a session.

Parliament comes to an end by dissolution. This dissolution may be by the will of the sovereign expressed in person or by her representatives. Having been first prorogued, it is dissolved by a royal proclamation, and by the same instrument it is declared that the chancellor of Great Britain and chancellor of Ireland have been respectively ordered to issue out writs for calling a new parliament. By 6 Anne c. 37, a parliament was determined six months after the demise of the crown; but by the Reform Act of 1867, the parliament in being at any future demise of the crown shall not be determined by such demise, but shall continue as long as it would otherwise have continued unless dissolved by the crown. Were the power of dissolving the parliament not vested in the executive, there would be a danger of its becoming permanent, and encroaching on the royal authority, so as to destroy the balance of the constitution. An example of this danger is shown in the Long Parliament, to which Charles I. conceded that it should not be dissolved till such time as it dissolved itself. If the Houses of Parliament encroach on the executive, or act factiously or injudiciously, the crown may, by a dissolution, bring their proceedings to an end, and appeal to the people by sending the members of the House of Commons to give an account of their conduct to their constituents.

There was originally no limit to the duration of a parliament except the will of the sovereign. By 6 Will. and Mary, c. 2, the continuance of a parliament was limited to three years, a term afterwards extended by 1 Geo. I. c. 38, to seven years. The same act of William and Mary enacts that parliament shall assemble once in three years at the least; but the practice of granting the Mutiny Act and the Budget for a year only, makes it necessary that it should assemble annually.

Conduct of Business.—Each House is presided over by its Speaker. The Speaker of the House of Commons does not take part in a debate, offer his opinion, or vote on ordinary occasions; but, in case of equality, he has a casting vote: his duty is to decide all questions which relate to order, putting the matter at issue in a substantive form for the decision of the House, if his own decision is not assented to. He explains any doubts that may arise on bills. He determines the precedence of members rising to address the House. He examines witnesses at the bar. At the close of the session, he addresses the sovereign on presenting the money-bills passed during the session for the royal assent. He nominates the tellers on a division, and makes known the votes to the House. He may commit members to custody during the pleasure of the House, a confinement which terminates with the close of the session. When a vacancy occurs by death, he signs the warrant to the Clerk of the Crown to make out the writ for the election of a new member. He audits the accounts of the receiver of fees, and directs the printing of the votes and proceedings of the House. The Lord Chancellor, or Lord Keeper of the Great Seal, is the Speaker of the House of Lords; in his absence, the Chairman of the Committee of Ways and Means takes the chair. The Speaker is not, as in the Lower House, charged with the maintenance of order, or the decision who is to be heard, which rest with the House itself. The Chairman of the Committee of Ways and Means of the House of Commons as Deputy-speaker, performs the Speaker's duties in his absence. The chief officers of the House of Lords are the Clerk of the Parliaments, who takes minutes of the proceedings of the House; the Gentleman Usher of the Black Rod, who, with his deputy, the Yeoman Usher, is sent to desire the attendance of the Commons, executes orders for committal, and assists in various ceremonies; the Clerk-assistant; and the Sergeant-at-arms, who attends the Lord Chancellor with the mace, and executes the orders of the House for the attachment of delinquents. Tho chief officers of the Commons are the Clerk of the House, the Sergeant-at-arms, the Clerk-assistant, and Second Clerk-assistant.

Each House has its *Standing Orders*, or regulations, adopted at different periods, relating partly to internal order, partly to certain preliminaries required in the introduction of bills and promulgation of statutes. A standing order endures till repealed (or 'vacated,' as it is called in the Upper House); but each House is also in the practice of agreeing to certain orders or *resolutions* of uncertain duration declaratory of its practice, which are considered less formally binding than standing orders.

The House of Lords usually meets at 5 P.M.; the Commons at a quarter before 4, except on Wednesdays and other days specially appointed for morning sittings. In the Lords, the Chancellor, as Speaker, sits on the woolsack. A standing order, which is never enforced, requires the Lords to take place according to precedence. Practically, the bishops sit together on the right hand of the throne; the members of the administration on the front bench on the right hand of the woolsack adjoining the bishops, and the peers who usually vote with them occupy the other benches on that side. The peers in opposition are ranged on the opposite side, and those considered politically neutral occupy the cross benches between the table and the bar. In the House of Commons, the front bench on the right hand of the chair is reserved for the ministry, and called the Treasury Bench, the front bench on the opposite side being occupied by the leaders of the opposition. By ancient custom and orders of both Houses, rarely enforced, strangers are excluded while the Houses are sitting.

Prayers are read before business is begun—in the House of Lords by a bishop; in the House of Commons by the chaplain. Every member is bound to attend the House—in the Lower House, personally; in the Upper personally, or by proxy; but in ordinary circumstances, this obligation is not enforced. The House of Lords may proceed to business when three peers are present; in the Commons, forty members are required to constitute a House for the despatch of business. The Speaker counts the House at four; and if that number be not then present, or if it be noticed, or appear on a division, that fewer than forty members are present, the House is adjourned. A call of the House is an expedient to secure attendance on important occasions; when it is made, members absent without leave may be ordered to be taken into custody. When matters of great interest are to be debated in the Upper House, the Lords are 'summoned.'

To make a motion, or, more properly, to *move the House*, is to propose a question, and notices of motion should be given on a previous day. The Commons are in the practice of setting apart Mondays, Wednesdays, Thursdays, and Fridays for considering *orders of the day*, or matters which the House had already agreed to consider on a particular day, and to reserve Tuesdays for motions. Government orders take precedence of others on all order days except Wednesdays, which are generally reserved for the orders of independent members. Notices of motion may be given not more than four motion days before their discussion; that is, ordinarily, not more than a month in advance.

Questions of privilege may be considered without previous

notices, and take precedence both of other motions and orders of the day. A motion may be accompanied by a speech, and must in the Lower House be seconded, otherwise there is no question before the House. In purely formal motions this rule is not observed, and an order of the day may be moved without a seconder. A seconder is not required in the House of Lords. A motion in the Commons must be reduced to writing by the mover, and delivered to the Speaker, who, when it has been seconded, puts it to the House; it cannot then be withdrawn without leave of the House. In the Lords, when a motion has been made, a question is proposed 'that the motion be agreed to.' When an amendment is proposed to a question, the original motion cannot be withdrawn till the amendment has been either withdrawn or negatived. An amendment is properly such an alteration on a motion by striking out or adding words, or both, as may enable members to vote for it who would not have done so otherwise.

A question may be evaded, superseded, or got rid of, in four ways: 1. By adjournment. Any member in possession of the House may move 'that the House do now adjourn.' The House may also be adjourned, even while a member is speaking, on its being noticed that there are fewer than forty members present. The motion, 'that the debate be now adjourned,' does not supersede the question, but merely defers the decision of the House. 2. By a motion, that the orders of the day be now read, which may be put and carried on days on which notices of motion have precedence. 3. By what is called *moving the previous question*. The act of the Speaker in putting the question is intercepted by a motion, 'that the question be now put.' The mover and seconder of this motion vote against it; and if it be resolved in the negative, the Speaker is prevented from putting the main question, which, however, may be brought forward on another day. 4. By an amendment substituting words of an entirely different import for those of the motion, so that the sense of the House is taken on a totally different question.

When the question is put by the Speaker in the Lords, the respective parties exclaim 'content' or 'non-content;' in the Commons, the expression used is 'aye' or 'no.' The Speaker signifies his opinion which party have the majority, and if the House acquiesce, the question is said to be resolved in the affirmative or negative; when his decision is disputed, the numbers must be counted by a division. Both Houses now divide by the content or ayes going into the right lobby, and the non-contents or noes into the left, each being counted by tellers appointed by the Speaker. In the House of Commons, two clerks with printed lists of the members put a mark to the name of each as he re-enters the House, so as to secure accuracy in the division-lists. The Speaker of the Commons, who does not otherwise vote or take part in a debate, has a casting-vote in case of equality. In the House of Lords, the Speaker is, on the other hand, not disqualified from taking part in a debate; he votes on divisions, but has no casting vote; and on an equality, the non-contents prevail. The system of pairing commonly practised, though never directly recognized by the House, enables members on opposite sides to absent themselves for a time agreed on, each neutralizing the votes of the other. A member of the Upper House may, with leave of the House, by a protest enter his dissent from a vote of the House, and its grounds. Every protest is entered on the Journals of the House, together with the names of all the lords who concur in it.

No question or bill is allowed to be offered in either House substantially the same with one on which the judgment of that House has already been expressed in the current session. A resolution of the House, however, may be rescinded, and an order discharged; and by 13 and 14 Vict. c. 21, it is provided that every act may be altered, amended, or repealed in the same session of parliament.

In debate, a member of the Commons addresses the Speaker; a member of the Upper House the lords generally, in both cases standing and uncovered. No member may speak except when there is a question before the House, or with the view to propose a motion or amendment, the only admitted exceptions being in putting questions to ministers of the crown, or to members concerned in some business which is before the House, and in explaining personal matters. A member is not allowed to speak twice to the same question except in explanation, and the proposer, in some cases, in reply—a restriction which does not apply in committee. By the rules adopted by both Houses for preserving order in debate, no allusion is allowed two debates of the same session on a question not under discussion, or to debates in the other House of Parliament. All reflections on any determination of the House are prohibited, except when made with a view of moving that the determination be rescinded; so is the mention by a member of her Majesty's name either irreverently, or to influence the debate. No member is allowed to refer to another by name, or otherwise than by the rank or office which he enjoys, or place which he represents. The speaker *naming* a member to the House, is an old established form of censure. To escape obstruction, the House of Commons adopted, in 1882, new procedure rules, securing the right of deciding when a debate should be closed and the vote taken. For these rules see end of article.

Messages.—It is often found necessary for the Houses to communicate with each other. Messages from the Lords were formerly sent by Masters in Chancery or judges, while the Commons sent a deputation of their own members. According to an arrangement adopted in 1855, one of the clerks of either House may be the bearer of a message.

Committees.—Parliamentary committees are either 'of the whole House,' or 'select.' (For the new *Grand Committees*, see end of article.) A committee of the whole House is the House itself, with a chairman instead of the Speaker presiding. The chair is taken in the Lords by the chairman of committees appointed at the beginning of each session, in the Commons by the chairman of the Committee of Ways and Means. Matters relating to religion, trade, the imposition of taxes, or the granting of public money, are generally considered in committee before legislation, as also are the provisions of any public bill. Proceedings are conducted nearly as when the House is sitting, the Lords being addressed in the Upper House, and in the Lower the chairman, who has the same powers to maintain order as the Speaker, and a casting vote in case of equality. In committees of the Commons, as in the House itself, a quorum of forty members is required; but if that number are not present, the Speaker must resume the chair to adjourn the House. A motion in committee need not be seconded, and there is a more unlimited power of debate than in the House, members being at liberty to speak any number of times on the same question. A motion for 'the previous question' is not allowed. When the business of the committee is not concluded on the day of sitting, the House is resumed, and the chairman moves 'that the House be again put into committee on a future day,' in the Lords, and in the Commons reports progress, and asks leave to sit again.

Select committees are composed of a limited number of members appointed to inquire into any matter, and report. In the Commons, it is usual to give select committees power to send for persons, papers, and records; in the Lords, they may, without any special authority, summon witnesses. In neither House can a committee enforce the attendance of a witness; this must be done, when necessary, by the House itself. The Commons have certain standing orders for insuring the efficiency of committees, and impartiality in their appointment. No committee is to consist of more than fifteen. Members moving for a committee must ascertain whether the members whom they propose to name will attend. Lists of the members serving on each committee are to be affixed in the committee clerk's office and the lobby. To every question asked of a witness, the name of the member who asks it is to be prefixed in the minutes of evidence laid before the House; and the names of the members present at each sitting, and, in the event of a division, the question proposed, the name of the proposer, and the votes of each member, are to be entered on the minutes, and reported to the House. In the Lords there are no special rules regarding the appointment and constitution of committees; but resolutions containing arrangements similar to those of the Commons regarding questions to witnesses, minutes of proceedings, and divisions, have been adopted since 1852. Select committees have the power of adjournment from time to time, and sometimes from place to place. By an anomaly not easily explained, the Commons have always been considered not to have the power of administering oaths; a power of examining on oath has, however, by statute been granted to election committees, and committees on private bills. In the House of Lords, witnesses had formerly to attend at the bar of the House to be sworn; but the oath may now be administered by any committee of the House. Except where leave of absence has been obtained, no member, unless above the age of sixty, can excuse himself from serving on committees, or for not attending when his attendance has been made compulsory by order of the House. In committees on private bills in the Commons, the chairman has a deliberative as well as a casting vote. Since 1864, joint committees of both Houses, composed of an equal number of members of each, have occasionally been appointed.

Bills.—The principal business which occupies both Houses is the passing of bills. In early times, laws were enacted in the form of petitions from the Commons, which were entered on the Rolls of Parliament, with the king's answers subjoined; and at the close of the session, those imperfect records were drawn up in the form of a statute, which was entered on the Statute Rolls. It was found that, on undergoing this process, the acts passed by the parliament were often both added to and mutilated, and much of the legislative power practically came into the hands of the judges. Bills in the form of complete statutes were first introduced in the reign of Henry VI. Bills are either public or private; the former affect the general interests of the community, the latter relate to local matters. Public bills are intro-

duced directly by members; private bills by petitions from the parties interested, presented by members. Bills may originate in either House; but the exclusive right of the Commons to deal with all legislation regarding taxes or supplies, makes it necessary and expedient that by far the greater part of both public and private bills, except such as are of a purely personal nature, should originate in the Lower House. Bills regarding restitution of honors originate in the House of Lords. One description of act alone originates with the crown—an act of grace or pardon. It is read only once in each House, and cannot be amended, but must be accepted in the form in which it is received from the crown, or rejected.

Public Bills.—In the House of Lords, any member may present a bill. In the Commons, any member may move for leave to bring in a bill, except it be for imposing a tax, when an order of the House is required. When the motion is seconded, and leave given, the mover and seconder are ordered to prepare and bring in the bill. Such bills, however, as relate to religion, trade, grants of public money, or taxation, are required to be introduced by the House itself, on the report of a committee of the whole House. A bill is drawn out on paper, with blanks or italics where any part is doubtful, or where sums have to be inserted. It is read a first time, and a day fixed for a second reading, allowing a sufficient interval to let it be printed and circulated. When ready, which is often as soon as the motion for leave to bring it in has been agreed to, it is presented at the bar by one of the members who were ordered to prepare and bring it in, and afterwards, on an intimation from the Speaker, brought up to the table. The question is put, 'That the bill be now read a first time,' which is rarely objected to; and in the Commons can only be opposed by a division. The short title of the bill, as entered in the orders of the day and endorsed on the bill, is then read aloud, which is accounted sufficient compliance with the order of the House. A day is then appointed for considering the question, 'that the bill be read a second time,' allowing a sufficient interval to let it be printed and circulated. At the second reading, the member in charge of the bill moves 'that the bill be now read a second time.' This is the usual time for opposing a bill whose general principle is disapproved. This is done by an amendment to the question, by leaving out the word 'now,' and adding 'this day three months,' 'this day six months,' or some other time beyond the probable duration of the session.

Counsel are sometimes allowed to plead at the second reading or other stages. If the bill be approved on the second reading, it is committed, either to a select committee, or to a committe of the whole House, to consider its provisions in detail. When the proceedings in committee are terminated, the bill is reported to the House with amendments, which may be agreed to, amended, or disagreed to. It is then ordered to be read a third time, when the entire measure is reviewed. No amendments, except what are verbal, can then be made, and the question is put to the House, 'That this bill do now pass.' The title of the bill is last settled. The bill, when passed by the Commons, is sent to the Lords, where it goes through the same forms: if rejected, no further notice is taken of it; if passed, a message is sent to the Commons that the bill is agreed to. If amendments have been made, they are sent down along with the bill to be discussed by the Commons; and if they are not agreed to, a conference is demanded by the Commons, to offer reasons for disagreeing to the amendments. A conference is a mode of communicating on important matters between the Houses, in which each House is brought into direct contact with the other by a deputation of its own members—the time and place of meeting being always fixed by the Lords. A confer ence is conducted, for both Houses, by managers, who, on the part of the House desiring the conference (in the case supposed the Commons), consist of the members who have drawn up the reasons, with others sometimes added. If the Lords be not satisfied with the reasons offered, a second conference is desired, after which what is called a 'free conference' may be demanded, in which the managers have more discretion vested in them to advance what arguments they please.

No free conference has been held since 1740. By resolutions of both Houses, agreed to in 1851, reasons for disagreement from amendments may be communicated by messages without a conference, unless the other House should desire a conference; and since that time, there has been but one instance of a conference where a message would have been available. If the Commons eventually agree to the amendments, the bill is sent back to the Lords; if not, it is dropped. The same forms are gone through when a bill originates in the House of Lords. The official record of the assent of one House to the bills passed, or amendments made by the other, is an endorsement on the bill in Norman French. Thus, when a bill is passed by the Commons, the Clerk of the House writes on the top of it, 'Soit baillé aux seignieurs.' When the Lords make amendment to a bill, it is returned with the endorsement, 'A ceste bille avesque des amendments les seignieurs sont assentus.' When it is sent back with these amendments agreed to, the Clerk of the House of Commons writes, 'Aces amendments les Communes sont assentus.' When both Houses have agreed to a bill, it is deposited in the House of Lords, to await the royal assent, unless it be a money-bill, which is sent back to the Commons.

Private Bills.—In private bills, the functions of parliament partake of the judicial as well as the legislative character, and the difficulties in reconciling the interests of the public and of individuals, often give rise to inquiries too extensive for the House to undertake, which therefore delegates them to committees. The standing orders require certain notices to be given to parties interested by personal service, and to the public by advertisement. The practice in both Houses now is for all petitions for private bills to be referred to four 'examiners,' two from the Lords and two from the Commons, whose duty it is to examine whether certain notices and other forms required by the standing orders of the House have been complied with. If the report be favorable, leave is given to bring in the bill; if unfavorable, it is referred to a committee, called the Committee on Standing Orders, who report on the propriety of relaxing the standing orders in this individual case—should they report unfavorably, it is still in the power ef the House to relax the standing orders, though this is rarely done. Three days must elapse between the first and second reading.

At the second reading, the principle is considered, as in the case of public bills; and if the bill be carried, it is referred, if not a railway, canal, or divorce bill, to the 'Committee of Selection,' consisting of the chairman of the Standing Orders Committee, and five other members nominated at the beginning of the session, whose functions are to classify the bills, to nominate the Committees on them, and to arrange their time of sitting. A railway or canal bill is referred to the 'General Committee of Railway and Canal Bills.' This committee forms bills of this class into groups, and appoints the chairman of the committee which is to sit on each bill from its own body, the remaining members, four in number, being chosen from the Committee of Selection. Before the sitting of the committee, every private bill, whether opposed or unopposed, must be examined by the chairman of the Committee of Ways and Means and his council. It is also laid before the chairman of the Lords' Committee and his council, and effect is given to their observations, a proceeding which greatly facilitates the after progress of the bill in the House of Lords. The Board of Trade, the Secretary of State for the Home Department, the Lords Commissioners of the Admiralty, and the Commissioners of Woods and Forests, also exercise a supervision over private bills of various kinds, by which the respective rights of their departments may be supposed to be encroached on. In the House of Lords, estate bills are referred to the judges. Every bill, at the first reading, is referred to the Examiners, before whom compliance with such standing orders as have not been previously inquired into must be proved. The Standing Orders Committee of the Lords is now assimilated in functions to that of the Commons. The bill is returned to the Commons either with amendments, or with a message that it is agreed to without amendments. In case of disagreement between the Houses, the same forms are observed as in public bills.

In recent times, the necessity for obtaining private acts has been, in many cases, obviated by general laws adapted to different classes of objects, of which parties are enabled to avail themselves, instead of applying to parliament for special powers.

Royal Assent.—A bill becomes a statute or act of parliament on receiving the royal assent, which is given in the House of Lords, the Commons being also present at the bar. It is given in either of two ways: by letters-patent under the Great Seal, signed by the sovereign's own hand, and communicated to the two Houses by commissioners; or by the sovereign present in person in the House of Lords. When the royal assent is given by commission, three or more of the Lords Commissioners command Black Rod to signify to the Commons that their attendance is desired, on which the Commons, with the Speaker, immediately come to the bar. The commission is then read at length; and the titles of all the bills being read by the Clerk of the Crown, the royal assent to each is signified by the Clerk of the Parliaments in Norman-French, and so entered on the Lords' Journals. In assenting to a public bill, the words used are: 'Le roy [la reyne] le veult;' to a private bill: 'Soit fait comme il est desiré;' and to a bill of supply (which is presented by the Speaker, and receives the royal assent before all other bills): 'Le roy remercie ses bons sujets, accepte leur benevolence, et ainsi le veult.' In the case of an act of grace, which has originated with the crown, there was, till lately, no further expression of the royal assent; but the Clerk of the Parliaments, having read its title, said: 'Les prélats, seigneurs, et communes, en ce présent parliament assemblés, au nom de tous vos auctres sujets, remercient très-humblement vostre Majesté, et prient à Dieu vous donner en santé bonne vie et longue:' the royal assent, however, has been latterly given to acts of grace in the usual form. The refusal

of the royal assent is announced by the words: 'Le roy s'avisera.' But the necessity for such refusal is generally removed by the observance of the constitutional principle, that the queen has no will but that of her ministers, who only continue in office so long as they have the confidence of parliament. The last instance in which the royal assent was refused was by Queen Anne in 1707, regarding a bill for settling the militia in Scotland.

The royal assent is seldom given in person, except at the close of a session, when the queen attends to prorogue parliament, and then signifies her assent to such bills as have been passed since the last commission was issued; but bills providing for the honor and dignity of the crown, and bills for settling the civil lists, have generally been assented to by the sovereign in person, immediately after they have passed both houses. When the royal assent is given in person, the Clerk of the Crown reads the titles of the bills; and the Clerk of the Parliaments, who has previously received her Majesty's commands in the robing room, makes an obeisance to the throne, and signifies her Majesty's assent, as already described, the queen giving a gentle inclination.

Supplies.—Prior to 1688, in addition to parliamentary taxation, imposts were sometimes levied by an exercise of the royal prerogative. Since the Revolution, no taxes have been raised otherwise than by parliamentary authority. The Commons have the exclusive right to impose taxes and vote money for the public service. The Lords cannot even make an alteration in a bill of supply, except to correct a clerical error. The Lords are not even entitled to insert in a bill any pecuniary penalties, or to alter the amount or application of any penalty imposed by the Commons; a rule whose rigid assertion has been found to be attended with so much inconvenience that there has latterly been a disposition to relax it. If a bill containing provisions which make a pecuniary charge on the public originate in the Lords, any such provisions are struck out in the bill as sent to the Commons. In the Commons, these provisions are printed in red ink, and supposed to be blank, and may be agreed to in committee. But though the Commons has the exclusive right to grant supplies, a grant requires the ultimate assent of the queen and the House of Lords.

The public revenue of the crown is derived in part from permanent charges on the consolidated fund, and in part from actual grants for specific public services, which require the yearly sanction of parliament. On the opening of parliament, the queen demands from the Commons the annual provision for the public services, and directs estimates to be laid before them. On agreeing to the address in answer to the royal speech, the Commons order the speech to be taken into consideration on another day. On the arrival of that day, a motion is made: 'That a supply be granted to her Majesty,' and the House resolves into a committee to consider that motion. On the day appointed, the committee sits and agrees that a supply be granted, which, being reported, is agreed to by the House. The House then appoints another day on which it resolves itself into a 'Committee of Supply.' The estimates for the army, navy, and ordnance departments, are first laid before the committee; then the estimates for civil services, known as the miscellaneous estimates. The first business of the Committee of Supply is to elect a chairman, who is known as the Chairman of the Committee of Ways and Means, over which he also presides. When the first report of the Committee of Supply has been received and agreed to, a day is appointed for the House to resolve itself into a 'Committee of Ways and Means.' This committee is not appointed till a sum has been voted by the House, nor is it afterwards allowed to vote in excess of the expenditure voted by the Committee of Supply. It is the function of the Committee of Supply to consider what specific grants are to be voted, and of the Committee of Ways and Means to determine how the funds shall be raised which are voted by the Committee of Supply.

Without special parliamentary authority, the consolidated fund could not be applied to meet the supplies voted for the service of the year; but to make it so available, the Committee of Ways and Means votes general grants from time to time out of the consolidated fund 'towards making good the supply granted to her Majesty;' and bills are founded on the resolutions of the committee, by which the treasury receives authority to issue the requisite amount from the consolidated fund for the service of the year. It belongs to the Committee of Ways and Means to determine what sums shall be raised by exchequer bills in anticipation of the annual revenue, to make up the supply granted to her Majesty. When the Committee of Supply has determined the number of men that shall be maintained during the year for the army and sea-service, and its resolutions have been agreed to, the *Mutiny Bill* and *Marine Mutiny Bill* are brought in, providing respectively for the discipline of the troops and marines when on shore. Apart from this annual sanction, the maintenance of a standing army in time of peace would be illegal, and the army and marines would be relieved from all martial discipline. The Committee of Ways and Means receives the annual financial statement from the Chancellor of the Exchequer, popularly called the *Budget*. That minister gives a general view of the resources of the country, and of the financial policy of the government, and presents a probable estimate of income and expenditure for the twelve months ending on the 12th of April of the following year. He states what taxes he intends to reduce, and what new ones he means to impose, and ends by proposing resolutions for the adoption of the committee, which, when reported to the House, form the groundwork of bills for accomplishing the financial objects proposed.

The charges for collecting the revenue, have, since 1854, been brought under the supervision of the House of Commons; and estimates are voted for the revenue departments. A new tax cannot be proposed except by a minister of the crown. The resolutions of Committees of Supply and of Ways and Means are reported on a day appointed by the House, and read a first time without a question, and a second time on a question put from the chair, and are agreed to by the House, or may be disagreed to, amended, postponed, or recommitted. When the Committee of Supply is closed, the Committee of Ways and Means authorizes the application of money from the consolidated fund, the surplus of ways and means, and sums in the Exchequer, to meet the grant and services of the year, and the resolutions of the committee are carried into effect by the Consolidated Fund Bill, or as it is often called, the *Appropriation Bill*. By a standing order of April 3, 1862, a standing Committee of Public Accounts is appointed at the beginning of each session to examine into the appropriation of the sums granted by parliament to meet the public expenditure. Taxes of a permanent and general character are not now considered in the Committee of Ways and Means.

Petitions.—Among the duties of parliament is the receiving of petitions. A petition must be presented by a member of the House to which it is addressed. Petitions from the corporation of London are, however, presented to the House of Commons by the sheriffs at the bar, or by one sheriff, if the other be a member of the House, or unavoidably absent. In 1840, a petition was allowed to be presented by the Lord Mayor and Aldermen, when the sheriffs were in custody of the sergeant-at-arms. The Lord Mayor of Dublin has been allowed to present a petition at the bar of the House, and the same privilege would probably be conceded to the Lord Provost of Edinburgh. Petitions which violate any of the rules of the House, are not brought up, but returned to the petitioners; and if an irregularity be discovered after a petition is brought up, its presentation is not recorded in the votes.

In the House of Lords, when a petition is laid on the table, an entry is made in the Lords' Minutes, and afterwards in the Journals of the House, which, however, does not describe its nature and substance. A petition may, on presentation, be made a subject of debate, but unless this is done, there remains no public record of its import, or of the parties by whom it was signed. In the House of Commons, according to standing orders adopted in 1842, the member presenting a petition is to confine himself to a statement of who the petitioners are, the number of signatures, the material allegations of the petition and its prayer. In case of urgency, or where questions of privilege are involved, the matter of the petition may be discussed; but in ordinary cases no debate is allowed, and it is referred to the Committee on Public Petitions, and if relating to a subject with regard to which the member presenting it has given notice of a motion, it may be ordered to be printed with the votes. The reports of the Committee on Public Petitions are printed twice a week, and point out the name, the subject, and the number of signatures of each petition, and the total number of signatures, and petitions relating to each subject; and, in some cases, the petition itself is printed at full length in the appendix.

Communications with the Crown.—Besides at the opening and proroguing of parliament, and giving of the royal assent, there are other occasions on which the crown communicates with parliament by a *message*, under the sign-manual, to either House singly, or both Houses separately. Messages are brought by a member of the House, being a minister of the crown or one of the royal household, and may relate to important public events, the prerogatives or property of the crown, provision for the royal family, &c. An *address* is the mode in which the resolutions of parliament are communicated to the crown. Addresses may be joint, of both Houses, or separate, of either House.

Returns.—Each House has the power of ordering returns from all those public departments which are connected with the revenue, under control of the Treasury, or regulated by statute; but returns of matters connected with the exercise of royal prerogative, as from public departments subject to her Majesty's secretaries of state, are obtained by means of addresses to the crown. A return is not allowed to be ordered in one House regarding the proceedings of the other; when such return is wished, it is usual to make an arrangement by which it is moved in the House to whose proceedings it relates, and after it has been presented, a message is sent to request that it may be communicated. Returns cannot be moved from private associations, or persons not exer-

cising public functions; and the papers and correspondence sought from government departments must be of an official, not a private or confidential description. This rule was, under special circumstances, departed from in 1858, in regard to the opinion of the law-officers of the crown in the case of the *Cagliari*. Accounts and papers presented are ordered to lie on the table, and when necessary, ordered to be printed, or in the Commons referred to the Printing Committee appointed at the beginning of each session.

Election Petitions.—Until 1770 all questions regarding controverted elections were decided by the whole House; the Grenville Act of that year introduced the practice of appointing committees for their trial, and the proceedings of election committees were further regulated by 11 and 12 Vict. c. 98. By the 'Parliamentary Elections Act, 1868' (31 and 32 Vict. c. 124), election petitions are now presented to the Court of Common Pleas in Westminster or Dublin, or the Court of Session in Scotland, and tried by a single judge appointed by the court, and sitting in the borough or county whose election is contested. An election petition must be signed by some person who voted, or had a right to vote at the election, or by some person who claims to be returned, or alleges himself to have been a candidate, and presented within twenty-one days after the return objected to, or if it proceeds on the allegation of bribery, within 28 days after the alleged payment. Security is to be found for costs to the extent of £1000, either by sureties not exceeding four, or by a deposit of money, or partly in each way. The judge determines whether the member was duly elected, and certifies to the Speaker his determination, which is final. Should the petition allege corrupt practices, the judge shall also report to the Speaker whether there has been any corrupt practice within the knowledge and consent of any candidate, the names of persons proved guilty, and whether corrupt practices have prevailed extensively at the election: also the judge may specially report any matter for consideration of the House of Commons. Where, on application of any party to a petition, it appears that the case raised can be conveniently stated as a special case, it may be so stated and determined by the court, who certify their decision to the Speaker, which is final.

An election petition cannot be withdrawn without leave of the court or judge on special application: and a person who might have been a petitioner may apply to be substituted for the person withdrawn. The court or judge is to report to the Speaker whether in their opinion the withdrawal of the petition has been induced by any corrupt arrangement. The most frequent subjects of special reports are bribery, treating, and the use of undue influence, matters regarding which, prior to 1868, various acts had been passed, the most important being those of 1854, of 1858, of 1868, of 1879, and of 1882 (see also the article BRIBERY), statutes generally known by the name, the 'Corrupt Practices Prevention Acts.' By the act of 1868, a candidate convicted of bribery is punished by voidance of his election, incapacity during 7 years to be elected or to vote, to hold any office under 5 and 6 Will. IV. c. 76, or 3 and 4 Vict. c. 108, or any municipal or judicial office, or to act as justice of the peace; and the same disqualifications to vote, to be elected, and to hold office, are incurred by any person other than a candidate found guilty of bribery. If a candidate is proved to have knowingly engaged as canvasser or election-agent a person found guilty within the previous seven years of any corrupt practice, his election is void. Act 15 and 16 Vict. c. 57 enacts that upon the joint address of both Houses of Parliament, representing to her Majesty that a Committee of the House of Commons has reported that corrupt practices have extensively prevailed at any election, her Majesty may appoint commissioners to make inquiry; and by the act of 1868, the judge's report to the effect that corrupt practices have prevailed, or that there is reason to believe they have prevailed, is to be accounted equivalent to the report of the House of Commons' Committee to that effect under the previous act. It is further provided by the act of 1868 that within 21 days of the return to the Clerk of the Crown, or within 14 days after the meeting of parliament, a petition may be presented by any two electors, alleging that corrupt practices have extensively prevailed at their last election, or that there is reason to believe this to have been the case. If, on such petition, an address by both Houses of Parliament be presented to the crown, praying for inquiry into such allegation, the crown may appoint commissioners to inquire, with the powers and subject to the provisions of Act 15 and 16 Vict. c. 57.

By the Act of 1854, the offering of money, office, employment, &c., to a voter to induce him to vote or abstain from voting, or the offering of a similar consideration to any person to induce him to procure the return of a candidate or the vote of an elector, the acceptance of such consideration, and the payment of money in the knowledge that it is to be expended in bribery, or the repayment of money which has been spent in bribery, are all declared to be acts of *bribery* punishable by fine and imprisonment, as well as by the forfeiture of £100 with costs to any person who will sue for the same. Any voter who agrees to receive money, office, or employment for voting or abstaining from voting, and any person who, after an election, receives money or other consideration on account of any person having voted or refrained from voting, is also guilty of bribery, and liable to forfeit £10 with costs to any one who will sue for the same. *Treating*, which is defined as the providing of meat, drink, or other entertainment to any person in order to be elected, or in consideration for any person voting or abstaining from voting, involves a penalty of £50 similarly recoverable, as also does *undue influence*, or interference by intimidation, abduction, or otherwise, with the freedom of electors. Persons guilty of any of these offences are, by the provisions of the same acts, to be struck off the register, and their names inserted in a separate 'list of persons disqualified for bribery, treatment, and undue influence,' which is to be appended to the register of voters. Cockades are prohibited, as is the furnishing of refreshment on the day of election to a voter in consideration of his being about to vote. By the Corrupt Practices Act, 1854, it is however declared lawful to provide a conveyance for a voter, though not to pay him a sum of money for traveling expenses. By the Act of 1863, no payment is allowed to be made on behalf of a candidate except through his authorized agent, and all claims against a candidate in respect of an election must be settled within a month, otherwise the right to recover them is barred. A detailed account of election expenses with vouchers is required to be delivered within two months of the election to the returning officers, by whom it is published in a local newspaper, and the vouchers are to be open for a month to the inspection of voters. The act of 1863 provides that when an election committee has reported that certain persons named have been guilty of bribery, and their report is confirmed by a commission of inquiry, such report, with the evidence taken, is to be laid before the Attorney-general with the view of instituting a prosecution.

Impeachment.—There are instances, as far back as the times of the Plantagenet princes, of the supreme power of parliament being exercised to punish offences where something extraordinary in the nature, or some unforseen obstacle to the execution of the ordinary laws, was deemed to render this advisable. This was done by a bill of attainder, which in the reign of Henry VIII. became the usual mode of proceeding against state offences. A bill of attainder sometimes followed a regular trial and conviction as in the case of Empson and Dudley, but was often passed without trial, examination of witnesses, or hearing the accused party, as in the attainder of Fisher and Sir Thomas More. Bills of attainder were sometimes, but rarely, had recourse to under the Stuart kings; the last instance was the case of Sir John Fenwick, in 1696. The practice of impeachment of extraordinary offenders before the Lords by the Commons, which had been frequent during the 14th and 15th centuries, was revived in the reign of James I. This proceeding is not like bills of attainder or pains and penalties, the making of a new law *pro re nata*, but a carrying out of the already known and established law. The great representative inquest of the nation first find the crime, and then as prosecutors support the charge before the highest court of criminal jurisdiction. It has always been allowed that a peer may be impeached for any crime whether cognizable by the ordinary courts or not. The right of the Commons to impeach a commoner of a capital offence, which was at one time doubted, has been solemnly affirmed by the House of Lords. The trial is conducted by managers for the Commons. Witnesses are summoned by the Lords at the desire of the Commons, and Westminster Hall has usually been the place of trial, the Lord High Steward presiding. The managers make their charges and adduce evidence; the accused answers, and may defend himself by counsel; and the managers have a right to reply.

In giving judgment, the question is put by the Lord High Steward to each peer, beginning with the junior baron, on each article separately, whether the accused be guilty. The answer is 'Guilty, on my honor,' or 'Not Guilty, on my honor,' the Lord High Steward giving his opinion the last, and the numbers being cast up, the accused is acquainted with the result. Impeachments have not been common in later times, though they are still a competent proceeding; the latest memorable cases are those of Warren Hastings in 1788, and Lord Melville in 1805.

Trial of Peers.—Peers are, in all cases, tried by their peers for treason, misprision of treason, felony, or misprision of felony. For misdemeanors, however, they are tried before the ordinary courts of law; and the Lords Spritual are in all cases tried before the ordinary courts of the country. During the sitting of parliament, the trial proceeds before the House of Lords, or more properly before the Court of Parliament presided over by the Lord High Steward. When parliament is not sitting, the trial takes place before the Court of the Lord High Steward—a tribunal whose constitution was at one time very objectionable, that officer being allowed to summon what peers he pleased, only with the proviso that the number should amount in all to 23. Act 7 Will. III. c. 3 requires that all the peers who have a right to sit and vote in parliament be summoned. Peers of Scotland and Ireland are, in terms of the Acts of Union, tried in the same way.

By 4 and 5 Vict. c. 22, a peer is liable, on conviction to the same punishment as any other of the lieges.

New Procedure Rules.—Incessant obstruction of business in the House of Commons by the concerted action of the Irish parliamentary party, and their systematic abuse of the rules of the House, led, in 1882, to the proposal by government of a series of new rules for procedure, which were adopted after long debate. Of the thirteen resolutions passed, ten were straightway made into standing orders. Henceforth, when it appears to the Speaker or Chairman that a subject has been adequately discussed, and that this is the evident sense of the House, he may inform the House to that effect; and a motion 'that the question be now put,' shall be carried, if supported by more than 200 members, or if opposed by less than 40 and supported by more than 100. Motions for adjournment may be used for the discussion of a definite matter of urgent public importance if 40 members stand up in favor of this course. Provision is made in that case for limiting the debates to the subject in hand. Some new arrangements are made for taking divisions, and technical directions are supplied for the guidance of Speaker or Chairman. No opposed motion shall be taken after half-past twelve. Regulations are laid down for the suspension of offending members. The Speaker or Chairman is invested with large discretionary powers for checking the attempts to secure delay by abuse of the rules. At the same time, rules were adopted relating to the appointment or working of Standing Committees, or Grand Committees, as an experimental means of assisting the House to get more expeditiously through its work, which had latterly got far into arrears.

See Sir T. Erskine May's *Laws, Privileges, Proceedings, and Usage of Parliament* (new ed. 1879); Lucy's *Parliamentary Procedure* (1880); Walpole's *The Electorate and the Legislature* (1881).

PARLIAME'NTARY CHURCH is a church erected under the authority of an act of parliament. In England such a church is generally called a district church; and the acts of parliament authorizing such churches are known as the Church Building Acts. See PARISH. In Scotland similar churches are called *Quoad Sacra* churches.

PARMA, once a sovereign duchy of Italy, lying between the Apennines and the Po, touching Sardinia (Piedmont) in the west, and Modena on the east. It comprised, at its annexation to the kingdom of Italy, the two duchies of Parma and Piacenza; had an area of 2270 sq. m., and a pop. of 490,000. The Apennines, which cross the southern division of the duchies, send off spurs northwards; the north is an undulating plain, sloping to the Po. The highest peaks in P. are about 7000 feet high. The mountain-range is richly clad with oak and chestnut forests. The plain, which is very fertile, produces rich crops of grain (including rice), leguminous plants, fruits of all kinds, olives, and grapes; while marble, alabaster, salt, and petroleum are the chief mineral products. Agriculture, silk-working, cattle-breeding, and cheese-making are the chief employments. Silk and cheese are the chief exports. The cheese, however, known as Parmesan, is not made in P., but near Lodi (q. v.).

The form of government was monarchial, and the administrative power was in the hands of a council of state. The revenue was about £450,000.

History.—P. and Piacenza belonged in the time of the Roman Empire to Cisalpine Gaul, and after its fall came under the rule of the Lombards, to whose rule succeeded that of the kings of Italy and the German emperors. In the 12th and following centuries, they joined the other territories of Northern Italy which were struggling for liberty and independence, and consequently became involved in the Guelph and Ghibelline contests. Weakened by these strifes, they fell under the domination of the powerful houses of Este, Visconti, and Sforza; but in 1499 they passed under the yoke of the French monarch, Louis XII., from whom they were soon recovered by the Emperor Maximilian, and handed over to Pope Leo X. in 1513. They continued under the sovereignty of the popes till 1543, when they were alienated by Pope Paul III., and with the surrounding territory were erected into a duchy for his natural son Pier-Luigi Farnese, the grandfather of Alessandro Farnese, the celebrated regent of the Low Countries. On the extinction of the male line of Farnese, in 1731, by the death of the eighth duke, Antonio, his niece Elizabeth, the queen of Philip V. of Spain, obtained the duchies for her son Don Carlos, who, however, exchanged them in 1735 with Austria for the throne of the Two Sicilies. In 1748 they were restored along with Guastalla to Spain, and became a duchy for the Infante Don Philip, with a reversion to Austria in case of the failure of his male descendants, or of any of them ascending the Spanish or Neapolitan throne. Philip was succeeded in 1765 by his son Ferdinand, who was an able and enlightened ruler, and expelled the Jesuits in 1768. He died in 1802, and his dominions were immediately taken possession of by the French, and were incorporated with France under the designation of the department of Taro in 1805.

In 1814, by the treaty of Paris, P., Piacenza, and Guastalla were presented as a sovereign duchy to the ex-empress Maria Louisa, a proceeding strongly opposed by the king of Spain, who demanded them for his sister, Maria Louisa, the widow of Louis, king of Etruria, the son of Duke Ferdinand. However, in 1817, it was settled that Maria Louisa of Austria should possess the duchies, and that on her death they should descend to Ferdinand Charles, Duke of Lucca, the son of Maria Louisa of Spain, and the rightful heir; and on failure of his heirs, P. should revert to Austria, and Piacenza to Sardinia. On her death, in 1847, the Duke of Lucca succeeded as Charles II., and certain exchanges of territory, previously settled by the great powers, took place with Tuscany and Modena—the chief of which being the transfer of Guastalla to Modena, resulting in a gain to P. of 100 sq. m. of territory. This transfer was not made without great discontent on the part of the inhabitants. The duke's rule was severe and tyrannical, and on an address being presented to him with a view of obtaining a reform of certain abuses, and a more liberal political constitution, similar to what Tuscany had (February 1848) obtained from its grand-duke, he threw himself into the arms of Austria, and consented to the occupation of his territory by Austrian troops. In March 1848 a revolution broke out, and the duke was compelled to grant the popular demands, but he almost immediately after retired from the country.

P. joined with Sardinia in the war of 1848—1849 against Austria, but on the triumph of the latter power was compelled to receive Charles III. (his father, Charles II., having resigned his throne, March 1849) as its ruler. The new duke recalled the constitution which his father had been compelled to grant, and punished with great severity the active agents of the revolutionary movements in his dominions. His arbitrary measures were effectively seconded by his chief minister, an Englishman named Ward, who shared the public obloquy with his master. After Charles III.'s assassination in March 1854, his widow Louise-Marie-Therese de Bourbon, daughter of the last Duke of Berry (q. v.), assumed the government for the behoof of her son Robert I., and made some attempts at political reform; but owing to the excited state of the people they were little effective, and she and her son were compelled to leave the country in 1859, on the outbreak of a new war between Sardinia and Austria. In March 18th of the following year the country was annexed to Sardinia, and it now forms a part of the 'compartimento' Emilia, in the kingdom of Italy, constituting the two provinces of Parma (area 1270 sq. m.; pop. in 1881, 267,386) and Piacenza (area 910 sq. m.; pop, 225,764); a few of the outlying districts being incorporated with other provinces.

PARMA, the chief town of the province of the same name in Italy, and formerly the capital of the duchy of Parma, is situated on both sides of the river Parma, 12 miles south from the Po, 75 miles south-east from Milan, and about the same distance east-north-east from Genoa, with a population (1881) of 45,217.

The town is of a circular form, and is surrounded by walls and ditches flanked by bastions; the streets are straight and wide, and meet at right angles, the chief of them, a part of the Roman Via Æmilia, crossing the city from east to west, and dividing it into two nearly equal parts. P. is celebrated for its churches, 10 in number, the chief of which are the *Duomo*, or Cathedral (consecrated 1106 A.D.), built chiefly in the Lombard style, having the interior adorned with magnificent frescoes by Correggio, and paintings by other artists, and surmounted by a beautiful dome; the *Battisterio*, or Baptistery, one of the most splendid in Italy, begun in 1196 and completed in 1281; the church of the *Madonna della Steccata*, containing the famous painting of 'Moses breaking the Tables of the Law' by Parmigianino. The other celebrated buildings are, the Farnese Palace, a gloomy and ill-constructed edifice; the Farnese Theater, built (1618—1628) of wood, and now in a most dilapidated condition. P. has also a library containing 120,000 volumes, mostly well selected, and many of them rare and valuable works; a museum of antiquities; a botanic garden; a theater (*Teatro Nuovo*); an academy of fine arts, founded in 1752, possessing a collection of 600 pictures, many of which are exceedingly valuable. The pictures most highly esteemed are the 'Madonnas' of Correggio and Francia, the 'St. Jerome' of Correggio, and the 'Jesus Glorified' of Raphael.

The manufactures of P. are stockings, porcelain, sugar, wax-candles, and vessels of crystal, also silk, cotton, and fustian stuffs, The chief exports are cheese and silk goods; and in June there is an annual silk fair.

PARMA, BATTLES OF. An indecisive engagement took place here June 29, 1734, between the confederated armies of England, France, and Spain, and the Austrians; and on June 19, 1799, the French under Macdonald were routed by the Russians under Suwarof, with a loss of 10,000 men and 4 generals.

PARME'LIA, a genus of Lichens, with a leafy horizontal thallus which is lobed and cut; and orbicular shields (*apothecia*) fixed by a central point, concave, and bordered by the inflexed

thallus. The species are numerous, and many are found in Britain. Some of them are occasionally employed in dyeing. Various chemical principles have been discovered in lichens of this genus, as *Usnine* or *Usnic Acid* (also found in species of the genus *Usnea*), and *Parietin*. Valuable medicinal properties—tonic and febrifugal—have been ascribed to *P. Parietina*, the Common Yellow Wall Lichen, or Common Yellow Wall Moss of the herb shops, a bright yellow species with deep orange shields, plentiful on walls and trees in Britain and most parts of Europe.

PARME'NIDÉS, a Greek philosopher of Elea, in Lower Italy, and in the opinion of the ancients the greatest member of the Eleatic school, flourished about the middle of the 5th c. B.C. Nothing is known with certainty regarding his life, but he is said to have visited Athens in his old age, and to have conversed with Socrates, then quite a youth. The story, though it rests on the authority of Plato, has a suspicious air, and seems as if it were intended to account for the influence which the philosophy of P. undoubtedly exercised on that of Socrates and Plato themselves. P., like Xenophanes of Colophon, sometimes regarded as the first of the Eleatics, expounded his philosophy in verse—his only work being a didactic poem *On Nature*. The leading design of this poem is to demonstrate the reality of Absolute Being, the non-existence of which P. declares to be inconceivable, but the nature of which, on the other hand, he admits to be equally inconceivable, inasmuch as it is dissociated from every limitation under which man thinks. P. is not a theologist in speculation, seeking rather to identify his 'Absolute Being' with 'Thought' than with a 'Deity.' Only fragments of his poem remain, which have been separately edited by Fülleborn (Züllichau, 1795); another collection is that by Brandis, in his *Commentationes Eleaticæ* (Altona, 1815); but the best is to be found in Karsten's *Philosophorum Græcorum veterum Reliquiæ* (Amstelod, 1835).

PARMIGIANO, Girolamo Francesco Maria Mazzola, called Parmigiano or Parmigianino, born at Parma in 1503, an able painter of the Lombard school, and the most distinguished of those who followed the style of Correggio. His pictures attracted much attention when he was little more than fourteen years of age. In 1523 he went to Rome to follow out his studies, and was soon favorably noticed and employed by Clement VII. He was in that city when it was stormed by the imperialists under Bourbon in 1527, and, it is said, was calmly at work on his picture of 'The Vision of St. Jerome' (now in the National Gallery, London) when soldiers, bent on pillage, burst into his studio. He was, however, protected by their leader. After this event he left Rome for Bologna, where he painted various important works, and returned to Parma in 1531. Having engaged to execute several extensive frescoes in the church of S. Maria Steccata, after repeated delays, he was thrown into prison for breach of contract, and on being released, in place of carrying out his undertaking, he fled to Casal Maggiore, in the territory of Cremona, where he died soon afterwards in 1540. Vasari, in his notice of P., attributes his misfortunes and premature death to his passion for alchemy; but this oft-repeated story has been disproved by the researches of late biographers. He executed several etchings, and some wood-cuts are attributed to him.

PARNAHI'BA, or PARANAHYBA, a river of Brazil, rises in the Sierra dos Coroados, between the provinces of Goyas and Piauhi, about 11° S. It flows north-east and north, and enters the Atlantic in long. about 41° 40′ W. by five mouths, which enclose a delta about 30 miles wide along the shore. These mouths, however, are only from two to four fathoms deep. It drains the province of Piauhi, and forms the boundary-line between it and the province of Maranhao. Total length estimated at 750 miles. —A chief tributary of the Parana also bears the name of Parnahiba.

PARNA'SSUS, a mountain greatly celebrated among the ancients, and regarded by the Greeks as the central point of their country. It was in Phocis. It has three steep peaks, almost always covered with snow, and seen from a great distance, the highest being fully 8000 feet above the level of the sea; but as only two of them are visible from Delphi, it was customary among the Greeks to speak of the two-peaked Parnassus. On its southern slope lay Delphi (q. v.), the seat of the famous oracle, and the fountain of Castalia (q. v.) The highest peak was the scene of the orgies of the worship of Dionysus (Bacchus); all the rest of the mountain was sacred to Apollo and the Muses, whence poets were said to 'climb Parnassus,' a phrase still thus employed.

PARO'CHIAL BOARD, in Scotland, is the board in each parish which manages the relief of the poor. In England, the same duty is performed by overseers, and in some cases by guardians of the poor.

PAROCHIAL RELIEF is the relief given to paupers by the parish authorities. See Poor.

PA'RODY (Gr. *para*, beside, and *ode*, a song) the name given to a burlesque imitation of a serious poem. Its peculiarity is that it preserves the form, and as far as possible the words of the original, and thereby differs from a Travesty, which is a looser and less literal kind of burlesque. The invention of parodies is commonly ascribed to the Greeks (from whom, at least, we have derived the name); the first parodist, according to Aristotle, being Hegemon of Thasos, who flourished during the Peloponnesian war, according to others, Hipponax. From the fragments that are extant of ancient parody, we infer that Homer was the favorite subject of comic imitation. Thus Hipponax, in his picture of a glutton, ludicrously insinuates a comparison between the feats of his hero in eating and those of Achilles in fighting, by commencing as follows:

> Sing, O celestial goddess, Eurymedon, foremost of gluttons,
> Whose stomach devours like Charybdis, eater unmatched among mortals.

The *Batrachomyomachia* (Battle of the Frogs and Mice), erroneously ascribed to Homer, is also a happy and harmless specimen of the parody, which, however, soon began to exchange its jocose and inoffensive raillery for a biting and sarcastic banter, of which numerous specimens may be seen in the comedies of Aristophanes; while the philosopher Timon of Phlius invented, under the name of *Silla*, a new species of satirical parody. Among the Romans we first meet with this form of literature in the period of the decline. All the power of Nero could not prevent his verses from being parodied by Persius. Among modern nations the French —as might naturally be expected from their character—have been most addicted to this literary mimicry. Corneille parodied Chapelain in his *Cid*, and Racine parodied Corneille. The *potpourris* of Désangiers are considered by his countrymen models of this ungracious kind of literature. Schiller's famous poem of the *Bell* has been often parodied by German wits. In England, perhaps the best compositions of this nature are the *Rejected Addresses* of the brothers James and Horace Smith. Many will remember, in particular, the parody on Scott's 'Battle of Flodden' in *Marmion*, ending—

> 'od rot 'em
> Were the last words of Higginbotham.

Barham's *Ingoldsby Legends* contains a felicitous parody on Wolfe's *Lines on the Burial of Sir John Moore*. We quote the first stanza as a specimen:

> Not a sou had he got, not a guinea or note,
> And he looked most confoundedly flurried
> As he bolted away without paying his shot,
> And his landlady after him hurried.

The *Verses* and *Translations* and the *Fly-Leaves* of C. S. Calverley contain clever parodies of the style of our modern poets. Thackeray's *Miscellanies* and Bret Harte's *Condensed Novels* also contain some very clever and satirical prose parodies upon certain of their brother novelists.

See Moser in Daub's and Creuzer's *Studien;* also Moser's *Parodiarum Exempla*.

PARO'LE (literally, a word) is the declaration made on honor by an officer, in a case in which there is no more than his sense of honor to restrain him from breaking his word. Thus a prisoner of war may be released from actual prison on his parole that he will not go beyond certain designated limits; or he may even be allowed to return to his own country on his parole not to fight again, during the existing war, against his captors. To break *parole* is accounted infamous in all civilized nations, and an officer who has so far forgotten his position as a gentleman ceases to have any claim to the treatment of an honorable man, nor can he expect quarter should he again fall into the hands of the enemy he has deceived.

PAROLE EVIDENCE, in Law, means such evidence as is given by witnesses by word of mouth at a trial or hearing of a cause. Parole Agreement, in English Law, means any agreement made either by word of mouth or by writing not under seal. If the agreement is made by writing under seal, it is called a deed, or indenture, or covenant, according to the nature of its contents.

PAROPAMISA'N MOUNTAINS. See Afghanistan.

PA'ROS, one of the larger islands of the Grecian Archipelago, is situated west of Naxos, from which it is separated by a channel from four to six miles wide. Greatest length 15 miles; greatest breadth, 9 miles; area about 95 square miles; pop. 6000. The surface is hilly, the scenery picturesque, and the soil naturally fertile, but imperfectly cultivated. The island is especially productive in cotton, wax, honey, partridges and wild pigeons. Near the middle of the island, the mountain Capresso (ancient *Marpessa*), abounds in the famous Parian marble, which was used by many of the greatest sculptors of antiquity. Parekhia on the west coast, is the principal town, and Naussa, on the north coast, is the chief port.

In ancient times, P., which is said to have been colonized by Cretans, attained great maritime prosperity, and became wealthy

and powerful. It submitted to the Persians; and after the battle of Marathon was assailed ineffectually by Miltiades, who received here the wound of which he soon after died. After the defeat of Xerxes, P. came under the supremacy of Athens, and shared the fate of the other Cyclades. Archilochus, the inventor of Iambic verse, was born here.

PARO'TID GLAND. See SALIVARY GLANDS.

PA'RQUETRY, a kind of wood mosaic used only for flooring. The art of making inlaid wood floors has until lately much declined in this country, but on the continent it has been much in use, and has been carried to great perfection. Parquetry floors are usually of oak, but other and more ornamental woods have also been much used for giving variety and beauty to the pattern. In the more elaborate kinds of parquetry, veneers are used, but it is much more generally composed of blocks of wood squared at the sides, and laid down so as to combine and form a geometric pattern. Of late, the taste for this work has revived in Britain, and it is beginning to be extensively employed in the better class of buildings.

PARR, SAMUEL, LL.D., a once notable scholar, was born January 15, 1747, at Harrow-on-the-Hill. He entered Emmanuel College, Cambridge, in 1765; but the death of his father, two years afterwards, necessitated his doing something for himself, and he was, in consequence, induced to accept an assistant-mastership at Harrow, where he remained five years. The headmastership then becoming vacant, P. applied for it, but was rejected, whereupon he left, and started as an independent schoolmaster. In 1777, he was appointed Master of Colchester School, where he was ordained priest, and obtained the curacies of Hythe and Trinity Church.

Next year, he became Master of Norwich School; but in 1786, settled at Hatton in Warwickshire, where he spent the rest of his life. In 1787, he published an edition of Bellenden, to which he prefixed his celebrated preface, which is as remarkable for its uncompromising advocacy of Whig principles as for the scrupulous Ciceronianism of its Latinity. He died March 6, 1825.

It is almost impossible to understand the reputation which P. once had. None of his voluminous writings justify it. That he was in some respects an accomplished, and even a great scholar, is undoubted, for he could write Latin of Ciceronian purity and finish; but it is equally undoubted that he never did anything with his boasted scholarship. P. has left the world absolutely nothing to keep it in remembrance of him, yet his complete works (edited by Dr. J. Johnstone in 1828)—exclusive of his contributions to periodicals—form eight enormous tomes, and contain 5734 octavo pages, many of them printed in small type. They relate to matters historical, critical, and metaphysical, but in all of them 'the thread of Parr's verbosity is finer than the staple of his argument.' What, then, gave him the fame that he certainly enjoyed during his life? Beyond all question, it was his conversational powers. He was an amazing, an overwhelming talker. Bold, dogmatic, arrogant, with a memory profoundly and minutely retentive, and with a genuine gift of ephemeral epigram, he seemed, at the tables of statesmen, and wits, and divines, to be a man of tremendous talent, capable of any literary feat; but the learning and the repartee have left little trace of their existence, and posterity declines to admire the wonders that it has neither seen nor heard. See De Quincey's famous essay on 'Dr. Samuel Parr on Whiggism in its Relations to Literature' (Author's edition, vol. 5. Edin. Adam and Charles Black, 1862).

PA'RRA. See JACANA.

PARRAKEE'T, or PAROQUET, a name very commonly given to many of the smaller species of the parrot family; generally to species having long tails, and natives of the East Indies, Africa, and Australia, not so frequently to American species; although it is sometimes also applied to some of these, indifferently with the name Parrot.—One of the most beautiful groups of the *Psittacidæ*, combining gracefulness of form with splendor of plumage, is that to which the ALEXANDRINA P. or RING P. (*Palæornis Alexandri*) belongs. It is about the size of a common pigeon, green, with a red collar, whence its name Ring P., and is a native of the East Indies. It is said to have been brought to Europe by some of the members of Alexander the Great's expedition to India, and to have been the first of the parrot tribe known to the Greeks and Romans, by whom it was highly prized, as it still is, not only for its beauty, but for its docility and its power of imitating human speech. Like many of its tribe, it is gregarious, and immense flocks make their abode in some of the cocoa-nut groves of the western part of Ceylon, filling the air with the most deafening screams. The Ring P. has many congeners, natives chiefly of the East Indies, exibiting much variety of splendid plumage.—Somewhat like them in length and form of tail, but with longer and stronger legs, is the GROUND P., or GROUND PARROT (*Pezophorus formosus*), of Australia, a bird once common in the southern parts of Australia and in Tasmania; but now nearly exterminated by cats run wild, which infest the scrubs. Its habits are very unlike those of parrots in general; it runs along the ground, and even seeks to escape from enemies by running, unwillingly takes wing, and then only for a short low flight. It makes no nest, but lays its eggs in a hole in the ground. It is a small bird, not much more than 12 inches in



Warbling Grass or Zebra Parrakeet (*Melopsittacus undulatus*).

entire length, one half of which is occupied by the tail; its color, dark green above, yellowish below, less brilliant than in many of the parrot tribe, but finely marked and mottled. Its flesh has a very strong *game* flavor.

There are numerous other Australian species, distributed in several genera, some of which, although less exclusively than that just noticed, live and seek their food on the ground. Some of them exhibit the greatest splendor of plumage. The only one we shall notice is the ZEBRA P. (*Melopsittacus undulatus*) a very beautiful little species, which has often been brought to England, and has sometimes bred in it. In the vast inland plains of Australia, this P. is to be seen in flocks of many hundreds feeding on the seeds of the grasses, which afford food also to many other small species.

PA'RRAS, a well-built town of Mexico, in the state of Coahuila 470 miles north-west of Mexico, near the east shore of Lake Parras. Pop. 8000.

PARRHA'SIUS, one of the greatest painters of ancient Greece, was the son of Evenor, himself an artist, and was born at Ephesus in the 5th c. B.C. He practised his profession, however, at Athens, the inhabitants of which held him in high estimation, and conferred on him the rights of citizenship. He was already celebrated in the time of Socrates, with whom, according to Xenophon, he held a conversation (*Mem.* 3, 10), and was also a younger contemporary of Zeuxis. The date of his death is unknown. Seneca, who lived several hundred years after, tells a monstrous story about him. He says that when P. was painting his 'Prometheus Vinctus,' he got hold of one of the prisoners taken at the capture of Olynthus by Philip of Macedon (347 B.C.), and crucified him in his studio that he might copy from life the expression of agony. Fortunately for P.'s memory, the anecdote is almost certainly untrue, as it would require us to suppose that he was still alive and painting when upwards of 100 years old. P. appears to have surpassed all his predecessors in purity of design, accuracy of drawing, force of expression, and what is technically called 'finish.'

According to Pliny, he was the first who established a true proportion between the different parts of a picture, and delineated with elegance and precision all the minutiæ of the features, even to those evanescent motions that betray the most delicate sentiments of the soul. He painted the extremities, such as the hands and fingers, in so exquisite a style, that the intermediate parts seemed relatively—but *only* relatively—inferior. Quinctilian calls him the legislator of his art, because his canon of proportion for gods and heroes was followed by all contemporary and subsequent painters. Among his works were an apparently symbolical picture of the Athenian *Demos* ('People'), a 'Theseus,' 'Naval Commander in full Armor,' 'Ulysses feigning Madness,' 'Castor and Pollux,' 'Bacchus and Virtue,' a 'Meleager, Hercules, and Perseus' on one canvas, a 'Cretan Nurse with a Child in her Arms,' a 'Priest officiating with a Child bearing Incense,' 'Two Young Children,' an 'Achilles,' an 'Agamemnon,' &c. But his subjects

were not always of a pure or lofty character. His 'Archigallus' (high-priest of Cybele) and his 'Meleager and Atalanta' were most licentious representations, and gave such pleasure to the Emperor Tiberius, a man of unbounded sensuality, that he kept them in his bedroom, and valued the second in particular at more than a million sesterces.

P. was of an excessively proud and arrogant disposition. He called himself the prince of painters, and claimed to be descended from Apollo; he also painted himself as the god Mercury, and then exposed his own portrait for the adoration of the crowd. His vanity was equal to his pride, and showed itself even in his apparel, which was of the kind called 'gorgeous.' He generally dressed in a purple robe with a golden fringe, sported a gold-headed cane, and wore boots tied with golden clasps.

PA'RRICIDE (Lat. *paricida*) is rather a popular than a legal term. In the Roman law it comprehended every one who murdered a near relative; but in English the term is usually confined to the murderer of one's father, or of one who is *in loco parentis*. The parricide does not, in any respect, differ in Britain, from the murderer of a stranger; in both cases, the punishment is death by hanging. In the Roman law, a parricide was punished in a much more severe manner, being sewed up in a leather sack, along with a live cock, viper, dog, and ape, and cast into the sea to take his fate with these companions.

PARRISH'S CHEMICAL FOOD is the popular name for a non-officinal preparation medicinally known as *Compound Syrup of Phosphate of Iron*, every drachm of which contains 1 grain of phosphate of iron, 2½, of phosphate of lime, besides soda and potash. Mr. Parrish of Philadelphia was the first to publish a formula for this very useful compound.

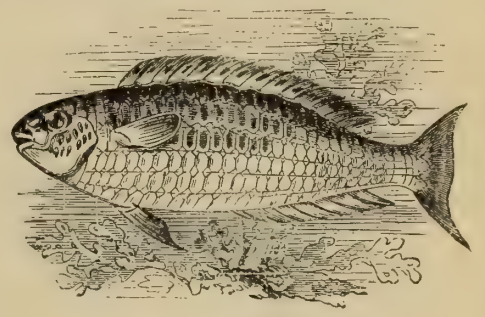
PA'RROT (*Psittacus*), a Linnæan genus of birds, now the family *Psittacidæ*, of the order *Scansores*, or Climbers (q. v.), comprehending a vast number of species, natives of almost all tropical and subtropical regions; a few species extending further north and south, in America, in New Zealand, and in Tasmania. They are mostly birds of splendid plumage; they vary very much in size, from the Great Macaw, more than three feet in length, tail included, to the little Love-birds, not larger than sparrows. They are mostly gregarious, and are often seen in vast flocks, generally inhabiting forests, and making their nests in trees, feeding chiefly on fruits and seeds, partly also on leaves and buds; but some of them live in open plains, feeding on the seeds of grasses and other plants, bulbs, and succulent parts of vegetables. The *Kea* or Mountain Nestor, a New Zealand parrot, has of late taken to attacking sheep and devouring the flesh of living animals, to the great damage of the flocks.

The voices of the P. tribe are generally harsh and discordant, although some of the smaller kinds have not unpleasant voices; but many of the larger have a remarkable power of imitating human speech, and in domestication become capable of articulating not only words but sentences. They exhibit a greater degree of intelligence than is usual in birds, with a monkey-like restlessness and love of trick; and although docile and affectionate, are generally of capricious irritable temper. They have a short, stout, hard beak, rounded on all sides, and enveloped at the base in a membrane in which the nostrils are pierced; the upper mandible generally much longer than the lower, much curved, and sharp pointed. The tongue is almost always very large, thick, round, and fleshy; the muscles which move the mandibles are more numerous and powerful than in most other birds. They make use of the powerful hooked bill as well as of the feet in climbing trees; and employ their feet as hands for holding their food, and bringing it up to the mouth. Their feet differ from those of all the other climbers, in being covered with small tubercle-like scales instead of plates. Some have short and some have long tails. Most of them have short wings. Their intestines are very long and slender, and without coeca.

The *Psittacidæ* are easily distinguished from all other birds; but their division into distinct subordinate groups has not been found so easy. Whilst the name P. popularly includes all, except that it is seldom given to some of the smallest species, some are known by the names Macaw, Cockatoo, Parrakeet, Lory, Love-bird, &c. See these heads. But some of these names are very vaguely applied. And although the P. family is regarded as consisting of a number of very natural groups, the characters and limits of these groups have not yet been very well defined.

The name P., in its most restricted sense, is sometimes applied only to those species which have the upper mandible very distinctly toothed, the lower mandible longer than it is high; and the tail short, and square or rounded; but this use is rather ornithological than popular, the most restricted popular use equally including long-tailed species, such as the Caroline P., which are ornithologically ranked with the macaws.—The CAROLINE P. (*Conurus Carolinensis*) is the species of which the northern range extends far beyond all others of its tribe to the shores of Lake Michigan; although by the increase of cultivation, and the war waged against these birds for their depredations on orchards and corn-ricks, their numbers have been greatly diminished in regions where they were once plentiful. Its whole length is about 14 inches, of which about one half is occupied by the tail; the general color is green, shaded with blue, and diversified with orange, the wing primaries almost black. It is gregarious, prefers to roost in the holes of hollow trees, and in such situations also the females lay their eggs. It seems to love salt, frequenting salt *licks* like pigeons. It is easily tamed, but does not acquire the power of articulation.—Of the short-tailed parrots, one of the best known is the GRAY P. (*Psittacus erythacus*), a West African species, about the size of a small pigeon, of an ash-gray color, with a crimson tail. It is famous for its docility, its power of articulation and of imitating noises of all kinds, its loquacity, and its mischievousness. It is very often brought to Europe, and often lives to a great age in confinement. Individuals have been known to attain the age of nearly 100 years.—The GREEN PARROTS (*Chrysotis*), natives of the tropical parts of South America, are also among the short-tailed parrots most frequently seen in Britain.

PARROT-FISH (*Scarus*), a genus of fishes of the family *Labridæ* (q. v.) or *Cyclo-Labridæ*, of oblong and massive form, with large scales, and remarkable for the structure of their jaws and teeth, the jaws being divided into halves by a median suture, the teeth incorporated with the bone in crowded quincuncial order, the surface even and polished in some species and rough in others, the oldest teeth forming the trenchant border of the jaw, and being succeeded by others as they are worn away, whilst new ones are formed behind. The species are numerous. Some of them feed on fuci, and some on corals, the younger branches of



Parrot-fish (*Scarus harid*).

which they crush, so that the animal part affords them nourishment, whilst the calcareous part is rejected. They are fishes generally of brilliant colors, some of them of wonderful splendor, and have received the name parrot-fish partly on this account, and partly on account of a fancied resemblance in their jaws to a parrot's bill. Most of them are natives of tropical seas. One species is found in the Mediterranean (*S. Creticus*), the *Scarus* of the ancients, of which many wonderful stories were told, as to its love, its wisdom, its ruminating, its emitting of sounds, &c., and which was esteemed the most savory and delicate of all fishes. It is still held in high esteem for the table. The Greeks cook it with a sauce made of its own liver and intestines.

PARRY, SIR WILLIAM EDWARD, commonly known as SIR EDWARD PARRY, a celebrated English navigator, was born at Bath, 19th December 1790. His father, who was a physician of some eminence, destined him for the medical profession; but acting on the advice of a friend entered him as a first-class volunteer on board the *Ville-de-Paris*, the flag-ship of the channel fleet, in 1803. After several years' service, he received his commission as lieutenant, January 6, 1810. Though thus early engaged in active service, his education had not been neglected; he had attained at school to considerable eminence in classical knowledge; and for the first five years after entering the navy, he had particularly studied French and mathematics under the chaplain's superintendence, after which he constantly employed his leisure time in nautical and astronomical studies. In February 1810, he was sent to the Arctic regions in command of a ship, for the purpose of protecting the British whale fisheries and improving the admiralty charts of those regions; but in 1813, he was recalled and despatched to join the fleet then blockading the coast of the United States. He remained on the North American station till the spring of 1817, and during this time he wrote and distributed MS. copies of a work entitled *Nautical Astronomy by Night*, in which rules were given for determining accurately the altitude of the pole by observations of the fixed stars. This work he subsequently published in London. Having returned to England too late to take part in the African exploring expedition, he was, at his urgent request, backed by the recommendations of Mr. Barrow, secretary to the Admiralty, appointed to the command of the *Alexander*, under the orders of Captain John Ross in the

Isabella, and despatched in search of the 'North-West Passage' (q. v.) in April 1818. The expedition returned to England, having made no important discoveries.

The admiralty were dissatisfied with the report of Captain Ross; and P.'s opinion, though only communicated to his private friends, having become known to them, he was again sent out (May 1819), and this time commenced that career of discovery (see NORTH-WEST PASSAGE) which has immortalized him as the greatest of all Arctic explorers. P. on his return to Britain was hailed with the utmost enthusiasm, and was made commander (4th November 1820) and a member of the Royal Society. He subsequently made a second and a third voyage to the same regions, but effected nothing of importance. P. now devoted himself to the discharge of his duties as hydrographer, but such labors were too monotonous for one of his temperament, and he accordingly prepared a plan of an expedition for reaching the north pole, which being submitted to the admiralty and approved of by them, his old ship the *Hecla* was fitted out for a polar expedition, and P. set sail in her, accompanied by Lieutenant J. C. Ross, 4th April 1827. See POLAR VOYAGES. The *Journals* of these voyages were published by order of the admiralty.

P.'s career as an explorer was now closed, and he again returned to his duties as hydrographer, but his health now gave way under this sedentary mode of life, and he exchanged his office for that of commissioner to the Agricultural Company of Australia, for which country he sailed 20th July 1829. He returned to England in November 1834, and filled in succession various government appointments up till December 1846, when he retired from active service, receiving a sinecure office. On 4th June 1852 he was raised to the rank of Rear-admiral of the White, and in the following year was appointed lieutenant-governor of Greenwich Hospital—an office which he held till his death, 7th July 1855, at Ems in Germany, whither he had gone for the benefit of his health. A complete edition of his voyages was published in 1833 (Lond. 5 vols.). His life has been written by his son, the Rev. Edward Parry, M.A. of Balliol College, Oxford (1857).

PA'RSEES (People of Pars or Fars, i. e., ancient Persia) is the name of the small remnant of the followers of the ancient Persian religion, as reformed by Zerdusht, or Zoroaster, as he is commonly called. They are also known under the denomination of Guebres, under which head some account will be found respecting their recent history and present numbers. The pre-Zoroastrian phase or phases of their primeval religion will probably for ever remain shrouded in deep obscurity; so much, however, is fully established by recent investigations, that this, and what afterwards became the Brahmanic religion, were originally identical; that in consequence of certain social and political conflicts between the Iranians and the Aryans, who afterwards peopled Hindustan Proper, an undying feud arose, in the course of which the former forswore even the hitherto common faith, and established a counter faith (Ahura), a principal dogma of which was the transformation of the ancient, now hostile, gods into demons, and the branding of the entire Deva religion as a source of all mischief and wickedness. Zerdusht, the prophet, whose era is given very differently by ancient writers and by modern investigators, placed variously between 500 or 600 B.C. (Röth) and 1200 B.C. (Haug), had, like all prophets and reformers, many predecessors, chiefly among the Soshyantos or Fire-priests (Atharvans); yet to him belongs the decisive act of separating for ever the contending parties, and of establishing a new community with a new faith—the Mazdayasna or Parsee religion proper, which absorbed the old Ahura religion of the fire-priests. Referring for a summary of what is known and speculated about the person of the great reformer to the article under his name, we shall here confine ourselves to pointing out, as the characteristics of his leading doctrines, that the principle of his theology was as pure a Monotheism as ever the followers of the Jehovistic faith were enjoined. He taught the existence of but one deity, the Ahura, who is called Mazdaô (see ORMUZD), the creator of all things, to whom all good things, spiritual and worldly, belong.

The principle of his speculative philosophy is dualism, i. e., the supposition of two primeval causes of the real and intellectual world; the Vohu Manô, the Good Mind or Reality (Gaya), and the Akem Manô, or the Naught Mind, or Non-reality (Ajyâiti); while the principle of his moral philosophy is the triad of Thought, Word, and Deed. Not long, however, did the pure idea of Monotheism prevail. The two sides of Ahura Mazdaô's being were taken to be two distinct personages—God and Devil—and they each took their due places in the Parsee pantheon in the course of time:—chiefly through the influence of the sect of the Zendiks, or followers of the Zend, i. e., Interpretation. According to Zerdusht, there are two intellects, as there are two lives—one *mental* and one *bodily*; and, again, there must be distinguished an *earthly* and a *future* life. The immortality of souls was taught long before the Semites had adopted this belief. There are two abodes for the departed—Heaven (Garô-Demâna, the House of the Angels' Hymns, Yazna, xxviii. 10; xxxiv. 2; cf. Is. vi., Revelat., &c.) and Hell (Drâjoô-Demâna, the residence of devils and the priests of the Deva religion). Between the two there is the Bridge of the Gatherer or Judge, which the souls of the pious alone can pass. There will be a general resurrection, which is to precede the last judgment, to foretell which Sosiosh (Soskyans), the son of Zerdusht, spiritually begotten (by later priests divided into three persons), will be sent by Ahuramazdao. The world, which by that time will be utterly steeped in wretchedness, darkness, and sin, will then be renewed; death, the archfiend of creation, will be slain, and life will be everlasting and holy. These are the outlines of the Zoroastrian creed, as it flourished up to the time of Alexander the Great, throughout ancient Irania, including Upper Tibet, Cabulistan, Sogdiana, Bactriana, Media, Persis, &c.; and it is curious to speculate on the consequences which might have followed Marathon and Salamis had the Persians been victorious.

The religion of Ormuzd would have dethroned the Olympians, as it dethroned the gods of the Assyrians and Babylonians; and it would certainly have left its traces upon the whole civilized world unto this day in a much more direct and palpable shape than it now does. From the death of Alexander, however, it gradually lost ground, and rapidly declined under his successors, until, in the time of Alexander Severus, Ardshir 'Arianos' (cf. Mirkhond ap. de Sacy, *Mémoires sur div. Aut. de la Perse*, &c., p. 59), the son of Babegan, called by the Greeks and Romans Artaxerxes or Artaxares, who claimed descent from the ancient royal lineage of Persia, took the field against Artabanus, and slew him (225), thus putting an end to the four hundred years' rule of the Parthians, and founded the Sassanide dynasty. This he effected in conjunction with the national Persians, who hated the 'semi-Greek' dynasty of the Arascidæ, their leaning to the foreign, and contempt for the Zend religion, and finally for their powerlessness against the spreading conquests of the Romans. The first act of the new king was the general and complete restoration of the partly lost, partly forgotten books of Zerdusht, which he effected, it is related, chiefly through the inspiration of a Magian Sage, chosen out of 40,000 Magians. The sacred volumes were translated out of the original Zend into the vernacular, and disseminated among the people at large, and fire temples were reared throughout the length and the breadth of the land. The Magi or priests were all-powerful, and their hatred was directed principally against the Greeks. 'Far too long,' wrote Ardshir, the king, to all the provinces of the Persian empire, 'for more than five hundred years, has the poison of Aristotle spread.' The fanaticism of the priests often also found vent against Christians and Jews. The latter have left us some account of the tyranny and oppression to which they as unbelievers were exposed—such as the prohibition of fire and light in their houses on Persian fast-days, of the slaughter of animals, the baths of purification, and the burial of the dead according to the Jewish rites—prohibitions only to be bought off by heavy bribes. In return, the Magi were cordially hated by the Jews, and remain branded in their writings by the title of demons of hell (*Kidushin*, 72 a.).

To accept the instruction of a Magian is pronounced by a Jewish sage to be an offence worthy of death (*Shabb.* 75 a. ; 156 b.). This mutual animosity does not, however, appear to have long continued, since in subsequent times we frequently find Jewish sages (Samuel *the Arian*, &c.) on terms of friendship and confidence with the later Sassanide kings (cf. Moed Katan, 26 a. &c.). From the period of its re-establishment, the Zoroastrian religion flourished uninterruptedly for about 400 years, till in 651, A. D., at the great battle of Nahavand (near Ecbatana), the Persian army, under Yezdezird, was routed by the Calif Omar. The subsequent fate of those that remained faithful to the creed of their fathers has been described, as we said before, under GUEBRES. At present, some remnants inhabit Yezd and Kirmân, on the ancient soil of their race; others, who preferred emigration to the endless tribulations inflicted upon them by the conquering race, found a resting-place along the western coast of India, chiefly at Bombay, Surat, Nawsari, Achmedâbâd, and the vicinity where they now live under English rule, and are recognized as one of the most respectable and thriving sections of the community, being for the most part merchants and landed proprietors. They bear, equally with their poorer brethren in Persia, with whom they have of late renewed some slight intercourse for religious and other purposes—such as their Rivâyets or correspondences on important and obscure doctrinal points—the very highest character for honesty, industry, and peacefulness, while their benevolence, intelligence, and magnificence outvies that of most of their European fellow-subjects. Their general appearance is to a certain degree prepossessing, and many of their women are strikingly beautiful. In all civil matters they are subject to the laws of the country they inhabit; and its language is also theirs, except in the ritual of their religion, when the holy language of Zend is used by the priests, who, as a rule, have no more knowledge of it than the laity.

We have spoken of the leading fundamental doctrines as laid down by their prophet. Respecting the practical side of their religion, we cannot here enter into a detailed description of their very copious rituals, which have partly found their way into other creeds.

Suffice it to mention the following few points. They do not eat anything cooked by a person of another religion; they also object to beef, pork, especially to ham. Marriages can only be contracted with persons of their own caste and creed. Polygamy, except after nine years of sterility and divorce, is forbidden. Fornication and adultery are punishable with death. Their dead are not buried, but exposed on an iron grating in the Dokhma, or Tower of Silence, to the fowls of the air, to the dew, and to the sun, until the flesh has disappeared, and the bleaching bones fall through into a pit beneath, from which they are afterwards removed to a subterranean cavern.

Ahuramazdao being the origin of light, his symbol is the sun, with the moon and the planets, and in default of them the fire, and the believer is enjoined to face a luminous object during his prayers. Hence, also, the temples and altars must for ever be fed with the holy fire, brought down, according to tradition, from heaven, and the sullying of whose flame is punishable with death. The priests themselves approach it only with a half-mask (Penom) over the face, lest their breath should defile it, and never touch it with their hands, but with holy instruments. The fires are of five kinds; but however great the awe felt by Parsees with respect to fire and light (they are the only eastern nation who abstain from smoking), yet they never consider these, as we said before, as anything but emblems of Divinity.

There are also five kinds of 'Sacrifice,' which term, however, is rather to be understood in the sense of a sacred action. These are—the slaughtering of animals for public or private solemnities; prayer; the Daruns sacrament, which, with its consecrated bread and wine in honor of the primeval founder of the law, Hom or Heomoh (the Sanscr. *Soma*), and Dahman, the personified blessing, bears a striking outward resemblance to the sacrament of the Lord's Supper; the sacrifice of Expiation, consisting either in flagellation, or in gifts to the priest; and, lastly, the sacrifice for the souls of the dead. The purification of physical and moral impurities is effected, in the first place, by cleansing with holy water (Nirang), earth, &c.; next, by prayers (of which sixteen, at least, are to be recited every day) and the recitation of the divine word; but other self-castigations, fasting, celibacy, &c., are considered hateful to the Divinity. The ethical code may be summed up in the three words—purity of thought, of word, and of deed: a religion 'that is for all, and not for any particular nation,' as the Zoroastrians say. It need hardly be added, that superstitions of all kinds have, in the course of the tribulations of ages, and the intimacy with neighboring countries, greatly defiled the original purity of this creed, and that its forms now vary much among the different communities of the present time.

Something like a very serious schism, however, has lately broken out in the Parsee communities, and the modern terms of Conservative and Liberal, or rather bigot and infidel, are almost as freely used with them as in Europe. The sum and substance of these innovations, stoutly advocated by one side, and as stoutly resisted by the other, is the desire to abolish the purification by the Nirang—a filthy substance in itself—to reduce the large number of obligatory prayers, to stop early betrothal and marriage, to suppress the extravagance in funerals and weddings, to educate women, and to admit them into society. Two counter alliances or societies, the 'Guides of the Worshipers of God' and 'the True Guides' respectively, are trying to carry out at this moment, by means of meetings, speeches, tracts, &c., the objects of their different parties.

The literature of the Parsees will be found noticed under PERSIAN LANGUAGE AND LITERATURE, and ZEND-AVESTA. Besides the latter, which is written in ancient Zend, and its Gujarati translation and commentaries, there are to be mentioned, as works specially treating of religious matters, the *Zardusht-Nameh*, or Legendary History of Zerdusht; the *Sadder*, or Summary of Parsee Doctrines; the *Dabistan*, or School of Manners; the *Desatir*, or Sacred Writings, &c. All these have been translated into English and other European languages.

On the influence Parsism has had upon Judaism and its later doctrines and ceremonial, and, through it, upon Christianity and Mohammedanism—which besides drew from it directly—we cannot dwell here at any length. So much, however, may be stated, that the most cursory reading of the sacred Parsee books will show, in a variety of points, their direct influence upon the three Semitic creeds. Of works treating on the subject of this article, we mention principally, Hyde, *Vet. Rel. Pers. Hist.* (Oxon. 1760, 4to); Ousely, *Travels in the East* (Lond. 1819); Anquetil du Perron, *Exposition des Usages des Parses;* Rhode, *Die heil. Sage der alten Baktrier, Meder u. Perser*, &c. (Frank.-a-M., 1820, 8vo); Dosabhoy Framjee, *The Parsees*, &c. (Lond. 1858); Dadabhai Naoroji, *The Manners and Customs of the Parsees;* and *The Parsee Religion* (Liverpool, 1861, 8vo); and lastly, Haug's *Essays on the Parsee Religion* (Bombay, 1862), and Spiegel's *Erân* (Berl. 1863).

PA'RSLEY (*Petroselinum*), a genus of plants of the natural order *Umbelliferæ*. The species are annual or biennial, branching, smooth, herbaceous plants, with variously pinnated leaves.—COMMON P. (*P. sativum*), which has tripinnate shining leaves, one of our best known culinary plants, is a native of the south of Europe, growing chiefly on rocks and old walls, and naturalized in some parts of England. The cultivation of P. is extremely simple, and an annual sowing is generally made, although when cut over and prevented from flowering, the plant lives for several years. A variety with curled leaflets is generally preferred to the common kind with plain leaflets, as finer and more beautiful, being often used as a garnish; it is also safer, as the poisonous Fool's P. (q. v.) is sometimes gathered by mistake instead of the other.—HAMBURG P. is a variety with a large white carrot-like root, cultivated for the sake of its root, and much in the same way as the carrot or parsnip. To produce large roots and of delicate flavor, a very rich soil is required. The foliage of P. is not merely of use for flavoring soups, &c , but is nutritious at the same time that it is stimulating, a quality which it seems to derive from an essential oil present in every part of the plant. P. contains also a peculiar gelatinous substance called *Apiine*. The bruised leaves of P. are sometimes employed as a stimulating poultice. The seeds are a deadly poison to many birds, and when powdered, they are sometimes used for killing lice.

PA'RSNIP (*Pastinaca*), a genus of plants of the natural order *Umbelliferæ*, having compound umbels with neither general nor partial involucres; yellow flowers with roundish, involute, sharp-pointed petals; calyx almost without teeth; fruit dorsally compressed and flat, with a broad border, the ridges very fine. The species are annual, biennial, or perennial herbaceous plants, with carrot-like, often fleshy roots, and pinnate leaves.—The COMMON P. (*P. sativa*) is a native of England, although not of Scotland, and is abundant in some districts, particularly in chalky and gravelly soils. It is also found in many parts of Europe, and of the north of Asia. It is a biennial, with angular furrowed stem, 2—3 feet high, pinnate leaves with ovate leaflets, rather shining, cut and serrated, and a three-lobed terminal leaflet. The root of the wild plant is white, aromatic, mucilaginous, sweet, but with some acridness; and injurious effects have followed from its use. Cultivation has greatly modified the qualities both of the root and foliage, rendering them much more bland. The P. has long been cultivated for the sake of its root, which in cultivation has greatly increased in size, and become more fleshy. The flavor is disliked by some, as well as the too great sweetness, but highly relished by others; and the root of the P. is more nutritious than that of the carrot. The produce is also, on many soils, of larger quantity; and although the P. delights in a very open rich soil, it will succeed in clayey soils far too stiff for the carrot. It is rather remarkable that it has not been extensively cultivated as a field-crop, and for the feeding of cattle, except in the Channel Islands and in limited districts of continental Europe; more particularly as cattle are very fond of it, and not only the flesh of cattle fed on it is of excellent quality, but the butter of dairy-cows fed on parsnips in winter is far superior to that produced by almost any other kind of winter-feeding. The mode of cultivation of the P. scarcely differs from that of the carrot. There are several varieties in cultivation.

A very large variety cultivated in the Channel Islands on deep sandy soils, has roots sometimes three or four feet long; but this is fully twice the ordinary length, and there is a smaller turnip-rooted variety sometimes cultivated in gardens where the soil is very shallow. The P. is used chiefly in winter, whether for the table or for feeding cattle. It is improved rather than injured by frost; but is apt to become *rusty*, if allowed to remain too long in the ground; and exhibits acrid qualities after it has begun to grow again in spring. The root of the P. is much used in the north of Ireland for making a fermented liquor, with yeast and hops; and both in England and Ireland, for making *P. wine*, which has some resemblance to Malmsey wine.—Another species, the CUT-LEAVED P. or SEKAKUL (*P. Sekakul*), having pinnatifid cut leaflets, a native of India, Syria, and Egypt, is cultivated in the Levant, and is very similar in its uses to the common parsnip.

PARSON, in English Ecclesiastical Law, means the incumbent of a benefice in a parish. He is called parson (Lat. *persona*) because he represents the church for several purposes. He requires to be a member of the Established Church of England, and to be duly admitted to holy orders, presented, instituted, and inducted; and requires to be 23 years of age. When he is inducted, and not before, he is said to be in full and complete possession of the incumbency. The theory is, that the freehold of the parish church is vested in him, and as the legal owner, he has various rights of control over the chancel. He is also the owner of the churchyard, and as such is entitled to the grass. As owner of the body of the church, he has a right to control of the church bells, and is en-

titled to prevent the churchwardens from ringing them against his will. The distinction between a parson and vicar is, that the parson has generally the whole right to the ecclesiastical dues in the parish, whereas, the vicar has an appropriator over him, who is the real owner of the dues and tithes, and the vicar has only an inferior portion. The duty of the parson is to perform divine service in the parish church under the control of the bishop, to administer the sacraments to parishioners, to read the burial-service on request of the parishioners, to marry them in the parish church when they tender themselves. He is bound to reside in the parish, and is subject to penalties and forfeiture, if he without cause absent himself from the parish. He is subject to the Clergy Discipline Act, in case of misconduct.

PA'RSONSTOWN (anciently called BIRR), a considerable inland town on the river Brosna, in King's County, Ireland, 69 miles west-south-west from Dublin, with which city it is connected by a branch-line issuing from the great Southern and Western Railway at Ballybrophy. Pop. in 1881, 4955; of whom about 4000 were Roman Catholics, 700 Protestant Episcopalians, and the rest Protestants of other denominations. Birr had its origin at an early period in a monastery founded by St. Brendan, and was the scene of many important events, both in the Irish and in the post-Invasion periods. The castle, which was anciently the seat of the O'Carrols, was granted by Henry II. to Philip de Worcester; but it frequently changed masters, and even alternated between English and Irish hands. By James I., it was granted to Lawrence Parsons, ancestor of the present proprietor, the Earl of Rosse; but through the entire period of the civil wars, its possession was constantly disputed, until after 1690, when the Parsons family was finally established in possession. About this time, Birr returned two members to parliament, but the privilege was temporary. The castle has been rebuilt. P. is one of the handsomest and best built inland towns in Ireland, with several fine churches and chapels, a nunnery, a statue of the Duke of Cumberland, a bronze statue (erected in 1876) of the third Earl of Rosse, a town-hall, a library, literary institute, a model and other schools. But the great attractions of P. are the castle, the observatory, and the laboratory of the late Earl of Rosse (q. v.), still maintained in active use by the present earl. P. is an important corn-market, a considerable center of inland commerce; but with the exception of a distillery and brewery, it is almost entirely without manufactures. It is a military station, and the seat of a union workhouse.

PARS'WANATHA, the twenty-third of the deified saints of the Jainas, in the present era. He and *Mahavira*, the twenty-fourth, are held in highest esteem, especially in Hindustan. In a suburb of Benares, called Belupura, there is a temple honored as the birthplace of Pârs'wanâtha. See JAINAS.

PART, in music. When a piece of music consists of several series of sounds performed simultaneously, each series is called a part.

PARTA'NNA, a town of Sicily (prov. Trapani), 36 miles S.W. of Palermo. Pop. 13,000.

PARTERRE, in gardens laid out in the old French style, the open part in front of the house, in which flower-beds and closely-cut lawn were intermingled according to a regular plan.

PA'RTHENOGE'NESIS (from the Gr. *parthenos*, a virgin, and *genesis*, the act of production) is a term invented by Professor Owen to indicate propagation by self-splitting or self-dividing, by budding from without or within, and by any mode save by the act of impregnation; the parthenogenetic individuals being sexless or virgin females. See the article GENERATIONS, ALTERNATION OF. For many remarkable facts in relation to parthenogenesis in insects, the reader is referred to Professor Owen's eighteenth lecture, *On the Anatomy and Physiology of Invertebrate Animals;* and to Siebold, *On Parthenogenesis*, translated by Dallas.

PA'RTHENON, the temple of Minerva at Athens; one of the most celebrated of the Greek temples, and usually regarded as the most perfect specimen of Greek architecture. Many of the sculptures have been brought to England, and are now in the British Museum. See GRECIAN ARCHITECTURE.

PARTHENOPE'AN REPUBLIC (from *Parthenope*, the oldest name of the city of Naples) was the name given to the state into which the kingdom of Naples was transformed by the French Republicans, 23d January 1799, and which only lasted till the following June, when the invading army was forced to retreat.

PA'RTHIA, anciently a country of Western Asia, lying at the south-east end of the Caspian Sea, from which it was separated by a narrow strip, known as Hyrcania, now forms the northern portion of the province of Khorassan, and is an almost wholly mountainous region. Its rivers are merely mountain torrents, which are supplied by the melting snow on the Elburz range during winter and spring, but are mostly dry in summer and autumn.

The original inhabitants are believed to have been of Scythian race, as shown by their language as well as by their manners, and to belong to the great Indo-Germanic family. If this be the case, as is very probable, the term Parthian, from its analogy to the Scythian word *parthe*, banished, seems to indicate that they were a tribe who had been driven to P. out of Scythia (i. e., Central Asia). The Parthians, during the time of the Roman Republic, were distinguished by primitive simplicity of life and extreme bravery, though at the same time much given to bacchanalian and voluptuous pleasures. They neglected agriculture and commerce, devoting their whole time to predatory expeditions and warfare. They fought on horseback, and after a peculiar fashion. Being armed solely with bows and arrows, they were rendered defenceless after the first discharge; and, to gain time for adjusting a second arrow to the bow, turned their horses, and retired, as if in full flight, but an enemy incautiously pursuing, was immediately assailed by a second flight of arrows; a second pretended flight followed, and the conflict was thus carried on till the Parthians gained the victory, or exhausted their quivers. They generally discharged their arrows backwards, holding the bow behind the shoulder; a mode of attack more dangerous to a pursuing enemy than to one in order of battle. The Parthians first appear in history as subject to the great Persian Empire. After the death of Alexander the Great, P. formed part of the Syrian kingdom, but revolted under Antiochus II., and constituted itself into an independent kingdom under the *Arsacidæ* (see ARSACES), 250 B.C., a race of kings who exercised the most completely despotic authority ever known, treating their subjects as if the vilest of slaves; yet so accustomed did the Parthians become to this odious rule, that some of the later monarchs, who had received a Roman education, and after their accession treated their subjects with ordinary justice and humanity, were completely despised.

The capital of the Parthian monarchy was Hecatompylos ('the city of the hundred gates'), now Damgan. The Parthian dominion rapidly extended to the Euphrates on the west and the Indus on the east, and became a most powerful and flourishing empire; Seleucia, Ctesiphon—the capital of the Persian emperors of the Sassanidæ—and other celebrated cities date their rise from this period, and soon eclipsed, in size and splendor, the ancient Hecatompylos. In spite of repeated attacks on the part of the Romans, the Parthians maintained their independence (see CRASSUS, SURENA); and though Trajan, in 115—116 A.D., seized certain portions of the country, the Romans were soon compelled to abandon them. In 214 A D., during the reign of Artabanus IV., the last of the Arsacidæ, a revolt, headed by Ardshir, son of Babegan, broke out in Persia, and the Parthian monarch, beaten in three engagements, lost his throne and life, while the victor substituted the Persian dynasty of the SASSANIDÆ (q. v.) for that of the Arsacidæ. Some scions of the Parthian royal family continued for several centuries to rule over the mountainous district of Armenia, under the protection of the Romans, and made frequent descents upon Assyria and Babylonia; but their htstory is obscure and of little importance.

PARTIAL LOSS, in the law of Marine Insurance, is a loss which is not total; and therefore the insurer is not entitled to abandon or give up the remains of the ship or cargo, and claim the entire insurance money; but he is bound to keep his ship or goods, and claim only in proportion to his actual loss or damage.

PA'RTICIPLE (Lat. *participium*, part-taking), the name of a class of words which have the meaning of a verb with the form of an adjective. The name is said to have been given from their partaking of the nature both of a verb and of an adjective. Some grammarians make the participle a distinct part of speech, but it is more commonly classed as a part of the conjugation of the verb. There are in English two participles, one in *ing*, usually called the present, but properly the imperfect, because it expresses continued unfinished action, e. g., *loving, writing;* and the other expressing past action, and ending either in *ed* (*t*) or in *en*, e. g., *loved, written*. In Ang.-Sax. and Old Eng., the imperfect participle ended in *and*, e. g., *haband* (having), corresponding to the modern Ger. *habend*, Gr. *echont*(os), Lat. *habent*(is.) In the sentence, 'He is *writing* a letter,' *writing* is the imperfect participle; in 'the *writing* of the letter occupies him,' or '*writing* is a difficult art,' it is a substantive, and had a different origin. In the latter case, *-ing* corresponds to the Ang.-Sax. termination *-ung*, used in forming substantives from a large class of verbs; thus, Ang.-Sax. *halgung* (hallowing) is equivalent in meaning and in etymology to Lat. *consecratio;* similarly, modern Ger. *Vernichtung*, annihilation, from *vernichten*, to annihilate. Such a phrase as, 'while the letter is writing,' seems to be a shortened form of the now antiquated, 'is a-writing,' which was originally, 'is in writing.' Although this mode of expression is liable in some cases to ambiguity, it is terser and more idiomatic than the circumlocution of, 'is being written,' which is often substituted for it. The verbal substantive in *-ing* is often exactly equivalent to the infinitive; thus, '*standing* long in one position is painful' = '*to stand*,' &c. It has this advantage, that while it can be construed as a noun

(e. g., with a possessive case), it can retain at the same time the usual adjuncts of a verb; as, 'What are we to infer from the the king's dismissing his minister?' The use of this form contributes not a little to the peculiar brevity and strength of the English language.

PA'RTICK, a town of Scotland, in the county of Lanark, prettily situated, chiefly on a rising ground on the Kelvin, immediately above its junction with the Clyde, and about three miles west-north-west of the Cross of Glasgow, of which city it now forms a suburb. Nine-tenths of the workmen of P. are engaged in shipbuilding, and there are numerous ship-building yards, flour-mills, cotton factories, and bleach-fields. A large proportion of the inhabitants are engaged in business in Glasgow, and for their accommodation extensive ranges of handsome villas have been built here. Pop. (1851) 3131; (1861) 8183; (1871) 17,707; (1881) 27,410.

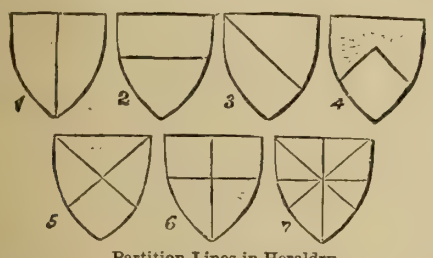
PARTI'NICO, SALA DI, a post-town of Sicily, in the province of Palermo, and 19 miles south-west of the city of that name, at the foot of a grand precipice of red limestone. The plain in the vicinity is of surpassing fertility; corn, wine, oil, fruit, and sumach are produced in rich abundance; and linen and woollen goods are manufactured. Pop. (1872) 20,154. Scattered vestiges of ancient habitations are still to be seen on the summit of the height above the town, and are said to be the ruins of the ancient *Parthenicum* mentioned in the *Itinerary* of Antoninus, and there only.

PA'RTISAN is a name for a halberd or pike, or for a marshal's baton. The name is also given to the leader of a detached body of light troops, who make war by harassing the enemy, rather than coming to direct fighting, by cutting off stragglers, interrupting his supplies, and confusing him by rapid strategy. The action of such a corps is known as *Partisan warfare.*

PARTI'TION, a thin interior wall dividing one apartment from another. It is usually of brick-work, 4½ or 9 inches thick, or of timber with standards about 4½ inches thick covered with lath and plaster. Wooden partitions are used when there is no sufficient support for brick. When these have to carry joists or any other weight, they ought to be constructed in the form of a truss (q. v.).

PARTITION, or PARTITURA, in Music. See SCORE.

PARTITION LINES, in Heraldry, lines dividing the shield in directions corresponding to the ordinaries. According to the direction of the partition lines, a shield is said to be party or parted per fess, per pale, per bend, per cheveron, per saltire; a



Partition Lines in Heraldry.

shield divided by lines in the direction of a cross, is said to be quartered; and a shield parted at once per cross and per saltire, is said to Gironné (q. v.) of eight. The partition lines are not always plain; they may be engrailed, invected, embattled, wavy, nebuly, indented, dancetté or raguly—forms which will be found explained under separate articles.

PA'RTNERSHIP, in the law of England, is the union of two or more individuals acting under a contract, whereby they mutually contribute their property or labor for the purpose of making profits jointly. When a partnership is confined to a particular transaction or speculation, it is usually called a joint-adventure, and the parties are joint-adventurers. The usual criterion by which a partnership is ascertained to exist, as distinguished from other arrangements, is that there is a community of profit; it is not essential that both should suffer losses equally or proportionably, for one partner may stipulate that he shall not be liable to loss. This stipulation is binding between the partners, but of course is insufficient to prevent the partners from being all liable to third parties. So one partner may contribute all the capital or all the labor. A dormant partner is one whose name does not generally appear to the world as a partner, but who nevertheless is to all intents and purposes a partner, with equal rights and liabilities to the rest. In order to constitute that kind of community of profit which is the chief ingredient in a partnership, it is necessary that the partner share in the profits as a partner; for in many cases, clerks, servants, or agents receive a commission or remuneration proportioned to profits, and yet are not partners, for this is merely one mode of ascertaining the salary which they are to receive. In all such cases, therefore, the distinction as to whether there is a partnership or not turns on the consideration whether the alleged partner receives a share of the profits, as such, or merely receives a salary proportioned to profits, without having a specific interest in the firm.

The contract of partnership may be entered into either by word of mouth or in writing. If no specified term be agreed upon, it is a partnership at will, and may be dissolved by either of the parties at pleasure. Sometimes, also, the Court of Chancery will interfere to dissolve the partnership before the time appointed; but this only happens when some unforeseen and urgent reason exists, as that one of the partners has become a lunatic, or has proved grossly dishonest, or the object of the partnership cannot be carried out. Mere differences of opinion on minor matters are no ground for seeking a dissolution. The partners may make any kind of arrangement between themselves that they think proper; but if these are unusual and special stipulations, there is no certainty of securing the same being adhered to, without a formal deed or indenture of partnership being executed. Thus, it is common to stipulate as to the capital each is to contribute, and as to the proportion of profits he is to receive, as to what is to be done in case of the death of a partner, &c. Unless a stipulation is made to the contrary, the rule is, that the death of one of the partners dissolves the partnership. So does his bankruptcy. It is also a rule that no new partner can be introduced without the consent of the rest. There was once a peculiarity in the law of England as to the form of remedy—the rule being, that partners cannot sue each other in a court of law in respect of partnership transactions, but the only remedy is by a bill in Chancery. As against third parties, whatever may be the secret arrangements between themselves, the rule is, that any partner can bind the firm in all matters which are within the scope of the partnership, each being by the nature of the contract made the agent of all the rest for business purposes. Thus, any one may accept a bill in the name of the firm, provided such be one of the modes of doing business.

It is, however, to be borne in mind, that the firm is only bound by one of the partners in those matters which are strictly within the proper business of the firm, which is an important qualification of the general power. Within the above limits, each partner can bind the rest of his copartners, however imprudent or foolish may be his act, for it is one of the implied conditions, that all have full confidence in each other. It follows from this principle, that the firm is liable for the dealings of each partner on its behalf within the scope of the partnership, and each is liable to the full extent for all the debts of the firm; in short, each is liable to his last shilling for the solvency of the firm. Hence, it is often of importance for a partner, on leaving the firm, to know how to terminate this liability. The rule is, that as regards all strangers, a notice in the *Gazette* is good notice: but as between the firm and those who have had dealings with it, the *Gazette* notice is of no use, unless it can be proved that the party had actual notice given to him—and hence a circular notice sent to customers announcing the fact of retirement, is the only course effectual.

The practice of individuals entering into large associations, now called joint-stock companies, which were originally only extended partnerships, has led to a separate code as to these being framed for the United Kingdom. See JOINT-STOCK COMPANIES. The practise of limiting the liability of partners or shareholders in joint-stock companies had of late years led to the belief, that a similar restriction might well be extended to ordinary partnerships, and accordingly a bill was introduced into parliament in 1864 to enable this to be done. But that view was not carried out except to a limited extent, though an attempt was made to simplify some of the rules as to partnership liability, which are somewhat perplexing. It had long been matter of complaint that every man who had a share of the profits of a trade was said to be liable also to bear his share of the loss; whereas by lending money at a fixed rate of interest he was a mere creditor, and could be exposed to no risk but the loss of his advance.

The House of Lords, however, in 1860, had held it to be a mistake to suppose that a person who advanced money on terms of sharing profits was necessarily a partner. To remove part of the difficulty, however, an act of 28 and 29 Vict. c. 86 was passed, which enacts that if advances are made by written contract to a person in trade on terms of sharing profits, that of itself will not make the lender a partner. Nor will the payment of a servant or agent by a share of profits, nor the receipt by a deceased partner's widow or child of part of the profits as annuity, make any of these a partner. But the benefit of this act was confined in most cases to written contracts, and thus the old law remains as to other cases. It is still the law that a person, not a partner, becomes liable as one, if he has either represented himself as a partner, or authorized another so to represent him; and the third person dealing with the firm must have known this representation to enable him to hold the dormant partner liable. In 1870, a bill was passed 'to facilitate compromises and arrangements between

creditors and shareholders of joint-stock and other companies in liquidation,' but these points do not call for notice here.

In Scotland, the law of partnership, though in its essential features the same with the law of England, differs in one or two particulars. The partnership is treated as a distinct person in law, the partners being only its sureties or cautioners; and the consequence of this is, that in actions by or against the firm, the individual partners need not be named, though in practice one or two of them generally are named. Each partner may also sue the firm as if it were a distinct person; and the firm may be made bankrupt without any of the partners being sequestrated. See Paterson's *Comp. of E. and S. Law*, p. 214.

PA'RTRIDGE (*Perdix*), a genus of gallinaceous birds, of the family *Tetraonidæ*, having a short, strong bill, naked at the base; the upper mandible convex, bent down at the tip; the wings and tail short, the tarsi as well as the toes naked, the tarsi not spurred.—The COMMON P., or GRAY P. (*P. einerea*), is the most plentiful of all the game-birds in Britain, and becomes increasingly plentiful as cultivation is extended, whilst the range of the moorfowl is restricted. It is not found in the Outer Hebrides. On the continent of Europe, it is abundant in almost all districts suitable to its habits, from Scandinavia to the Mediterranean, and is found also in the north of Africa, and in some parts of the west of Asia. It varies considerably in size; those found in rich lowlands being generally the largest, and about 12½ inches in entire length; whilst those which inhabit poorer and more upland districts are rather smaller. The female is rather smaller than the male. The upper parts of both are ash-gray, finely varied with brown and black; the male has a deep chestnut crescent-shaped spot on the breast, which is almost or altogether wanting in the female. A variety called the Mountain P. has the plumage brown. The P. is seldom found far from cultivated land. It feeds on grain and other seeds, insects and their larvæ and pupæ, and the pupæ of ants are generally the food sought at first for the young. The nest is usually on the ground, among brushwood and long grass, or in fields of clover or corn, and generally contains from twelve to twenty eggs. The young run as soon as they are hatched. Both parents show a very strong attachment to their young, and great courage in repelling assailants; they have also recourse, like many other birds, to stratagem, to draw off the most powerful and dangerous enemies, such as dogs, in another direction, fluttering close before them as if broken-winged, whilst the brood escape. Until the end of autumn, the parent birds and their broods keep together in a *covey;* late in the season, several coveys often unite into a *pack*, when it becomes much more difficult for the sportsman to approach them.

The flight of the P. is strong and rapid for a short distance, but it does not seem to be capable of a long-sustained flight. The eggs of partridges are often hatched, and the young birds reared, by the domestic hen, the chief requisite being a plentiful supply of ants when the birds are very young. Partridges thus reared become very tame, but they seldom breed in the aviary.—The RED-LEGGED P. (*P. rufus*, or *Caccabis rufus*, the genus or subgenus *Caccabis* being distinguished by a rudimentary blunt spur on the tarsi) is a native of the south of Europe and of the Channel Islands, and is now also plentiful in some parts of England, particularly Norfolk and Suffolk, into which it has been introduced. It is rather larger than the Common P., stronger on the wing, and less easily approached by the sportsman, whilst it is also less esteemed for the table. The upper parts are of a reddish-ash color; the throat and cheeks white, bounded by a collar of black, which expands in black spots on the breast; and the sides exhibit bars of black. The plumage is smooth.—Two other species, nearly allied to this, are found in some of the southern parts of Europe. India has a number of species. The habits of all the species much resemble those of the Common Partridge.—The name P. is sometimes extended so as to include the species of *Ortyx* (see VIRGINIAN QUAIL), and in South America is sometimes given to the Tinamous.

PARTRIDGE BERRY. See GAULTHERIA.

PARTRIDGE PIGEON (*Geophaps*), an Australian genus of *Columbidæ*, approaching more than most of the pigeons, in character and habits, to the true gallinaceous birds and particularly to partridges. Their plumage is beautiful, and generally with a bronze tinge and lustre on the wings, which causes them to be sometimes called Bronze-wings. There are several species. They live mostly on the ground, and rise with a whirring noise, like the pheasant, when disturbed. They are highly esteemed for the table.—*Geotrygon montana*, a species of another genus of *Columbidæ*, bears the name of PARTRIDGE DOVE in the West Indies. It also seeks its food chiefly on the ground, although it affects well-wooded districts.

PARTRIDGES, in Artillery, were very large bombards formerly in use at sieges and in defensive works. They are mentioned in Froissart.

PARTRIDGE-WOOD, a very pretty hard-wood from the West Indies and Brazil; it is usually of a reddish color, in various shade from light to dark, the shades being mingled in thin streaks; but in some choice sorts they are curled upon one another so as to resemble the feathers of the partridge, whence its name. One variety occurs in which the colors are remarkably bright, and it is consequently called Pheasant-wood. In Brazil, this beautiful wood is so plentiful that it is employed in ship-building, and it is said to be used in our navy-yards under the name of Cabbage-wood, but this is doubtful; many woods are known as partridge, and several as cabbage-wood. Among the Brazilians, it is called 'Angelim,' and they describe four sorts—*Angelim de pedra* (the Stone Angelim), *A. vermelho* (Red Angelim), *A. amargoso* (Bitter Angelim), and *A. varzea* (Cultivated Angelim). Its chief use in this country is for cabinet-work, Tunbridge-ware, parasol-sticks, fans, and other small matters for which its beauty recommends it. It is said to be yielded by the leguminous tree (*Andira inermis*), which is found not only in the Brazils, but in other parts of South America and the West Indies.

PARTS OF SPEECH are the several kinds or classes into which the words of a language are divided. There is nothing in the outward form of words that would enable us to divide them into classes. The distinction lies in the *offices* that the several words perform in a sentence (q. v.). All words performing the same office in sentences belong to the same class. The essential parts of speech are the Noun, Adjective, Pronoun, Verb, Adverb, Preposition, Conjunction (see these several heads). The Articles (q.v.) are not distinct parts of speech, being essentially pronouns; and Interjections (q. v.) hardly belong to articulate speech. To name the class or part of speech to which each word of a sentence belongs, is called to *parse* it.

PARTURI'TION. See MIDWIFERY.

PARTY, in Heraldry. See PARTITION LINES.

PARTY-WALL is the wall dividing two houses or tenements, and which is, in a certain sense, one and indivisible, though the property of two or more parties. The question as to who is the owner of any particular part of the party-wall, is solved by ascertaining who is the owner of the soil on which it is built. In the absence of evidence to the contrary, it is presumed that half of the soil belongs to the owner on one side, and the other half to the owner of the other side; and unless the wall has stood twenty years and upwards, each owner can do what he likes with his own half, and can pare it away if he likes. But in general, mutual interest prevents each party from resorting to his strict legal rights. A practice exists for one who builds a house adjoining the wall of a neighbor, to pay for half the expense. In Scotland, a party building close to the wall of another's house, can compel the owner of the first house to give him half of the wall or gable, on paying half the expense; while in England there is no such compulsion.

In Scotland, where the practice exists of building houses in flats lying each upon the other, the law is not clearly settled, and requires to be cleared up as to what is the nature of the property or interest which each proprietor of a flat has in that part of the gable bounding his own flat. The better opinion is, that each is the entire owner of his half of the gable, the others having merely cross servitudes; and hence it follows, that if the flats on both sides of a gable belong to one owner, he can make a communication through the gable, provided he do not injure the chimney-flues of the lower flats, or the stability of the structure.

PARVATI (from the Sanscrit *parvata*, mountain, literally, mountain-born) is one of the names by which Durgâ, the consort of S'iva, is usually called, she being the daughter of the mountain Himalaya.

PA'RVISE, a porch or open space in front of the door of a church.

PASCAGOU'LA, a river, and bay at its mouth, in Mississippi, U. S. The river, formed by the junction of the Leaf, the Chickahay, with numerous branches, drains the south-eastern portion of the state, and flows into Mississippi Sound through two mouths which form the bay. It is navigable 100 miles through a sandy region of pine-forests, supplying turpentine. The villages on the bay are summer resorts from Mobile and New Orleans; and on the shores at night are heard sounds like the Æolian harp, supposed to be caused by some kind of shell-fish.

PASCAL, BLAISE, one of the most distinguished philosophers and scholars of the 17th c., was born at Clermont, in Auvergne, France, June 19, 1623. His father, Etienne Pascal, was president of the Cour des Aides at Clermont. His mother, Antoinette Bezon, died while he was little beyond infancy. He had two sisters—the elder, Gilberte, Madame Perier, afterwards his biographer; the younger, Jacqueline, who became a nun of Port Royal, under the celebrated Mère Angelique, sister of Antoine Arnauld.

From childhood, Blaise gave evidence of extraordinary abilities; and when he reached his eighth year, his father resigned his office at Clermont, and came to Paris, in order personally to direct the boy's education. For the purpose of concentrating all the boy's efforts upon languages, his father kept out of his reach all books treating the subject of mathematics, for which he had early evinced a decided taste; and it is recorded that by his own unaided speculations, drawing the diagrams with charcoal upon the floor, he made some progress in geometry. One account represents him as having thus mastered the first thirty-two propositions of the first book of Euclid's *Elements*—a statement which carries its own refutation with it. Thenceforward, he was permitted freely to follow the bent of his genius. In his sixteenth year, he produced a treatise on Conic Sections, which extorted the almost incredulous admiration of Descartes. In his nineteenth year, he invented a calculating-machine; and turning his attention to the novel questions as to the nature of fluids, which Torricelli's theories had raised, he produced two essays, which, although not published till after his death, have established his reputation as an experimental physicist. His father having accepted an office at Rouen, P. was there brought much into intercourse with a distinguished preacher, Abbé Guillebert, a member of the Jansenists, but a man of great eloquence, a great master of ascetic theology, from whom and from other members of the same rigid sect, as well as from the writings of Arnauld, St. Cyran, and Nicole, P.'s mind received a deeply religious turn; and his health having suffered much from excessive study, he gave himself up in great measure to retirement and theological reading, and to the practice of asceticism. The death of his father, and his sister Jacqueline's withdrawal to Port Royal, confirmed these habits; and it is to this period that we owe his magnificent though unfinished *Pensées*, which have extorted the admiration even of his unbelieving, and therefore unsympathizing critics.

Having fully identified himself with the Jansenist party, he was induced (1655) to take up his residence at Port Royal, although not as a member of the body, where he resided till his death, entirely given up to prayer and practices of mortification, among which practices may be mentioned that of wearing an iron girdle, studded with sharp points, which he forced into his flesh whenever he felt himself assailed by sinful thoughts. In the controversy to which the comdemnation of Arnauld by the Sorbonne (1655) gave rise, P. took a lively interest; and it was to this controversy that he contributed the memorable *Lettres Provinciales*, published under the pseudonym of Louis de Montalt. These famous Letters (eighteen in number, not reckoning the nineteenth, which is a fragment, and the twentieth, which is by Lemaistre), are written, as if to a provincial friend, on the absorbing controversial topic of the day. The first three are devoted to the vindication of Arnauld, and the demonstration of the identity of his doctrine with that of St. Augustine. But it was to the later letters that the collection owed both its contemporary popularity and its abiding fame. In these P. addresses himself to the casuistry and to the directorial system of Arnauld's great antagonists, the Jesuits; and in a strain of humorous irony which has seldom been surpassed, he holds up to ridicule their imputed laxity of principle on the obligation of restitution, on simony, on probable opinions, on directing the intention, on equivocation and mental reservation, &c. In all this, he professes to produce the authorities of their own authors. Of the extraordinary ability displayed in these celebrated Letters, no question can be entertained; but the Jesuits and their friends loudly complain of their unfairness, and represent them as in great part the work of a special pleader. The quotations, with the exception of those from Escobar, were confessedly supplied by P.'s friends.

It is complained that many of the authors cited are not Jesuits at all; that many of the opinions ridiculed and reprobated as opinions of the Jesuit order, had been in reality formally repudiated and condemned in the Society; that many of the extracts are garbled and distorted; that it treats as though they had been designed for the pulpit and as manuals for teaching, works which in reality were but meant as private directions of the judgment of the confessor; and that, in almost all cases, statements, facts, and circumstances are withheld, which would modify, if not entirely remove, their objectionable tendency. See JESUITS. To all which the enemies of the Jesuits reply by arguments intended thoroughly to vindicate Pascal. P. himself entertained no compunctious feeling for the production of these Letters, but even at the approach of death declared his full satisfaction with the work, such as it was. His later years were made very wretched by continued, or at least frequently recurring hypochondria, under the influence of which he suffered from very painful fantasies, which he was unable to control. His strength was completely worn out by these and other infirmities, and, permaturely old, he died at the early age of thirty-nine in Paris, in the year 1662. His *Pensées sur la Religion, et sur quelques autres Sujets*, being unfinished, were published with suppressions and modifications in 1669; but their full value was only learned from the complete edition which was published at the instance of M. Cousin (Paris, 1844). Of all his works, the *Lettres Provinciales* have been the most frequently reprinted. They were translated into Latin in the lifetime of P. by Nicole, under the pseudonym of a German professor, 'Wilhelm Wendroc;' and an edition in four languages appeared at Cologne, in 1684.

PASCHAL. See PASSOVER.

PA'SCO, or CE'RRO DE PASCO, an important mining city in Peru, in the department of Junin, stands at an elevation of about 14,000 feet above sea-level, 80 miles north-east of Lima, in a direct line, but upwards of 130 miles by the winding mountain road. It consists of a collection of huts spread over an area that has been hollowed out and perforated in all directions by mines. The number of the inhabitants varies according to the state of the mines; being sometimes considerably more than 12,000 and often much less. It possesses a journal of literature and mining. The Cerro, or 'mountain knot,' of Pasco rises, in Sacshuanata, 16,000 feet above the level of the sea. Coal is found.

PAS-DE-CALAIS (Fr. for Strait of Dover), a department in the north of France, bounded on the N. by the department of Nord and the Strait of Dover, and on the W. by the Strait of Dover and the English Channel. Area, 2540 square miles, of which 883,300 acres are cultivated, and 236,707 in meadows. Pop. (1880) 819,022. The surface is level, with the exception of a ridge of hills running from the south-east to the north-west, ending in Gris-nez Cape (q. v.), and forming the water-shed between the North Sea and the English Channel. The rivers, which are of no considerable length, are the Scarpe and Lys in the basin of the North Sea, and the Authie and Canche belonging to the basin of the English Channel. The rivers are navigable within the department, and are connected by canals. The coast-line is 80 miles in length, and the shores are in certain parts low and sandy; while for several miles on either side of Gris-nez, cliffs similar to those of Dover front the sea. The climate is mild, but exceedingly inconstant. The soil is very fertile—all the usual cereal and leguminous crops are produced in abundance—and the country is very productive both as regards agriculture and manufactures. Fishing is actively carried on, on the coast particularly in the neighborhood of Boulogne. Coal of an indifferent quality is raised, the excellent quarries of the department are worked, and considerable quantities of turf are cut.

The industrial establishments are numerous and important, as iron-foundries, glass-works, potteries, tanneries, and numerous bleach-works, and mills and factories of various kinds. Boulogne and Calais are the principal harbors. There are six arrondissements—Arras, Béthune, St. Omer, St. Pol, Boulogne, and Montreuil. The capital is Arras.

PASENG. See GOAT.

PA'SEWALK, a town of Prussia, in the government of Stettin, 25 miles west-north-west of the city of that name, on the Uker. It contains two churches, two hospitals, and several woollen-cloth and leather factories; and carries on an active general trade. Pop. (1880) 9469.

PASHA', or PACHA, a title used in the Ottoman empire, and applied to governors of provinces, or military and naval commanders of high rank. The name is said to be derived from two Persian words—*pa*, foot or support, and *shah*, ruler—and signifies 'the support of the ruler.' The title was limited in the early period of the Ottoman empire to the princes of the blood, but was subsequently extended to the grand-vizier, the members of the divân, the seraskier, capitan-pasha, the begler-begs, and other civil and military authorities. The distinctive badge of a pasha is a horse's tail, waving from the end of a staff, crowned with a gilt ball; in war, this badge is always carried before him when he goes abroad, and is at other times planted in front of his tent. The three grades of pashas are distinguished by the number of the horse-tails on their standards; those of the highest rank are pashas of three tails, and include, in general, the highest functionaries, civil and military. All pashas of this class have the title of vizier; and the grand-vizier is, *par excellence*, a pasha of three tails. The pashas of two tails are the governors of provinces, who generally are called by the simple title 'pasha.' The lowest rank of pasha is the pasha of one tail; the sanjaks, or lowest class of provincial governors, are of this rank.

The pasha of a province has authority over the military force, the revenue, and the administration of justice. His authority was formerly absolute, but recently a check was imposed on him by the appointment of local councils. The pasha is in his own person the military leader and administrator of justice for the province under his charge, and holds office during the pleasure of the sultan—a most precarious tenure, as the sultan can at any moment, in the exercise of his despotic power, exile, imprison, or put him to death; and this has frequently been done in cases where the pasha's power has excited the apprehension, or his wealth the avarice of his royal master.

PASKEVITCH, Ivan Feodorovitch, Count of Erivan, Prince of Warsaw, and a Russian field-marshal, was born at Poltava, May 19, 1782. He was descended from a Polish family, and was at first a page to the Czar Paul, but entered the army, and served in the campaign in 1805, which was ended by the defeat of Austerlitz; and then against the Turks. He took a prominent part in the campaign of 1812, and several times defeated the French under Eugène, Ney, and St. Cyr; he was also present at Leipzig and the conflicts under the walls of Paris. In 1825, he was appointed commander-in-chief against the Persians, whom he completely defeated, conquering Persian Armenia, taking Erivan, and ending the war by the peace of Turkmanshai (q. v.), a peace exceedingly favorable to Russia. In recompense for these services, he was created Count of Erivan, and received a grant of 1,000,000 rubles (£158,600). In 1828 and 1829, he made two campaigns against the Turks in Asia, signalized by the taking of Kars, Erzerum, and other important provinces, and terminated by the treaty of Adrianople in 1829.

In 1831, P., now a field-marshal, was appointed viceroy of Poland, put an end to the revolt within three months after his appointment, and reconstructed the administration on the basis of a complete incorporation with Russia. Such was the vigor and severity of his rule, that the eventful year 1848 passed over without any attempt at revolution. When Russian intervention in Hungary had been resolved upon, P., though now 67 years of age, marched into that country at the head of 200,000 men, and, after a junction with the Austrians, defeated the Hungarians in several battles, and by mere force of numbers crushed out the last spark of insurrection. The 50th anniversary of his military service was celebrated at Warsaw, in 1850, with the utmost rejoicings, and on this occasion the sovereigns of Austria and Prussia conferred on him the rank of field-marshal in their respective armies. In 1854, he unwillingly took the command of the Russian army on the Danube; but fortune, which had hitherto invariably smiled upon him, deserted him at Silistria; and after undergoing a succession of sanguinary repulses, and being himself grievously wounded, he withdrew his army, and resigning the command, retired to Warsaw, where he fell into a state of profound melancholy, and died January 29, 1856.

PA'SMA is the name given to a non-officinal healing-powder, which is regarded as very serviceable in burns, ulcers, excoriations, &c. It is composed of 30 parts of silica, 12 of magnesia, 6 of alumina, 2 of protoxide of iron, and 50 of starch from the olgra root.

PA'SPALUM, a genus of grasses, with spikes either solitary or variously grouped, one-flowered spikelets, and awnless paleæ. The species are numerous, natives of warm climates.—*P. scrobiculatum* is cultivated as a cereal in India, where it is called Koda. See Millet. It will grow in very barren soils, and delights in a dry loose soil. *P. exile* is cultivated in like manner in the west of Africa, where it is called Fundi (q. v.) or Fundungi.—Other species are valuable as fodder-grasses. *P. purpureum* is a very important fodder-grass in the coast districts of Peru, during the dry months of February and March. *P. stoloniferum*, also a Peruvian species, has been introduced into France; but is apt to be injured by frosts, and seldom ripens its seeds in the neighborhood of Paris.

PASQUE FLOWER (*Pulsatilla*), a genus of plants of the



Pasque Flower (*Anemone pulsatilla*).

natural order *Ranunculaceæ*, by many botanists still included in *Anemone*, the chief distinguishing characteristic being the long feathery awns of the fruit. The species are perennial, silky, herbaceous plants, with doubly pinnatifid or doubly trifid leaves, and a simple one-flowered scape. They are narcotic, acrid, and poisonous. The Common P. (*Pulsatilla vulgaris* or *Anemone pulsatilla*) is a native of many parts of Europe, and of chalky pastures in several parts of England. It has widely bell-shaped bluish-purple flowers. Another species, *P.* or *A. pratensis*, a native of the continent of Europe, not of Britain, has smaller and more perfectly bell-shaped blackish-purple flowers.—These plants emit, when bruised, a pungent smell; and contain, as their principal constituent, a peculiar pungent essential oil, which, in combination with *Anemonic Acid*, forms an acrid and very inflammable substance called *Anemonine*, or *Pulsatilla Camphor*, and is sometimes used in medicine. *Pulsatilla* is a favorite medicine of the homœopathists. *Easter Eggs* are colored purple in some places by the petals of the pasque flower.—More acrid than any of the species just named is *Pulsatilla patens*, which occasionally even blisters the skin.

PASQUINA'DE, an anonymous or pseudonymous publication of small size, sometimes printed, sometimes only posted up or circulated in manuscript, and having for its object the defamation of a character, or at least the turning of a person to ridicule. The name is derived from *Pasquino*, a tailor remarkable for his wit and sarcastic humor, who lived in Rome towards the close of the 15th c., and attracted many to his shop by his sharp and lively sayings. Some time after his death, a mutilated fragment of an ancient statue, considered to represent Menelaus supporting the dead body of Patroclus, was dug up opposite his shop, and placed at the end of the Braschi Palace, near the Piazza Navoni. It was named after the defunct tailor, and thus the practice originated of affixing to it placards containing satires and jests relative to the affairs of the day—the pope and the cardinals being favorite victims of the invisible satirists. It till recently continued to be the only outlet which the Roman had for his opinions and feelings. One or two may be quoted as specimens of the mordant style of the Pasquin statue. 'Great sums,' said the satirist one day, in an epigram addressed to Pope Paul III., 'were formerly given to poets for singing; how much will you give me, O Paul, to be silent?'—On the marriage of a young Roman called Cesare to a girl called Roma, the statue gave the following advice: 'Cave, Cæsar, ne tua Roma respublica fiat.' Next day the rival statue of Marforio, in the Capitol, replied: 'Cæsar imperat;' to which Pasquin with exquisite malice retorted: 'Ergo coronabitur.'

PA'SSAGE, West, a seaport town upon the western shore of the estuary of the river Lee, in the county of Cork, Ireland, which has risen into importance chiefly as a watering-place, and as the shipping-port and marine suburb of the city of Cork, from which it is distant, by the Cork and Passage Railway, about 6 miles. As the river above P. is not navigable for ships above 400 or 500 tons burden, ships of higher tonnage discharge their cargoes at Passage. It is also a ship-building station. Pop. 2440, about four-fifths of whom are Catholics. The rest belong mainly to the Protestant Episcopal Church, other denominations being sparsely represented.—There is another small town of the same name, East Passage, near the mouth of the Suir, in the county of Waterford; pop. (1881) 688.

PASSAGLIA, Carlo, a Roman Catholic theologian of great eminence, who has obtained much notoriety in connection with the recent movement for the unity of Italy, is a native of the duchy of Lucca, where he was born May 2, 1812. His origin is very humble, and he entered extremely young as a scholar of the Jesuit Society, of which he was enrolled a member in the year 1827. Having obtained much distinction in the schools of the order, and having, as is usual with its members, taught for some time in the lower schools, he completed his theological studies in the Roman College, and was appointed Professor of Canon Law, and eventually of Dogmatical Theology. His reputation for learning stood in the very first rank of Roman Catholic theology, and his lectures were exceedingly admired for their eloquence and erudition, but were considered in some respects too diffuse for the class of pupils who frequented his school. During the temporary withdrawal of the Jesuits from Rome in 1848—1851, P. with some of his brethren came to England, where he taught theology to the young brethren of his order, and on the re-establishment of the Jesuits in the Roman College, he resumed possession of his chair.

During the discussions which preceded the definition of the doctrine of the Immaculate Conception of the blessed Virgin Mary (q. v.), P. published an elaborate treatise on the doctrine and history of that question, which was published at the cost of the Roman government. Soon afterwards, however, the dissatisfaction which was expressed at the unsuitable character and method of his lectures by the authorities of the order led to his resignation of the professorship of theology. Still, however, he continued a member of the Society; and the pope, who felt a warm

friendship for him, established in the Roman university a special chair of Philosophy for him, which he did not long retain. In 1858 or 1859, he left the Society of the Jesuits, and entered warmly into the discussions as to the temporal power of the pope, in connection with which he undertook a voluntary mission to Turin, which, however, led to no results. Having fallen under suspicion in Rome, and his house having been invaded by a domiciliary visit of the police, he withdrew from that city to Turin, where he established a journal entitled *Il Mediatore*, which appeared till 1866. He was appointed by the king professor of moral philosophy, and subsequently of theology in the university of Turin. In 1863 he became a member of the Turin parliament, but his success fell far short of his reputation. He is said to have sought reconciliation with the Church, but to have failed to make the required retraction.

P.'s principal works are the treatise on the Immaculate Conception already referred to (4 vols. 4to); a treatise (Latin) on the Primacy of St. Peter (8vo, 1850); a Scholastic treatise entitled *Commentarius Theologicus de Partitione Divinæ Voluntatis* (8vo, Rome, 1851), an apology for the cause of Italian unity, entitled *Pro Caussa Italica; ad Episcopos Catholicos* (Florence, 1861), in which he recommends the church to make peace with the nation; several essays on religious and political subjects, and recently a learned and very detailed Reply to Renan's *Vie de Jesus* (Italian).

PASSA'IC, a river of New Jersey, U. S., rises in Morris County, and after a circuitous south-easterly course of 90 miles, empties into Newark Bay. It is navigable for sloops for a short distance; and its falls of 72 feet at Patterson, furnish water-power to numerous factories, and are an attraction to tourists.

PASSAMAQUO'DDY BAY opens out of the Bay of Fundy, between Maine and New Brunswick, North America. It is 12 miles long by 6 wide, and shut in by a cluster of islands so as to form an excellent harbor. It receives the St. Croix, Didgequash, and other rivers, and forms the harbor of the flourishing town of Eastport. The bay abounds in fish, and has tides of 25 feet.

PA'SSANT, a heraldic term used to express the attitude of an animal in a walking position, with his head straight before him



1 2 3

(fig. 1); fig. 2 represents the attitude, *Passant gardant;* fig. 3, *Passant regardant.*

PASSA'ROWITZ, or POSHAREWATZ (Servian *Pozarevaz*), a town in the principality of Servia, 5 miles south of the Danube. Its streets are wide and unpaved, its houses detached, and surrounded with palisades. Pop. (1874) 7829. The town is chiefly noteworthy for the treaty which was signed here by Prince Eugene and the grand vizier, July 21, 1718. By this treaty, which put an end to the war undertaken by the Turks against Venice in 1714 for the conquest of the Morea, a truce of 25 years was established, and the Banat of Temesvar, the western portion of Walachia and Servia, the town and territory of Belgrade, and a part of Bosnia, were secured to the House of Austria.

PA'SSAU, an ancient, picturesque, frontier town of Bavaria, at the confluence of the Inn and the Ilz with the Danube, 90 miles east-north-east of Munich. It consists of P. Proper (triangular in shape, and occupying an eminence on the tongue of land between the right bank of the Danube and the left bank of the Inn), and the suburbs, Innstadt, on the right bank of the Inn; Anger and Fort Oberhaus, between the Danube and the Ilz; and Ilzstadt, on the left bank of the Ilz. At the point of junction, the Inn is both wider and has had a longer course than the Danube, the former being 834 feet; while the latter is only 696 feet wide. The railway bridge and another iron bridge on eight piers of granite, connect Innstadt with P., and the Danube is crossed by a fine bridge resting on seven piers, also of granite. Fort Oberhaus, on the left bank of the Danube, stands on steep, wooded cliffs, at an elevation of upwards of 400 feet, and is connected with the castle of Niederhaus by old walls; both are now used as prisons for criminals from the upper classes and military offenders. The appearance of P., situated at the confluence of two great rivers, and rising like an amphitheater on the most beautiful spot of the Danube, is strikingly effective and picturesque. Among the chief buildings are the cathedral, the bishop's palace, the post-office, where the treaty of P. was signed in 1552; the Jesuits' College, a large building, now used as a school; and the Church of St. Michael's. In the Cathedral Square (Domplatz) is a bronze statue of King Maximilian Joseph, erected in 1828. P. contains also numerous picture-galleries, collections of antiquities, and benevolent and charitable institutions. The women of P. are famous for their beauty. Pop. (1875) 14,752; (1880) 15,365.

The natural advantages of this site, in a military point of view, were appreciated at an early period by the Romans, who erected a strong camp here, garrisoned it with Batavian troops, and from this circumstance named it *Batava Castra.* P. was long the seat of an independent bishopric founded in the 7th c., but secularized in 1803. By the treaty of P., signed here in 1552 by the emperor Charles V. on the one side, and the Protestant princes of Germany on the other, public recognition of the Lutheran faith among the institutions of the empire was granted. The cathedral of P. and great part of the town were consumed by fire in 1662.

PASSECAILLE AND PASSEPIED, two old French dances, the music of the former being in $\frac{3}{4}$, the latter in $\frac{6}{8}$ time. Compositions under these names, suggestive of the dances in question, though not meant for dancing, occur among the 'Suites,' or collections of short pieces for the harpsichord or clavichord by Sebastian Bach and Handel.

PA'SSENGER PIGEON (*Ectopistes migratorius*), a species of pigeon, native of North America, and particularly interesting from the marvelous numbers of which its flocks are often composed. The genus to which it belongs has, like the turtle doves, a bill more slender than the ordinary pigeons, notched, and with a tumid fleshy covering above at the base; the head is small in proportion to the body, the legs are short and strong, the feet naked, the tail either rounded or wedge-shaped, the wings long and pointed.

The P. P., generally known in North America as the Wild Pigeon, has a long wedge-shaped tail; the whole length being from 15 to 17 inches, of which the tail occupies nearly one half. It is a beautiful bird, of very graceful form and finely-colored plumage. The plumage of the female is duller than that of the



Passenger Pigeon (*Ectopistes migratorius*).

male.—The P. P. is found in almost all parts of North America, from the Gulf of Mexico to the Arctic regions. It is not, properly speaking, a bird of passage; its migrations being apparently altogether consequent on the failure of the supplies of food in one locality, and the necessity of seeking it in another, and not connected with the breeding season or the season of the year. Its power of flight is very great, and it is supposed to be able to sustain a long flight at the rate of sixty miles an hour. Passenger pigeons have been killed in the neighborhood of New York, with their crops full of rice, which they must have collected in the fields of Carolina or Georgia not many hours before. It is not, therefore, very wonderful that wanderers of this species should occasionally appear in Britain and in other regions far from their native abode. The nest of the P. P. in the American forests generally consists of a few dry twigs placed in a fork of the branches of a tree, and containing two eggs, sometimes only one egg. They breed two or three times in a season. In the backwoods, vast numbers of pigeons building in one breeding-place, many nests, sometimes 100 or more, are often to be seen in one tree. These great breeding-places extend over a vast tract of forest, sometimes not less than forty miles in length; but in the more cultivated parts of the United States the P. P. builds singly and not in communities.

The numbers of birds forming the communities of the western forests surpass calculation. Flocks of them are to be seen flying at a great height in dense columns, eight or ten miles long; and there is reason to suppose, from the rapidity of their flight, and the number of hours taken by a column in passing a particular spot, that in some of their great migrations the column, a mile broad, is more than 150 miles long. Their roosting-places, as

well as their breeding-places, are of prodigious magnitude. The graphic descriptions of Wilson and Audubon are too long to be quoted; but there is perhaps nothing of the kind so wonderful in relation to any species of bird. The noise of wings and of cooing voices is as loud as thunder, and is heard at the distance of miles. It drowns the report of guns. The multitudes which settle on trees, break down great branches by their weight, so that it is dangerous to pass beneath. They crowd together, alighting one upon another, till they form solid masses like hogsheads, and great numbers are killed when the branches break. The inhabitants of the neighboring country assemble, shoot them, knock them down with poles, stifle them by means of pots of burning sulphur, cut down trees in order to bring them in great numbers to the ground, eat them, salt them, and bring their hogs to fatten on them. Wolves, foxes, lynxes, cougars, bears, raccoons, opossums, polecats, eagles, hawks, and vultures all congregate to share the spoil. The flesh of the P. P. is of a dark color, but tolerably pleasant. That of young birds is much esteemed. The nestlings are in general extremely fat, and are sometimes melted down for the sake of their fat alone. The food of the P. P. consists chiefly of beech-mast and acorns, but it readily eats almost any kind of nut, berry, or seed.

PASSENGERS BY LAND AND SEA. The law affecting passengers by land, in a carriage or public conveyance, may be stated as follows: The owners of the railway or other carriage do not contract to carry the passenger with perfect safety; they do not warrant that he will not be injured; but they merely contract to carry him without any negligence on their part. Hence, in case of accident, though it is not strictly correct in point of law to assume that the accident arose from some negligence of the carrier, unless there is evidence to support it, this presumption is in point of fact always made, and it lies on the carrier to show that it was from no fault or negligence on his part that the accident happened. As questions of negligence must almost always be decided by a jury, and their prepossessions are against admitting the idea that accidents arise from any cause except negligence of the carrier—which is a wholesome doctrine—it seldom ever happens that a railway or public company attempt to dispute their responsibility on that ground. The rule is that a railway company is responsible for the negligence of any of their servants; and hence, in case of accidents, all passengers injured, and in case of death, the parent, husband, wife, or children of the deceased passenger, invariably make a claim of compensation, except when the accident was caused by the passenger's own personal negligence. For while a carrier is bound to use due care to carry the passenger with safety, it is equally true that the passenger is at the same time bound to take ordinary care of himself, and not act in a rash or foolish way, so as to lead to an accident. Before railways and canals were in use, it was sometimes doubted whether it was not the duty of carriers by coach to carry all persons who presented themselves and offered to pay their fare; but this notion is exploded, and even railway companies are not bound to carry everybody who comes, but merely to give reasonable accommodation to the ordinary number, otherwise their liability would be enormous on particular occasions where crowds assemble. Their interest is usually a sufficient inducement on such occasions to provide the accommodation required. A passenger has a right to carry along with him Luggage (q. v.).

In the case of passengers by sea, a peculiar code has been constructed, owing to the peculiarity of their situation. The fundamental rule of the common law is the same as on land carriage—that the carrier by sea does not engage to carry with absolute safety, but merely to omit nothing in his power, and to use due care. The legislature, however, has passed statutes to regulate the duties of carriers by sea, so as to secure due care; and their minute and detailed regulations apply to every sea-going vessel, whether British or foreign, carrying more than fifty passengers. Payment of the passage money must be made before commencing the voyage, and the owners are not bound to forward steerage passengers by the very ship contracted for, if an equally eligible ship be offered, provided, however, that families are not to be separated. If the ship is disabled on the voyage, the owners are bound to repair the ship in six weeks, or send on the passengers. If the passengers exceed 300, a medical practitioner must be on board, and the provisions must be according to a certain scale of diet. The Emigration Commissioners require to inspect emigrant ships, and to give a certificate as to fitness. As to passenger steamers in this country, a certificate is required from the Board of Trade, specifying the voyage and number of passengers allowed to be carried, and their survey, once every year.

PA'SSERINE BIRDS. See INSESSORES.

PASSING-BELL, a bell tolled during the death agony of a dying person, at the moment of the soul's 'passing' from earth to its eternal abode. Its use in Catholic countries is to invite the hearers to join in the prayers which are ordered for the dying in their 'hour of agony,' and which the priest with his attendants recite in the death chamber. See BELL.

PASSING-NOTES, in Music. In passing from one chord to another, an intervening note, not belonging to either chord, may be used to assist the progression. Such a note is called a passing-note or note of transition, as the notes D and F in the upper part of the subjoined example:



PA'SSION CROSS, a cross of the form on which our Saviour suffered, with a long stem and a short traverse near the top. It is of occasional occurrence as a heraldic charge, though less frequent than many other varieties of cross. A passion cross, when elevated on three steps or degrees (which have been said by heralds to represent the virtues of Faith, Hope, and Charity), is called a Cross Calvary.



Passion Cross.

PASSIONFLOWER (*Passiflora*), a genus of plants almost exclusively natives of the warm parts of America, and belonging to the natural order *Passifloraceæ;* an order of exogenous plants, of which more than 200 species are known, mostly climbers, having tendrils which spring from the axils of the leaves, herbaceous or half shrubby, natives of tropical and subtropical countries, but rare in Asia and Africa. The leaves of the *Passifloraceæ* are alternate, simple, and variously lobed. The flowers are generally



Passionflower (*Passiflora cærulea*).

hermaphrodite, with a colored calyx, generally of five segments; the segments of the corolla equal in number to those of the calyx or absent, and several rows of filamentous processes springing from within the cup which is formed by the consolidated calyx and corolla; the stamens, generally five, and generally united by their filaments, inserted at the base of the tube of the calyx; the ovary free, generally elevated on a long stalk, one-celled; three thick styles with dilated stigmas; ovules numerous. The fruit is either fleshy or capsular. In the Passionflowers it is fleshy. This genus has received its name from fanciful persons among the first Spanish settlers in America, imagining that they saw in its flowers a representation of our Lord's passion; the filamentous processes being taken to represent the crown of thorns, the nail-shaped styles the nails of the cross, and the five anthers the marks of the wounds. The species are mostly half shrubby evergreen climbers, of rapid growth; and most of them have lobed leaves, with from two to seven lobes. The flowers of many are large and beautiful, on which account they are often cultivated in hothouses. Some of the species are also cultivated in tropical countries for their fruit, particularly those of which the fruit is known by the name Granadilla (q. v.).

The fruit of *P. edulis* is also somewhat acid and of a pleasant flavor, and ices flavored with it are delicious. Its fruit is about two inches long, and an inch and a half in diameter, of a livid purple color, with orange pulp.—The fruit of some species of P., however, is not only uneatable, but fetid; and the roots, leaves, and flowers of some, as well as of other *Passifloraceæ*, have medicinal properties, narcotic, emmenagogue, anthelmintic, febrifugal, &c. *P. rukra* is called Dutchman's Laudanum in Jamaica, because a tincture of the flowers is used as a substitute for lauda-

num. The most hardy species of P. is the BLUE P. (*P. cærulea*), which grows well enough in some parts of France, and even in the south of England. Where the climate is suitable, passion-flowers form an admirable covering for arbors and trellises.

PA'SSIONISTS, a religious congregation of priests of the Roman Catholic Church, the object of whose institute, indicated by their name, is to preach 'Jesus Christ and him crucified.' The founder, Paul Francis, surnamed Paul of the Cross, was born in 1694 at Ovada, in the diocese of Acqui in the kingdom of Sardinia. Having commenced his career as a hermit he formed the design of enlisting others in the missionary life; and being ordained priest in 1737, he associated himself with ten others, and obtained for his plan the approbation of successive popes, together with the convent on the Celian Hill, at Rome, which still forms the mother-house of the congregation. The special object of the institute was to instil into men's minds by preaching, by example, and by devotional practices, a sense of the mercy and love of God as manifested in the passion of Christ. Hence the cross appears everywhere as their emblem, in their churches, in their halls, and in the courts and public places of their monasteries.

A large crucifix, moreover, forms part of their very striking costume. They go barefooted, and practise many other personal austerities, rising at midnight to recite the canonical hours in the church; and their ministerial work consist chiefly in holding what are called 'missions,' wherever they are invited by the local clergy, in which sermons on the passion of Christ, on sin, and on repentance, together with the hearing of confessions, hold the principal places. Paul of the Cross died in 1775. For a time his congregation remained in obscurity; but it has risen into notice within the last half century, new houses having been founded in England, Ireland, Belgium, America, and Australia.

PASSION PLAY. See MYSTERIES.

PASSION-WEEK, the name commonly given in England to the week immediately preceding Easter, and otherwise called HOLY WEEK (q. v.). But by the proper rubrical usage, Passion Week is that which precedes Holy Week, commencing on PASSION SUNDAY, the fifth Sunday of Lent. In the Roman calendar, the whole of the last fortnight of Lent is known by the name of Passion-tide, and all the services of that time differ in many respects from those, not alone of the year, but even of the rest of Lent. The verse *Gloria-Patri* is discontinued both in the mass and in the Breviary, and all pictures, crucifixes, statues, and other sacred representations are veiled during the whole of Passion-tide.

PA'SSIVE TITLE, in the Law of Scotland, is the liability of an heir, or one who represents and interferes with the estate of a deceased person, to pay all the debts of the deceased. It was considered that so great an opportunity of fraud in secreting the goods of a deceased person existed, that the heir was presumed to be liable for all the debts of the deceased, unless he took good care to give up an inventory, and so show what property there was. The barbarous doctrine of holding an heir universally liable has latterly been much restricted; but the explanation is entirely technical.

PA'SSOVER (*Pesach, Pascha*), the first and greatest of the three annual feasts (*Regalim*) instituted by Moses, at which it was incumbent upon every male Israelite to make a pilgrimage to the house of the Lord. It was celebrated on the anniversary of the Exodus from Egypt—i. e., on the 14th day of Nisan, otherwise called Abib, the period of the first full moon in the spring—and lasted eight days. In commemoration of the incidents connected with the great event of the liberation of the people, it was ordained that unleavened bread only should be eaten during this festive period, whence it also bore the name *Chag hamazzoth* (Feast of Unleavened Bread); and, further, that a lamb one year old, and free from all blemish, roasted whole, together with bitter herbs, should form the meal in every house on the eve of the feast. Prayers and thanksgivings, all with a reference to the redemption from bondage, accompanied the repast, at which the members of the family or families who had joined in the purchase of the lamb had to appear in traveling garb. At a later period, a certain number of cups of red wine were superadded to this meal, to which, as its special ceremonies and the order of its benedictions were fixed, the name *Seder* (arrangement) was given. The name P. was more strictly limited to the first day, in which the paschal lamb was entirely consumed, the reserving of any part of it to the next day being expressly forbidden (Ex. xii. 10); and the name Feast of Unleavened Bread belonged rather to the remaining days, on which other animal food was eaten; but the names were often used indiscriminately.

The P. is generally regarded by Christian theologians as at once a sacrifice and a sacrament, and in the former character as an eminent type of the sacrifice of Christ. The death of Christ at the very time of the P. is regarded as corroborative of this view, which is indeed plainly adopted in certain passages of the New Testament, as John xix. 36, and 1 Cor. v. 7, in which last place our Saviour is designated 'Christ our Passover.' The P. is regarded as typical of Christ, in its connection with the deliverance of Israel from the bondage of Egypt, held to typify our salvation from the bondage of sin; in its being a sacrifice, and that of a lamb without blemish—the perfection of the paschal lamb, as of the other sacrificial victims, being supposed to signify the perfection of the great sacrifice; and in many other minor particulars, of which one is that referred to in John xix. 36, that no bone of the paschal lamb was to be broken.

The Paschal meal, as at present celebrated among the Jews, has more the character of a hallowed family-feast, with reference, however, to the great national event. The greater part of those —it may be added here—who live out of the Holy Land celebrate it on the two first evenings, as, owing to the uncertainty prevalent at one time with respect to the fixing of the new moon by the Sanhedrim at Jerusalem, it was ordained that the 'Exiles' should celebrate all their festivals—except the Day of Atonement—on two successive days, a law still in force among the orthodox. The regulations of the 'lamb for each house,' the traveling garb, &c., are abrogated, but many further symbolical tokens have been superadded; reminiscences, as it were, both of the liberation from Egypt, and the subsequent downfall of the sanctuary and empire. The order of prayers and songs to be recited on these evenings has also received many additions, and even medieval German songs have crept in, as supposed to contain a symbolical reference to the ultimate fate of Israel. See HAGGADA (*shel Pesach*), FESTIVALS, EASTER, LORD'S SUPPER.

PA'SSPORT, a warrant of protection and permission to travel, granted by the proper authority to persons moving from place to place. Every independent state has the right to exclude whom it pleases from its territory, and may require that all strangers entering it be furnished with properly authenticated documents, showing who they are, and for what purpose they are visiting the country. Passports are sometimes issued by the ministers and consuls of the country which the traveler intends to visit, which cannot, however, be done without the consent or connivance of the state of which the holder of the instrument is a subject; they properly proceed from the authorities of the state to which the traveler belongs, and ought to bear the *visa* or countersignature of the minister or consul of the country which he is about to visit. In some European states no one is allowed to go abroad without a passport from his government authorizing him to leave the country —a provision used as a means of detaining persons charged with crime; and passports are even required by the natives to enable them to go from place to place in their own country. The regulations of different states have varied much regarding the use of passports; and of late years there has been a great relaxation of the stringency of the regulations connected with them. Since the facilities of traveling have so greatly increased, it seems to have become the prevalent opinion that the passport system tends to obstruct the free intercourse that is desirable between citizens of different countries; while it is ineffectual to prevent the entrance of dangerous or suspicious characters, who can obtain passports on false pretences, or make their way in without them.

Within the United Kingdom, no passports are required; but for a British subject traveling in some parts of the continent they are still requisite. At one time the greater part of British subjects traveling abroad used to be furnished with passports from the ministers or consuls of the countries which they purposed to visit; the lord provost of Edinburgh was also in the way of issuing passports to Scotchmen. Of late years the passport most used by British subjects is that of the British Secretary of State for Foreign Affairs, which is now granted to any British subject for a fee of two shillings, and is good for life. If the applicant be not personally known to the Secretary of State, he must either be recommended to him by some person who is known to him, or produce an application in his favor by some banking firm established in London or elsewhere in the United Kingdom, or a certificate of identity signed by a mayor, magistrate, justice of the peace, minister of religion, physician, surgeon, solicitor, or notary, resident in the United Kingdom. In certain cases, the production of a certificate of birth may be required. If the applicant be a naturalized British subject, his certificate of naturalization must be forwarded to the Foreign Office. If it be dated subsequently to 24th August 1850, and previously to 1st August, 1858, his passport will be good for one year only; if subsequently to 1st August 1858, for six months only. The passport of a British subject naturalized by act of parliament is good for life. Where the passport system is in full force, it is required that the passport be countersigned by the minister or consul of the country which the holder means to visit, the visa being only of force for a year.

The French government allows British subjects to enter and leave France, and travel in it without passports; but they are said to be sometimes asked for when France is entered from the south and east. In Belgium, Holland, Germany, Switzerland, Austria, Italy, Denmark, Norway, and Sweden, passports are no longer required. For Greece and Portugal they are necessary, and the

visa is insisted on in Russia, Turkey, and Egypt. A British subject traveling in countries where passports are not *de rigueur*, will sometimes find it an advantage to have one as an evidence of his identity and nationality. Till lately, throughout the greater part of Europe, a traveler was liable to be called on to produce his passport, not only at every frontier town, but at every garrison town through which he passed. In several of the countries where passports are not required of travelers, they are of a decided advantage, if not a necessity, to those who propose to settle there for some time—for example in Germany, especially since the anti-socialist legislation.

In time of war, passports or safe-conducts are granted by the supreme authority on the spot—i. e., the officer in command—to insure safety to the holders when passing from spot to spot, or while occupied in the performance of some act specified in and permitted by the passport. Passports may be granted for goods as well as individuals; and, in time of war, the passport of a ship is the formal voucher of its neutral character. It purports to be a requisition on the part of the government of a state to allow the vessel to pass freely with her company, passengers, goods, and merchandise, without hinderance, seizure, or molestation, as being owned by citizens or subjects of such state.

PASSY, a town of France, in the department of Seine, a suburb of Paris, and included within the fortifications of that city. See PARIS.

PASTA, GIUDITTA (JUDITH), one of the most distinguished opera singers of modern times, was born near Milan in Italy in 1798, and received her musical education partly at Como, under the chapel-master of the cathedral there, and partly in the conservatoire at Milan. After 1811 she appeared at various theaters of the second rank in Northern Italy, and obtained a respectable success, but did not give any particular indication of possessing more than average ability. Her first great triumph was achieved at Verona in 1822. The year following she was engaged at the Paris Italian Opera, where her singing excited great admiration. From this moment she labored incessantly to reach the ideal perfection she had set before her mind. From 1825 to 1830 was the period of her most splendid triumphs, which were won principally in London and Paris. Vienna, where she accepted an engagement in 1832, witnessed the last. Some time afterwards she withdrew from the stage, and purchased a villa on the banks of Lake Como, where, and at Milan, she resided till she died in 1865. P. in her best days had a magnificent voice, which easily passed from clear shrill soprano notes to the gravest contralto tones. In addition she had a fine dramatic energy and stateliness of manner, that suited lofty and imposing characters. Her principal rôles were *Medea, Desdemona, Semiramide, La Sonnambula* (the opera of this name was written for her by Bellini), and *Giulia* in *Romeo e Giulia*.

PASTE, a term applied to various compositions in which there is just sufficient moisture to soften without liquefying the mass.

Common or adhesive paste is made by mixing wheaten flour with cold water in the proportion of about two pounds to a gallon. The water is added by degrees, and well stirred in, so as to prevent lumpiness. About an ounce of powdered alum is sometimes added to increase its adhesiveness, and for shoemakers and bookbinders about an ounce and a half of finely-powdered rosin is substituted for the alum, which thickens it much and renders it much more tenacious. When the ingredients are thoroughly mixed, they are boiled, great care being taken to stir them thorcughly whilst boiling to prevent burning. This paste is used for a great variety of purposes, more especially by paper-hangers, bill-stickers, bookbinders, paste-board makers, &c. An adhesive paste, called *Chinese Paste*, is made by reducing to perfect dryness bullock's blood. It is then powdered and mixed with one tenth of its weight of finely-powdered quicklime. When used, it is mixed with water sufficient to form a paste, which is a strong cement for pottery, wood, stone, &c.

Fruit Paste is made by taking the juice of any fruit and dissolving in it an ounce to a pint of gum-arabic, or gum-senegal, which many prefer; then evaporate by a gentle heat until the liquid is as thick as syrup, and add to every pound of it a pound of finely-powdered refined-sugar; continue the heat, and stir it until the sugar and juice are thoroughly incorporated, after which it is poured out on a marble slab slightly oiled. When cooled, it may be formed into lozenges for use. An imitation of this is made very generally by mixing three parts of citric acid, twenty-four parts of gum, and forty-eight parts of refined sugar, and dissolving the whole in water, and gently heating it to insure complete solution and mixture. It is then variously colored and flavored with any of the fruit essences. This paste is often sold under the name of jujubes, which were formerly lozenges of fruit paste prepared from the juice of the jujube fruit, *Ziziphus jujuba*.

Polishing Pastes vary according to the materials upon which they are to be employed. For brass, the best kind is a mixture of two parts of soft soap with four parts of rotten-stone in very fine powder. Another sort is eight parts of fine rotten-stone powder, two parts of oxalic acid powdered, three parts olive oil, and enough of turpentine to make them into a paste. For iron, a mixture of emery powder and lard is used; and for pewter a mixture of finely powdered bath-brick and soft soap. For wood, a paste called furniture paste is made by adding spirit of turpentine to beeswax sufficient to form it into a soft paste, which is rubbed on thinly with a brush and woollen rag, and afterwards polished with a dry woollen cloth and soft brush.

Shaving pastes are very numerous, but the base of all is soap. The best of all is the true Naples soap (see SOAP), but it is often mixed with other ingredients according to the fancy of the vendor. For other applications of the word Paste, see GEMS (IMITATION), and MACARONI.

PA'STEL, chalk mixed with other materials and various colors, and formed into pencils or crayons (q. v.).

PASTEL. See WOAD.

PASTEUR, LOUIS, distinguished for his achievements in chemistry and microscopic biology, was born 27th December 1822, at Dôle in the department of Jura. On the completion of a course of scientific studies at Paris, he obtained chairs at Besançon, Dijon, Strassburg, Lille, and, in 1863, at Paris; and in 1867, he became professor of Chemistry in the Sorbonne. In molecular chemistry, P. has achieved important results; and in the province of fermentation, and the Germ Theory, his works are of special value. His studies on the diseased conditions of wine and of beer have rendered possible the prevention of these conditions. His investigations into the silk-worm's disease, *pebrine*, and its cure, have proved of signal service. His discovery of bacteria as the cause of anthrax (see SPLENIC APOPLEXY) in cattle was quite an epoch in the science of disease. Similar results were obtained with regard to fowl cholera; and in his hands led to a very important method of preventing the various diseases caused by sceptic bacteria—viz., by inoculating the animals with a milder form of the disease by means of a weaker brood of bacteria, artificially cultured. In 1883 he studied cholera in Egypt. See GERM THEORY.

PA'STILE, PASTIL, or PASTILLE, a diminutive of paste. This term was originally applied to lozenges as little portions of confectionery paste, but it has been of late chiefly confined to a mixture of odorous materials, as in the case of the *fumigating pastiles*, which are burned either as incense or as a means of diffusing an agreeable odor. They are composed of charcoal powder, with such aromatic gums as benzoin, labdanum, &c.; and powders of sweet-scented woods and barks, as sandal-wood, cinnamon, and especially cascarilla barks. Essential oils are also added, and the whole are worked into a paste with a little gum-mucilage, and formed into small sharp-pointed cones about an inch and a half high, and half an inch broad at the base. When perfectly dry, they are used by lighting at the point, and as they burn down an agreeable odor is given out with the smoke. Very tasteful vessels, called pastille burners, usually of porcelain, are made for using them. Another kind of pastille, usually in the form of a small pill covered with gold or silver leaf, is used for perfuming the breath; it is made of the same kind of ingredients, excepting the charcoal.

PA'STO, a town of the United States of Colombia, on a high plateau between two ridges of the Andes, 148 miles north-east of Quito. Height above sea-level upwards of 8500 feet. It is in the direct route from the Popayan Pass to Quito. Pop. about 7000.

PASTOR, a genus of birds of the Starling family (*Sturnidæ*),



Rose-colored Pastor (*Pastor roseus*).

differing from starlings in the compressed and slightly-curved bill. In habits, as in characters, they are very nearly allied to starlings. The name P. is supposed to be derived from their being frequently seen with flocks of sheep. The only European species is the ROSE-COLORED P., or Rose-colored Ouzel (*P. roseus*), a rare visitant of Britain and of the northern parts of Europe, and more common in the north of Africa, Syria, and India than in any part of Europe.

PA'STORAL LETTER, a letter addressed either at certain stated times, or on the occurrence of some notable occasion, by a 'pastor,' but especially by a bishop to the clergy under his jurisdiction, to the laity of his flock, or to both. Of the former class, in the Church of Rome, are the so-called Lenten Mandates, or Instructions, issued before the commencement of Lent, and making known the regulations enacted for the observance of the Lenten fast, the dispensations granted, and the devotions and other pious works prescribed. Such also are the letters issued by a bishop on many of the chief festivals of the year. It is usual for bishops, besides their stated letters, to address to their clergy or people instructions suited to any particular emergency which may arise, and sometimes to take occasion from the issuing of the stated pastoral letter to offer instruction on some topic of importance which may engage public attention at the time, on some prevalent abuse or scandal, or some apprehended danger to the faith or to morals. To this class belong many of the remains of the early fathers, especially in the Western Church. In some countries the government, as formerly in Austria, claimed a right to exercise a censorship over the pastoral letters to be issued by the bishops. This right, however, is regarded by churchmen as a usurpation, and although submitted to, is admitted only under protest. See PLACETUM REGIUM, FEBRONIANISM.

PASTORAL POETRY is that kind of poetry which professes to delineate the scenery, sentiment, and incidents of shepherd-life, It is highly probable that the first attempts to give a rhythmic expression to human feeling were to some extent of this character. Men were originally shepherds, and their festal songs and hymns would derive at least substance and imagery from their primitive occupations; but as a distinct branch of poetic art, pastoral poetry was not cultivated till a comparatively late period; for although critics are fond of pointing to the lives of the Hebrew patriarchs, and to the story of Ruth, as specimens of the antiquity of the pastoral in the East, yet, as these profess to be history, and not fiction, they can be instanced only to prove that the *material* for this kind of poetry existed from the earliest ages. In point of fact, it was only after innocence and simplicity had passed away, or were thought to have passed away, from real life, that men began, half from fancy, and half from memory, to paint the manners of the past as artless, and the lives of their ancestors as constantly happy. It was thus the *Brass* Age that made the *Golden*. The oldest specimens of the classic pastoral are the Idylls of Theocritus (q. v.), which appeared about 275 B. C.—long after Greece had produced her masterpieces in epic narrative, in the war ode, and almost all other kinds of the lyric, in tragedy, comedy, history, philosophy, and rhetoric. Theocritus was imitated by Bion and Moschus, whose pastorals approximate in form to the drama. Among the Latins, the refined and courtly Virgil, in the reign of Augustus, wrote his *Bucolica* or *Eclogues*, on the model of his Greek predecessors; but, however beautiful and melodious the verses of these urban writers are, we cannot suppose for a moment that the rude shepherds and shepherdesses of Italy or Sicily indulged in such refined sentiments, or spent their time so poetically as there they are made to do. Virgil, we may rest assured, is as far from giving a genuine picture of pastoral life in his verse, as any modern poet who prates of Chloe and Phyllis.

During the middle ages, pastoral poetry in this artistic, and therefore conventional sense of the term, was almost unknown; but with the first glimpse of reviving classicism, the pastoral reappears. The earliest specimens are afforded by Boccaccio (q. v.), about the first modern Italian who studied Greek. It is to the countrymen of Boccaccio that we owe the creation of the pastoral drama, of which there is no trace in ancient literature. The *Favola di Orfeo* of Politian (q. v.), performed at the court of Mantua in 1483, is the first dramatic poem which pretends to represent the sentiments, incidents, and forms of pastoral life. Critics have forgotten this work when they make Tansillo the inventor of the *favola pastorale*, or *boscareccia*, on account of his *I due Pellegrini* (1539), or Agostino Beccari, whose pastoral comedy, *Il Sacrifizio*, was played at Ferrara in 1554. However, it is true that the extraordinary popularity of Beccari's piece originated a crowd of *favole boscareccie*, the finest and most poetical of which is the *Aminta* of Tasso, represented at the court of Ferrara in 1572. A later, but hardly less famous production is the *Pastor Fido* of Guarini (q. v.), published at Venice in 1590; and in the 18th c., the poet Metastasio (q. v.) revived for a moment the interest in this graceful and picturesque, but unreal branch of literature. In Spain, during the first part of the 16th c., it abundantly flourished. The first who wrote pastoral dialogues was Juan del Elcina (*cir.* 1500); he was followed by Garcilaso de la Vega, and others.

During the reign of the Emperor Charles V., one may say that Spanish imaginative literature was almost wholly of a bucolic character; but in Spain, as elsewhere, it took largely the form of prose-romance (see NOVELS) rather than of poetry, deriving its inspiration from the *Daphnis* and *Chloe* of Longus, the Byzantine romancist, not from the tuneful strains of the Mantuan swan. England, however, can boast of Spenser's *Shepherd's Calendar*, which is at least full of charming poetry, and is appropriately dedicated to Sir Philip Sidney, whose pastoral romance of *Arcadia* outstrips in point of literary beauty all other fictions of that class. The Germans reckon Shakspeare's *As You Like It* in the list of pastoral dramas; but its right to be so classified is by no means clear, although we may admit that it betrays the influence of the pastoral poetry and romance that had just ceased to be the rage among the scholarly geniuses of Europe. A similar influence is visible in the writings of other Elizabethan dramatists, as, for example, in the *Faithful Shepherdess* of Fletcher. In France, pastoral poetry is perhaps older than in any of the western nations. The comedy of Adam de Lehalle, surnamed Le Bossu d'Arras (The Hunchback of Arras), entitled *Le Jeu de Robin et Marion* (and which exists in MS. in the *Bibliothèque Impériale*), belongs to the middle of the 13th century. During the civil wars in the latter half of the 16th c., the pastoral was turned to political uses. In the following century it continued for some time to be popular, or rather, let us say, fashionable. Even the great Richelieu alleviated the cares of office with the composition of *La Grande Pastorale;* but here, too, the poem soon gave way to the prose-romance, which was hardly less unreal, and more exciting.

Perhaps the best pastoral, ancient or modern, is the *Gentle Shepherd* of Allan Ramsay (q. v.), published in 1725. 'It is,' says Mr. Carruthers (Chambers's *Cyclopædia of English Literature*, vol. i., p. 601; p. 523 of 3d ed.), 'a genuine picture of Scottish life, but of life passed in simple rural employments, apart from the guilt and fever of large towns, and reflecting only the pure and unsophisticated emotions of our nature. The affected sensibilities and feigned distresses of the Corydons and Delias find no place in Ramsay's clear and manly page. He drew his shepherds from the life, placed them in scenes which he actually saw, and made them speak the language which he every day heard—the free idiomatic speech of his native vales.' His English contemporaries, Pope, Ambrose Philips, Gay, and others, who form the 'Augustan,' or Queen Anne school of poets, also addicted themselves to the composition of pastoral poetry; but though there is much fine description in the verses, they are, in general, purely conventional performances, in imitation of the classic poets, who, as we have said, did not themselves imitate nature. From this censure, however, must be excepted the six pastorals of Gay, entitled the *Shepherd's Week*, which are full of honest country humor, and contain charming pictures of English country life. Since the early part of the 18th c., however, pastoral poetry, strictly so called, has ceased to be cultivated in England and almost everywhere else. In the pages of Wordsworth, who lived all his days among the Cumberland shepherds, we indeed find many exquisite glimpses of pastoral life, as it represented itself to the profound and tender imagination of that great poet of nature, but few direct delineations of pastoral manners. Germany imitated abundantly the French and Italian models during the greater part of the 18th century. The last and best of the German series is the *Erwin and Elmire* of Goethe's youth. The general impression appears to be that the age of pastoral poetry has passed away forever, and that Damon and Chloe will never reappear in verse.

PASTORAL STAFF, sometimes also, although not properly, called CROSIER (q. v.) (Lat. *baculus pastoralis*), one of the insignia of the episcopal office, sometimes also borne by an abbot. It is a tall staff of metal, or of wood ornamented with metal, having, at least in the Western Church, the head curved in the form of a shepherd's crook, as a symbol of the pastoral office. The head of the pastoral staff of an archbishop, instead of the crook, has a double cross, from which its name of *crosier* is derived. In the Greek Church the staff is much shorter, and the head is either a plain Greek cross of the form of the letter *Tau*, or it is a double-headed crook, which sometimes appears in the shape of the upsilon, *Υ*. It is difficult to determine the time at which the pastoral staff first came into use. The first distinct allusion to it is in St. Augustine's commentary on the 124th psalm. Gregory of Tours, in his life of St. Martin, mentions the pastoral staff of St. Severinus, who was Bishop of Cologne in the end of the 4th century. From an early time, the pastoral staff was connected with the actual possession of the jurisdiction which it symbolizes. The giving of it was one of the ceremonies of investiture; its withdrawal was part of the form of deprivation; its voluntary abandonment accompanied the act of resignation; its being broken was the most solemn form of degradation. So also the veiling of the crook of an abbot's pastoral staff, during the episcopal visitation, signified the temporary subjection of his authority to that of the bishop.



Pastoral Staff.

An abbot being required to carry his pastoral staff with the crook turned inwards, showed that his authority was purely domestic. The pope alone does not use a pastoral staff. In the later medieval period the material was often extremely costly, and, referring to the relaxation of the times, it was said 'that formerly the church had wooden pastoral staves and golden bishops, but that now the staves are of gold and the bishops of wood.' The workmanship was sometimes extremely beautiful. We annex as a specimen of the highest art the pastoral staff of William of Wykeham, now in New College, Oxford. This is a sample of the Norman pastoral staff. The Saxon was by no means so tall. The Irish pastoral staff is of a type quite peculiar, and some of the sculptured specimens preserved in the British Museum, at the Royal Irish Academy, and elsewhere, are very interesting. St. Fillan's Crosier, now in Edinburgh, resembles these.

PASTORAL THEOLOGY, that branch of theological science which regards the duties and obligations of pastors in relation to the care of souls. It comprises two parts; first, that which treats of the obligations of the pastors themselves, and which is therefore designed for the training and preparation of the candidates for the pastoral office. The other part of pastoral theology, which might perhaps better be called Popular Theology, comprises the objective teaching which is to be employed in the instruction and direction of the flock committed to the pastor's charge. This branch of theology has long formed a leading portion of the training of candidates in the Evangelical Churches of France and Germany. Numerous works on the subject represent the practice of the various sections of the Protestant church; and more recently Catholic manuals of P. T. have appeared.

PA'STRY, articles of food in which the chief part consists of a paste made of flour. This would of course apply to bread, but it has been limited by custom to such lighter articles as are made by the pastry-cook, and chiefly to those in which the paste is made to assume a light flaky character by the addition of butter, &c., and by the mode of working it up. The commonest kind is made of a dough of flour and water, into which butter or lard is worked by hand, in the proportion of six ounces to the pound. The finest kind is usually termed *puff paste*, and considerable skill is required to make it well, for it depends, next to the goodness of the materials, upon lightness of hand in kneading the ingredients together. These ingredients consist of fine wheaten flour and butter in the proportion of four ounces of butter to a pound of flour, with cold water just sufficient to make a good stiff elastic dough; this is rolled out with a *rolling-pin*, and double the previous quantity of butter is then spread over it. It is then rolled up and lightly kneaded, so as to work the butter in thoroughly. Coolness is very important in making pastry; a marble slab is thererore most desirable for making it upon. The thinner it is rolled out before the butter is then spread the better, because when it is put in the oven the laminæ which have been formed by folding or rolling up the butter with the dough, separate by the disengagement of the watery vapor, and the thinner and lighter the flakes are the better is the puff paste. Another kind is called *short paste;* in this the flour is made warm, and the butter or lard used is often melted, and a little sugar and an egg or two are added. This, when baked, has none of the flaky character of puff paste, but it is better adapted for meat and some other kinds of pies which require to be baked without a dish. Game-pies, with elaborately-decorated crusts, are made of this pastry.

PA'STURAGE, in English Law called Common of Pasture, is classed among rights of common or profits *à prendre*, and is the right of one who is not the owner of land to put his sheep or cattle on such land to feed there. In Scotland it is called a servitude of pasturage. In both countries the right can be established by prescription, in England of thirty years, and in Scotland of forty years. Where the parties entitled to pasturage dispute as to their respective proportions of cattle, the suit to redress the matter is called in Scotland an action of 'sowming and rowming.'

PA'STURES (Lat. *pasco*, to feed) are fields or tracts of land devoted to the feeding of oxen, sheep, and other herbivorous animals, which eat the grass and other herbage as it grows. Grass is grown sometimes in the rotation with grain and other crops, when it remains on the ground for one or more years, is frequently mown during the first summer, and grazed afterwards, but is again ploughed up to be succeeded usually by oats or wheat. For such purposes, rye-grass, red, white, yellow, and alsike clovers, are used either alone or mixed in varying proportions. On the uplands of Great Britain, wherever from any cause grain crops cannot profitably be grown, and throughout many of the richest plains and valleys, especially of England and Ireland, there are thousands of acres of land which have been under grass from time immemorial. Such permanent pastures are estimated to occupy fully 14,000,000 acres in England, nearly 8,000,000 in Scotland, and about 9,000,000 in Ireland. Sometimes they have been self-sown, occasionally they have been laid down with care, seldom are they as highly cultivated and liberally managed as they should be. The best of them are used for feeding heavy bullocks; those of somewhat poorer description are often grazed by dairy stock; whilst the down or upland pastures are especially profitable for sheep.

It has now become a common practice, and is every year becoming more and more general, to give additional food of various kinds to animals fed on pastures. Even cattle grazing on the richest pastures are supplied with linseed cake, &c., to hasten the process of fattening, and to improve their quality; roots are given to sheep when fattening for the market, and hay to those which are to be kept as stock; whilst when oats or beans are cheap, many sheep-farmers find it advantageous to give them even to the hardy stock of exposed hill-pastures. All pastures are much improved by thorough drainage. The application of farmyard dung, soil, lime, and almost every sort of top-dressing is beneficial. Irrigation is sometimes profitable, and in some other countries is far more common and far more requisite than in Britain. Rich pastures on which oxen are fed are injured by sheep, which reject the coarsest grass, and pick out the finest; but a few horses turned into them during the autumn or winter help to consume the coarser tufts. The coarsest and rankest grass may once or twice a year be cut over by the scythe; and either made into rough hay, or if left on the ground, the cattle, when it has partially dried, will readily eat it up. A dressing of lime and salt scattered over the rougher parts of the fields in autumn will sweeten the herbage, and induce the stock to eat it down regularly. Moss, which is a great pest in many pastures, may be got rid of by penning sheep, well fed with swedes, cake, or corn, regularly over the field; or by harrowing the surface in several different directions during January or February, applying then a top-dressing of soil or dung, and in March or April sowing some clover or other seeds, which will be firmed down by the bush harrow, clod-crusher, or heavy roller. The droppings of the cattle ought to be broken up and scattered over the ground.

Rich pastures intended for the fattening of cattle ought not to be used during winter, but allowed to become luxuriant before the cattle are turned upon them in spring. Very lean animals, whether oxen or sheep, cannot with advantage be at once placed on very rich pasture, but must be gradually fitted for it. In some of the hill districts of Scotland, devoted to sheep-farming, increased productiveness has resulted from breaking up portions of the pasture, and after two or three crops have been taken, laying them down as pastures again. All good pastures produce a very mixed herbage, not consisting merely of one kind of grass, but of several or many, with clovers and others plants. Different species of Meadow-grass (*Poa*), Fescue (*Festuca*), Foxtail (*Alopecurus*), Oat-grass (*Avena*), Cock's-foot (*Dactylis glomerata*), Rye-grass (*Lolium*), Hair-grass (*Aira*), Vernal-grass (*Anthoxanthum*), and Timothy or Cat's-tail (*Phleum*), are among the most common grasses of British pastures. Yarrow (*Achillæa millefolium*) is very abundant in some pastures, and is sometimes sown with grass, clover, &c., in land meant for permanent pasture. Different kinds of clover are adapted to different soils and situations. The presence of rushes is very indicative of the want of drainage. Thistles and docks are injurious, and are to be extirpated as much as possible. Some of the plants naturally abundant on high hill-pastures, as *Nardus stricta* and *Juncus bufonius*, are very unnutritious; and the substitution of others in their stead, is one of the benefits derived from the breaking up of such lands.

PATAGO'NIA, the most southern region of South America, extending from lat. 38° southwards to the Strait of Magellan, and occupying the extremity of the continent. The name P. is sometimes confined to the territory east of the Cordilleras; the district to the westward forming now a province of Chili. The possession of the country east of the Andes, long disputed, was in 1881 made over to the Argentine Republic. Length upwards of 1000 miles, greatest breadth about 480 miles; area about 350,000 square miles; population estimated by a recent traveler, Mr. Musters, at not more than 3000. The coast of the Atlantic has extensive bays and inlets, none of which, however, are of much importance or advantage, in a commercial point of view. Along the western coast, and stretching from 42° S. to the Strait of Magellan, are numerous islands, with precipitous shores, belonging apparently to the system of the Cordilleras. The principal islands are Chiloé, the Chonos Archipelago (q. v.), Wellington Island, the Archipelago of Madre de Dios, Queen Adelaide's Archipelago, and Desolation Island. These islands—which, together with several peninsulas, form a coast almost as rugged as that of Norway—are mountainous; but in none of them, except in Desolation Island, do the mountains rise to the snow-line.

Surface, Soil, &c.—The country of P. divides itself into two regions, very unequal in size and very different in character. These are Eastern and Western P., which are divided by the great mountain range of the Andes. Western P., comprising this range, the coast districts, and the islands, is rugged and moun-

tainous. Opposite the island of Chiloé are two active volcanoes, one of which, Minchinmavida, is 8000 feet high. The slope of the country from the Andes to the Pacific is so steep, and the strip of shore so narrow, that the largest river of this district has its origin only about 13 miles from its embouchure on the coast. In the island of Chiloé, in the north of Western P., the mean temperature of winter is about 40°, that of summer rather above 50°; while at Port Famine, in the extreme south of this region, and 800 miles nearer antarctic latitudes than Chiloé, the mean temperature is not much lower, being in winter about 33°, and in summer about 50°. This unusually small difference in the mean temperature of the extremes of Western P., which extends over about 14° of lat., is due to the great dampness of the atmosphere all along the coast. The prevailing winds of this region blow from the west; and, heavily surcharged with the moisture they have drawn from the immense wastes of the Pacific Ocean, they strike against the Andes, are thoroughly condensed by the cold high mountains, and fall in rains that are almost perpetual from Chiloé to the Strait of Magellan. South of 47° S. lat., hardly a day passes without a fall of rain, snow, or sleet. This continual dampness has produced forests of almost tropical luxuriance. A kind of deer wanders on the east side of the mountains; guanacos, pumas, and water-fowl abound in the region between the Andes and the Atlantic; and along the coast, seals, otters, sea-elephants, fish, and shell-fish are found.

Eastern P. comprises by far the larger portion of P., and extends eastward from the Andes to the Atlantic. Its surface has not yet been thoroughly explored, but the recent wanderings of Mr. Musters have at last furnished us with some authentic information. It mainly consists of high undulating plains or plateaux, frequently intersected by valleys and ravines, or rising into successive or isolated hills, which generally occupy the crest of the country. These plateaux are occasionally covered with coarse grass, but more frequently the surface is sterile, with a sparse vegetation of stunted bushes and round thistle clumps; and even these are sometimes wanting, absolutely nothing clothing the bare patches of clay or gravel; elsewhere, it is strewn with huge round boulders, and again rugged with confused heaps or ridges of bare, sharp-edged rocks, many of them of volcanic origin: this more particularly applying to the northern part of the country. Piercing blasts sweep almost incessantly from various points, but chiefly from the west; and snow, sleet, and rain seem to prevail during the greater part of the year. The descent from these plains or pampas to the valleys or more sheltered and fertile ground bordering the banks of the streams and rivers, is commonly termed 'barranca,' or bank, from the scarped slopes, varying in depth from fifty to two or three feet, and in angle from an easy to an almost perpendicular descent. The soil in many places is strongly impregnated with saltpetre, and salt-lakes and lagoons are numerous. North of the Rio Chico, and towards the sea-coast, there is a wild, weird, desolate region called by the Indians 'The Devil's Country;' it is said to be almost impassable. Several inhospitable wastes of this kind fringe the Atlantic, and have probably induced the belief that P. is a barren and waterless desert; but the interior, though not fertile, really abounds in lagoons, springs, and streams, and the banks of the Rio Negro and even the Santa Cruz are capable of cultivation.

Along the eastern base of the Andes, also, there is a great tract of territory which is astonishingly picturesque and fertile. Here great forests abound, to which the Indians retire for shelter from the freezing winds of winter. There are also deep valleys furrowed by mountain torrents; and numerous lakes, the haunts of wild-duck and other water-fowl. The largest of these lakes are Nahuel Huapi in the north, Coluguape in the middle, and Viedma in the south. Except pasture, Eastern P. has no productions. However fertile the soil in some places may be, it is nowhere cultivated. The Indians live upon the produce of the chase alone, and seem to desire no better sustenance. The principal rivers are the Rio Negro (q. v.); the Chupat, which flows through a good soil, producing excellent pasture and good firewood; the Rio Desire, probably rising in Lake Coluguape; and the Rio Chico, which flows out of Lake Viedma, through a valley sometimes opening out into wide grass-covered plains dotted with incense bushes, and sometimes rising in huge, bare ridge and burrow-like undulations. All these rivers rise in the Andes, and flow east or south-east. Herds of horses are reared, dogs abound, and, in the more favored regions, cattle are bred; pumas and foxes are met with, as well as condors, hawks, partridges, and water-fowl. But by far the most important animals are the guanaco or Huanaca (q. v.); the Rhea Darwinii, called by the Patagonians *mekyush*, and by the Spaniards *avestrus* or ostrich; and the gama, a kind of deer.

Inhabitants.—The Patagonians have been hitherto described only in the most general terms, and in many cases very inaccurately. Little was known of their appearance, habits, and employments. The work of M. Guinnard, *Trois Ans d'Esclavage chez les Patagons* (1864) was for a time believed to form a valuable addition to our knowledge of P. and its inhabitants; but the publication of Mr. Musters' record of his travels from the Straits of Magellan to the Rio Negro, under the title of *At Home with the Patagonians* (1871), has utterly destroyed the Frenchman's claim to be an authority. Mr. Musters is decidedly of the opinion that M. Guinnard was never in Patagonia at all, and that his 'experiences' were confined to the Indians *north of the Rio Negro*.

The Patagonians or Tehuelche Indians are divided into two great tribes, the northern and the southern. They speak the same language, but are distinguishable by difference of accent; and the southern men appear to be on an average taller and finer, and are more expert hunters. The northern range chiefly over the district between the Cordillera and the Atlantic, from the Rio Negro to the Chupat, and even the Santa Cruz River. The southern occupy the rest of P. as far south as the Strait of Magellan. The two divisions, however, are much intermixed, and frequently intermarry. The question is often asked: 'Are the Patagonians of gigantic stature?' Mr. Musters' statement is: 'The average height of the Tehuelche male members of our party with which I traveled was rather over than under 5 feet 10 inches.' Two others, measured carefully by Mr. Clarke (while resident at Santa Cruz), stood 6 feet 4 inches each. The muscular development of the arms and chest is extraordinary, and in general the Patagonians are well proportioned. They are splendid swimmers, can walk great distances without being tired, and can go for two and even three days without being tired.

As an illustration of their strength of arm, Musters mention that he has seen them 'ball' an ostrich over seventy yards distant. The expression of their face is ordinarily good-humored, except in the settlements: their eyes are bright and intelligent, their noses aquiline and well formed, their foreheads open and prominent. The complexion of the men, when cleansed from paint, is a reddish brown. Thick flowing masses of long hair cover their heads, and are combed out by their wives at least once a day. The scanty natural growth of beard, mustaches, and even eyebrows, is carefully eradicated. The young women are frequently good-looking, displaying healthy, ruddy cheeks when not disguised with paint. The dress of the men consists of a *chiripa* or under garment round the loins, made of a poncho, a piece of cloth, or other material; a long mantle of hide worn with the fur inside, and drooping in unbroken outline from their shoulders to the ground; and potro boots or buskins made from the skin of horse's hock, and occasionally from the leg of a large puma. The dress of the women is similar, except that the under garment is made of calico or stuff sacque, and extends from the shoulders to the ancle. Both sexes are fond of ornaments, wearing huge ear-rings of square shape, suspended from small rings passing through the lobe of the ear; also silver or blue bead necklaces. The reason assigned for the use of paint is that it forms a protection against sun and wind, and Musters states that he 'found from personal experience it proved a complete preservative from excoriation or a chapped skin.'

The arms of the Tehuelches consist of gun or revolver; sword or dagger; a long, heavy lance, used only by dismounted Indians, and altogether different from the light lance of Araucanian and Pampa horsemen; and the *bola perdida*, or single ball, so called because once thrown from the sling, it is not picked up again.

Their houses, called *toldos*, are formed of three rows of stakes driven into the ground. The middle row is higher than the others, and the three rows are tied together with strings of hide, and so kept in their place. This frail framework is covered with hides which reach the ground on all sides, and are fastened to it by small stakes of bone. At night-fall, guanaco hides are spread on the ground within the tents, and the men and women, laying aside their mantle, their only garment, and which sometimes serves as a blanket, go to sleep under the same roof and in the same apartment. Bathing in cold water every morning, throughout the whole year, is a custom to which men, women, and children conform; and although the morning bath may not free them from vermin—a national characteristic—yet it has the effect of preventing disease, and of enabling them the more easily to endure the severities of winter. Their only manufactures are mantles of guanaco hide, and saddles, bridles, stirrups, and lassos. The lassos and the articles of harness are chiefly plaited, and evince wonderful ingenuity and nicety of execution.

The religion of the Patagonians (according to Mr. Musters) is distinguished from that of the Pampas and Araucanians by an absence of any trace of sun-worship. They believe in a great and good spirit who created the Indians and animals, and who dispersed them from a place which they call 'God's Hill;' but Mr. Musters is inclined to think that this belief owes its origin to a confused apprehension of the story of creation as told by the Christian missionaries. Curiously enough, this great and good spirit takes no concern with the beings whom he has created. Idols are unknown, and during the whole of his wanderings, Mr. Musters saw no trace of any periodic religious festival. Whatever religious acts the natives performed were prompted by their

dread of malicious demons, the chief of whom, Gualichu, is always on the watch to cause mischief. To propitiate or drive away this spirit is the function of the wizard, doctor, or medicine-man, who (as in other countries) combines the medical and magical arts. The Gualichu lurks outside the *toldos*. He is invisible (except to the 'doctor,' who has the gift of second-sight), and he can enter into the bodies of people, and cause sickness and disease of every sort. Besides the Gualichu, there are, as has been said, many other evil spirits, who are supposed to inhabit subterranean dwellings, underneath certain woods and rivers, and peculiarly shaped rocks, all of whom are saluted on occasion with special incantations. The cry of the nightjar on the Cordillera betokens sickness or death, a certain toad-like lizard mysteriously lames horses, a fabulous two-headed guanaco is a sure forerunner of epidemic disease, &c. To counteract the influence of these, charms and talismans are liberally employed.

Their language is quite different from either Pampa or Araucanian. 'Though able to converse in Tehuelche,' says Mr. Musters, 'I could not at all understand the Pampas; and this is noted with reference to statements made in M. Guinnard's work, which, coupled with other internal evidences . . . . compel me to doubt that the author was ever in the hands of the real Patagonians.' The same writer has a more favorable opinion of their character than is common. He found them 'kindly, good-tempered, impulsive children of nature, taking great likes or dislikes, becoming firm friends or equally confirmed enemies.' They are, however, 'steadily and rapidly decreasing,' through the combined effect of disease and bad liquor supplied to them by traders at the stations; and before long the race will be extirpated. The largest of these stations is Patagones (formerly El Carmen), at the mouth of the Rio Negro, in the extreme north-east of the country, and bordering on the Argentine territory. It has a population of about 2000, composed of Spanish and other settlers, negroes, and convicts from Buenos Ayres. At the mouth of the Chupat there was from 1865 till 1870 an unprosperous Welsh colony; at the mouth of the Santa Cruz, further south, there is also a petty station; and at Punta Arenas (Sandy Point), on the Strait of Magellan, the Chilian government have established a colony and a penal settlement.

See *At Home with the Patagonians, a Year's Wanderings*, by George Chaworth Musters (Lond. 1871); more recently, *Across Patagonia*, by Lady Florence Dixie (1880).

PATALA (from *pat*, fall) is, in Hindu Mythology, the name of those inferior regions which have seven, or, according to some, eight divisions, each extending downwards ten thousand *yojanas*, or miles. The soil of these regions, as the *Vishn'u-Purân'a* relates, is severally white, black, purple, yellow, sandy, stony, and of gold; they are embellished with magnificent palaces, in which dwell numerous Dânavas, Daityas, Yakshas, and great snake-gods, decorated with brilliant jewels, and happy in the enjoyment of delicious viands and strong wines. There are in these regions beautiful groves, and streams and lakes, where the lotus blows, and the skies are resonant with the kokila's songs. They are, in short, so delightful, that the saint Narada, after his return from them to heaven, declared among the celestials that P. was much more delightful than Indra's heaven. Professor Wilson, in his *Vishn'u-Purân'a*, says 'that there is no very copious description of Pâtâla in any of the *Purân'as;* that the most circumstantial are those of the *Vâyu* and *Bhâgavata Purân'as;* and that the *Mahâbhârata* and these two *Purân'as* assign different divisions to the Dânavas, Daityas, and Nâgas. . . . . The regions of the Pâtâla and their inhabitants are oftener the subjects of profane than of sacred fiction, in consequence of the frequent intercourse between mortal heroes and the serpent-maids. A considerable section of the *Vr'ihat-Kathâ* consists of adventures and events in this sub terraneous world.' For inferior regions of a different description, see NARAKA.

PATANJALI is the name of two celebrated authors of ancient India, who are generally looked upon as the same personage, but apparently for no other reason than that they bear the same name. The one is the author of the system of philosophy called Yoga (q. v.), the other the great critic of Kâtyâyana (q. v.) and Pân'ini (q. v.). Of the former, nothing is known beyond his work —for which see the article YOGA. The few historical facts relating to the latter, as at present ascertained, may be gathered from his great work, the *Mahâbhâshya*, or 'the great commentary.' The name of his mother was Gon'ikâ; his birthplace was Gonarda, situated in the east of India, and he resided temporarily in Cashmere, where his work was especially patronized. From circumstantial evidence, Professor Goldstücker has, moreover, proved that he wrote between 140 and 120 B.C. (*Pân'ini his Place in Sanscrit Literature*, p. 235 ff.). The *Mahâbhâshya* of P. is not a full commentary on Pân'ini, but, with a few exceptions, only a commentary on the Vârttikas, or critical remarks of Kâtyâyana on Pân'ini. 'Its method is analogous to that of other classical commentaries: it establishes, usually by repetition, the correct reading of the text, in explaining every important or doubtful word, in showing the connection of the principal parts of the sentence, and in adding such observations as may be required for a better understanding of the author. But frequently Patanjali also attaches his own critical remarks to the emendations of Kâtyâyana, often in support of the views of the latter, but not seldom, too, in order to refute his criticisms, and to defend Pân'ini; while, again, at other times, he completes the statement of one of them by his own additional rules.'

P. being the third of the grammatical triad of India (see PAN'INI), and his work, therefore, having the advantage of profiting by the scholarship of his predecessors, he is looked upon as a paramount authority in all matters relating to classical Sanscrit grammar; and very justly so, for as to learning, ingenuity, and conscientiousness, there is no grammatical author of India who can be held superior to him. The *Mahâbhâshya* has been commented upon by Kaiyyat'a, in a work called the *Bhâshya. Pradîpa;* and the latter has been annotated by Nagojîbhatta, in a work called the *Bhâshyapradîpodyota*. So much of these three latter works as relates to the first chapter of the first book of Pân'ini, together with the Vârttikas connected with them, has been edited at Mirzapore, 1856, by the late Dr. J. R. Ballantyne, who also gave a valuable literal translation of the first forty pages of the text.

PATA'PSCO, a river of Maryland, U.S., rises on the northern boundary of the state, and flows south-easterly 80 miles to the Chesapeake Bay, 14 miles south of Baltimore, to which city it is navigable. Its falls furnish water-power to numerous factories.

PATCHOU'LI. This very interesting material is the dried branches of *Pogostemon Patchouli* (natural order *Labiatæ*), which was first introduced to this country as an article of merchandise in 1844. The plant is a native of Silhet, the Malay coast, Ceylon, Java, the neighborhood of Bombay, and probably also of China; but owing to the fondness of Asiatics for the perfume which it yields, it is difficult to say where it is native or cultivated. Every part of the plant is odoriferous, but the younger portions of the branches with the leaves are chosen; they are usually about a foot long. The odor is peculiar and difficult to define, but it has a slight resemblance to sandal-wood; it is very powerful, and to many persons is extremely disagreeable. The odor of patchouli was known in Europe before the material itself was introduced, in consequence of its use in Cashmere to scent the shawls with a view of keeping out moths, which are averse to it; hence the genuine Cashmere shawls were known by their scent, until the French found the secret, and imported the herb for use in the same way. Its name in India is *Pucha-pat*, and it is there used as an ingredient in fancy tobaccoes, and as a perfume for the hair. It is also much prized for keeping insects from linen and woollen articles. The essence of patchouli is a peculiar heavy brown oil, with a disagreeably powerful odor; it is obtained by distillation, and requires extreme dilution for perfumery purposes.

PATE'LLA, or KNEE-CAP, is a Sesamoid Bone (q. v.), developed in the single tendon of the *rectus*, *vastus externus*, and *vastus internus* muscles—the greater extensor muscles of the leg. It is heart-shaped in form, the broad end being directed upwards, and the apex downwards. The anterior or external surface is convex, perforated by small apertures for the entrance of vessels, and marked by rough longitudinal striæ, while the posterior or internal surface is smooth, and divided into two facets by a vertical ridge, which corresponds and fits into the groove on the lower articulating surface of the femur or thigh-bone, while the two facets (of which the outer is the broader and deeper) correspond to the articular surface of the two condyles.



Fig. 1—Posterior surface of right Patella.

1, outer facet; 2, inner facet; 3, surface to which the ligamentum patellæ is attached.

This bone is liable both to dislocation and fracture. Dislocation may occur either inwards or outwards; but it is most frequent in the outward direction. The displacement may be caused either by mechanical violence, or by too sudden contraction of the extensor muscles in whose conjoined tendon it lies; and is most liable to occur in knock-kneed, flabby persons. It may be readily detected by the impossibility of bending the knee, and by the bone being felt in its new postion, and, except in one rare variety, the dislocation is capable of being reduced without any difficulty. Fracture of the patella may (like dislocation) be caused either by muscular action or by mechanical violence.

Fracture by muscular action is the more common of the two forms, and occurs thus: A person in danger of falling forwards, attempts to recover himself by throwing the body backwards, and the violent action of the extensors (chiefly the *rectus*) snaps the patella across, the upper fragment being drawn up the thigh, while the lower portion is retained *in situ* by that portion of the common tendon which is continued from the patella to the tubercle of the tibia, and which is called the ligamentum patellæ. The treatment consists in relaxing the opposing muscles by raising the trunk, and slightly elevating the limb, which should be kept in a straight position. In consequence of the great difficulty of bringing the broken surfaces into exact apposition, as may be readily understood from the accompanying figure, it is very difficult to obtain bony reunion of the parts, and the case generally results either in mere ligamentous union or in no true union at all.



Fig. 2.
a, *rectus* muscle; *b*, *vastus externus* muscle; *c*, ligamentum patella; *d*, external condyle of right femur; *e*, head of tibia; *f*, head of fibula.

PATELLA and PATELLIDÆ. See LIMPET.

PA'TEN (Lat. *patina*, a dish), the plate employed for the elements of bread in the Eucharistic service. Anciently it was of considerable size; and while the practice of the OFFERTORY (q. v.) continued, there was a special paten for the bread-offering. In the Roman Catholic Church, in which the unleavened wafer-bread is used, and the communion is distributed from a distinct vessel called PYX (q. v.), the paten is a small circular plate, always of the same material with the chalice. It is often richly chased or carved, and studded with precious stones. It is used only in the mass.

PA'TENT is an exclusive right granted by the crown (in letters *patent* or open, whence the name) to an individual to manufacture and sell a chattel or article of commerce of his own invention. The policy of the present law of patents has latterly been much canvassed, and it has been suggested that, instead of the present monopoly, with the drawback of litigation to which it uniformly gives rise, the use of all inventions should be dedicated to the public at once, and the inventor rewarded by a pension from the state, according to the merits and utility of the invention. The present law allows the inventor to have a monopoly of his invention for fourteen years, with a further privilege at the end of that time, provided he has not been sufficiently remunerated, to have the patent renewed for a further term of fourteen years. That some mode of rewarding the individual whose perseverance and ingenuity have enabled him to discover a new invention should be established, is universally admitted, but whether it should be at the expense of that part of the public who are purchasers, and therefore benefited by his discovery, or by the public at large in the shape of a pension, is a matter still undecided. The evils of the present law are that there is a great deal of uncertainty in the mode of ascertaining what is a new invention. Hence, when a patent has been granted, if it is of such a nature as to lead to competition, infringements are almost matters of course, and the only mode of discovering and checking the infringement is so tedious, costly, and ineffective, that inventors generally pass their lives in constant litigation, fighting in detail a succession of imitators who often have nothing to lose by defeat, and therefore entail all the greater burden on the legitimate manufacturer.

It has been said that not more than three patents per cent. are remunerative. A royal commission has latterly been engaged in inquiries as to the best mode of remunerating inventors, and improving the law in reference to infringements; but it is doubtful how far the subject is capable of being put on a better footing, so many difficulties being inherent in it. The crown seems always to have enjoyed the prerogative right to grant monopolies, and this had been so greatly perverted in the time of Elizabeth, that the popular clamor led to a statute in the following reign, having for its object to prevent the crown in future making any grants of that kind which should be prejudicial to the interests of trade. By that act an exception was expressly made in favor of new inventions. At first the judges construed grants of monopoly to inventors very strictly; but afterwards it was seen that they were for the benefit of trade, and were dealt with more liberally. An important modification of the law was introduced by a statute of Queen Anne, which required every inventor to describe in detail the nature of the invention in an instrument called a specification. Another statute of 5 and 6 Will. IV. c. 83, further altered the law by allowing parties who had a difficulty in separating what was new from what was old in their invention to enter an express disclaimer of that part which was not new. But the most important alteration was made in 1852, by the statute of 15 and 16 Vict. c. 83, which reduced the fees, and otherwise improved the practice attending the obtaining of patents for the United Kingdom. Before stating shortly the substance of this act, it may be observed that there has always been a difficulty in defining what is an invention that is patentable—a difficulty which no act of parliament can get rid of, for it is inherent in the subject-matter. It has been held that a patent must be not merely a discovery of a new substance or article of food, but it must be a combination of processes producing some new result, or an old result by different means. It is of the essence of the patent that it be entirely new, that is, that it should not have been described in a published book, or well known in the business of the world, nor publicly used before. The specification must give a full disclosure of the secret, and describe it so that an intelligent person could from the description make the article itself.

There is a patent-office in London, in Edinburgh, and in Dublin, but the Scotch and Irish offices have long been used only as places for inspecting copies of patents, specifications, and documents. From 1852 till the new Act of 1883 came into force, the commissioners of patents were the Lord Chancellor, Master of the Rolls, Attorney and Solicitor General of England and Ireland, and the Lord Advocate and Solicitor-General of Scotland. The inventor first presented a petition for a grant of letters-patent, accompanied by a statement in writing of the specification, a copy of which was left at the patent-office. The application was referred, as a matter of course, to one of the law officers of the crown, who might call to his aid a scientific person to be paid by the applicant. A provisional patent might be applied for in the first instance, and the complete patent deferred for six months—the patent dating from the first application. After a patent was granted, and had been in existence for three years, a fee of £50 fell to be paid; and, at the end of the seven years, a fee of £100. The letters-patent extend to the whole of the United Kingdom. The practice with reference to patents, especially as to the drawing of the specification, was too minute to justify an inventor to attempt to take out a patent without professional aid; and a class of persons called patent agents (a business for which no qualifications were required by any constituted authority) devoted themselves to this branch of business—their charges (often exorbitant) being generally ascertained by estimate beforehand. The fees payable to the law officers were as follows: On leaving petition for grant of letters-patent, £5; on notice of intention to proceed with application, £5; on warrant of law officer for letters-patent, £5; on sealing of letters-patent, £5; on filing specifications, £5; at or before expiration of third year, £50; at or before expiration of seventh year, £100. Besides these fees, if opposition was entered to the grant, additional fees were incurred, both by the party applying and the party opposing.

At the date of the passing of the Patents, Designs, and Trade Marks Act of 1883, there were nine acts on patents more or less fully in force; and six others on copyright of designs. Now the management of this branch of the public service is put under the Science and Art Department, and the new responsible official, called the Comptroller of Patents, is an officer of the Board of Trade—from whose decisions, however, there is in certain cases an appeal to a court comprising some of the chief law officers of the crown. There is a paid examiner of patents, to whom applications are first submitted. Heretofore, seven different applications were necessary; now one suffices, and that may be sent through the post. The formulas are simplified, with the hope of enabling the patentee to dispense with the services of patent agents. In contrast with the scale of fees given above, the charges under the new law are: £1 paid down at once, when the provisional specification is lodged at the Patent Office; £3 more after nine months, when the final specification is passed by the Comptroller, and sealed; £50 after the fourth year; and £100 after the ninth. The latter two payments may be made in annual instalments. (The Board of Trade has power hereafter to reduce the fees, on obtaining the consent of the Treasury.) A register of patents is to be kept, and an Illustrated Journal of Patents officially published. Patents, as formerly, hold for 14 years, and extend to the whole of the United Kingdom.

A patent obtained in this country does not extend to the colonies, but several of the colonies have machinery for granting patents for a like period. In the United States, patents are granted for a term of 17 years. In France, the term is 5, 10, or 15 years, at the option of the applicant; in Prussia, for 15 years; in Russia, for 3, 5, or 10 years; in Spain, for 5, 10, or 15 years; in Belgium, for 20 years; in Holland, for 5, 10, or 15 years; in Austria, not more than 15 years; in Sardinia, 15 years. In all cases, fees are exigible from the patentee. See PATENT LAWS and PATENT OFFICE.

PATENT LAWS. Since the introduction of the amended Patent Law in 1852 (see PATENTS), many manufacturers have boldly advocated the abolition of the patent system altogether;

on the plea, that the good results, whatever they may be, are overbalanced by the bad. The great majority of advisers, however, call for further reform, not abolition. The Economic Section of the British Association has discussed this matter during a long series of years. The Society of Arts, also, have had many discussions on the subject; and the arguments *pro* and *con.* will be found at length in the *Transactions* of these bodies. The various Chambers of Commerce throughout the kingdom have likewise debated the subject at length. The actual operation of the system may be briefly illustrated. Mr. Bennett Woodcroft, in 1864, examined 100 patents out of those which had been applied for in 1855. Of the 100, he found 96 frivolous in character, of little or no value as to the merit of the inventions; 4 of moderate value; and not one of striking promise. Out of the 100 applications, 70 patents were granted, of which one became void at the end of six months, 51 more at the end of three years, and 15 more at the end of seven years—because the patentees declined to pay the successive instalments of fees. There were therefore, in 1863, only 3 patents left out of the 100 which had been applied for in 1855. Mr. Woodcroft finds that about the same ratio is exhibited in the whole of the 3000 or so applied for every year. In 100 of the average applications in 1858, he pronounced that there was not one invention of much value, 3 of some, and 97 of little or no value. In 1862, he found 1 of much, 1 of some, and 98 of little or no value. As to statistics of actual numbers, see PATENT OFFICE, LIBRARY AND MUSEUM.

In 1862, a royal commission was appointed to consider the whole subject of the patent laws, and to suggest alterations which might be useful. The commission collected evidence in that and the two following years, and made its Report in 1864. Other commissions and committees have made later inquiries, and offered suggestions founded on the evidence collected; but the opinions expressed, on almost every point, are most conflicting. The divided opinion of practical men has hitherto discouraged any attempt to legislate on their recommendations; and the act of 1852 remains still in force.

PATENT OFFICE LIBRARY, AND MUSEUM. The present organization of these establishments arose mainly out of the act relating to *Patents* (q. v.) passed in 1852. Rooms were rented in Southampton Buildings, London, for the office as reorganized; a superintendent of specifications was appointed; and a plan was adopted for making the system as useful to the public as possible.

The Office.—All the specifications of patents from the earliest date were examined, and minutely classified according to their contents. The patents from 1711 to 1852 were found to amount to the large number of 12,977; and the specifications of the whole of these were printed between 1853 and 1858. There were a few of earlier date, between 1617 and 1711, but none in so complete a form as to render them worth printing. The whole fill many hundred quarto volumes, with the lithographed illustrations bound in separate folio volumes. The expense of the whole undertaking—for paper, printing, and lithographing—was £92,000; the number of copies printed was small; but any single specification can be reprinted if a demand for it should arise. The next work was to utilize this immense collection by a thorough system of indexing. Three indexes were prepared—*Chronological*, *Alphabetical* (according to the names of the inventors), and *Subject-matter*. Arrangements were at the same time made for printing and indexing the specifications of all patents obtained under the new law (1852); and this has been done year by year. (The total number of patents from 1617 to 1878 exceeded 100,000.) These specifications are sold to the public at the price of paper and print, varying from 1½*d*, to about 4*s*., averaging about 8*d*. each. The printing and publishing are completed within three weeks of the time when each final specification reaches the hands of the superintendent. Any copy of any of these, if stamped and certified, is received in any court of law or equity in the kingdom, in evidence of the patent to which it relates, without the necessity of producing the original document itself.

There are generally over 4000 petitions for new patents every year; about 800 of the petitioners usually fail to give notice of their intention to proceed, and 200 more fall away before the actual sealing of the patent; so that, roughly speaking, about 3000 specifications of patents are added to the list every year. Of this number, not more than 500 to 600 over-live three years. In 1878, 5343 applications for patents were made; but 1905 of these lapsed during the year, for various reasons. The old and new specifications from 1711 to 1878, amounting to 110,334, have all been printed and published. These works are acquiring ever-increasing value as standards of reference for intending patentees. To render the new specifications equally available with those of older date, three indexes are prepared for each year's collection, of the kinds already described. There has also been prepared a *reference* index to the whole series. In 1871, a new plan was adopted, of publishing weekly abridgments of the specifications of new patents: dispensing with any further alphabetical and subject-matter indexes. Besides this, abridgments have been drawn up of most of the specifications, and will be eventually of all: setting forth, in a few words, the general nature of the invention. These abridgments are collected into 12mo volumes, one or more to each class of subjects; and the volumes are sold at 6*d*. to 10*s*. each, according to their bulk. At the end of 1878, there were 115 volumes of these useful works, relating to no less than 94 groups or classes of abridgments. By reference to one of these handy volumes, or to the *Subject-matter* index, an inventor can see whether any person has preceded him in the particular subject for which he desires a patent.

The Library and Reading-room.—Special arrangements are made to render the specifications, and all that relates to them, as available as possible to the public. Complete sets of the printed specifications, indexes, &c., have been presented to universities, government offices, provincial towns, colonies, and foreign governments; and partial sets to 300 mechanics' institutes and scientific and literary societies. A complete set comprised in 1880 above 3600 volumes, from folio to 12mo, and cost no less than £3500 for paper, printing, and lithographing; about 160 of these complete sets have been presented. At the head office in Southampton Buildings, a Reading-room has been provided, open to such of the public as may wish to consult the specifications at their leisure. But besides this, the commissioners have gradually become possessed of a large and valuable collection of scientific and technical books and periodicals, to which additions are every year made by purchase. A new Library and Reading-room, occuping the upper part of the old building, has been constructed at a cost of £15,000, and was finished and opened in 1867. All the scientific and technical works of the Library of 80,000 volumes, as well as the specifications of the patents, may here be consulted.

The Museum.—The commissioners having come into possession, by gift and otherwise, of several models illustrating patented inventions, had no place of their own to deposit them for preservation and exhibition. But an arrangement was made with the authorities at South Kensington for the reception of these models; and, greatly augmented by specimens, drawings, diagrams, and portraits, the Patent Museum now occupies a site adjacent to the South Kensington Museum.

The commissioners have for many years sought permission to erect a large and handsome building to accommodate the whole of their departments—offices, Library, Reading-room, and Museum. They possess the pecuniary means, but lack the authority. Their receipts exceed £100,000 a year, in the form of fees from patentees; and after a very liberal expenditure for salaries, superannuation allowances, editing, compiling, printing, purchase of books and periodicals, &c., there is a considerable surplus. A clause in the act of 1852 prevents them from buying land and erecting buildings without the consent of the Treasury. One suggestion made by the commissioners is for permission to build in a new street to be formed from the Horse Guards to the Thames Embankment; and another is, that the new building should be on the Embankment itself, a still more prominent site.

PA'TERA (Lat.), a round dish, imitations of which were carved



Patera.

by the Romans in the panels of their ceilings, &c. The name is also applied to the foliated ornaments used in the same position.

PATE'RCULUS, C. VELLEIUS, a Roman historian, born about 19 B.C. He served under Tiberius, as prefect or legate in Germany, Pannonia, and Dalmatia; and in 14 A.D. was appointed prætor. He was alive in 30 A.D. P.'s claim to remembrance is his *Historiæ Romanæ*, a compendium of universal, but more particularly of Roman history, in two books. The work, as we have it, is not complete; the beginning, and a portion following the 8th chapter, being wanting. The work is, on the whole, impartial and discriminating; its style is based on that of Sallust. The *editio princeps* appeared at Basel in 1520.

PATERE'ROS, were small pieces of ordnance, now obsolete, worked on swivels; most commonly used on board ships, where they were mounted on the gunwale, and discharged showers of old nails, &c., into hostile boats.

PATE'RNO (anc. *Hybla Major*), a town of Catania, Sicily, 11 m. N.W. by W. from Catania, at the southern base of Mount Etna. Near P. are salt-springs and a salt-mine. Pop. (1871) 14,790.

PA'TER-NO'STER (Lat. 'Our Father'), called also THE LORD'S PRAYER, a short form of prayer suggested or prescribed by our Lord to his disciples (Matt. vi. 9—13, Luke xi. 1—4) as the model according to which, in contrast with the prayers of the Pharisees, their petitions ought to be composed. The Pater-Noster has been accepted as, by excellence, the form of Christian prayer. It formed part of all the ancient liturgies. So sacred, indeed, was its use, that it was reserved from pagans and catechumens under what is known as the Discipline of the Secret. The early fathers—Origen, Tertullian, Cyprian—refer to it in terms which show that even then it was a recognized form of private prayer. It was recited in baptism, and one of the privileges of the baptized was the use of the Pater-Noster. More than one of the fathers, and very many later writers, have devoted special treatises to the exposition of this prayer, as embracing all the fitting and legitimate objects of the prayer of a Christian. The Catechism of the Council of Trent contains a detailed exposition and commentary of it, and in all the services, not only of the Roman Missal, Breviary, Ritual, Processional, and Ordinal, but in all the occasional services prescribed from time to time, it is invariably introduced. In the Rosary (q. v.) of the Virgin Mary, it is combined with the Hail Mary (whence the larger beads of the 'Rosary' are sometimes called *Pater-Nosters*), and perhaps the most usual of the shorter devotions among Roman Catholics is the recitation of the 'Pater,' with one or more 'Ave Marias,' concluding with the Doxology. The Pater-Noster as commonly used by Protestants concludes with the clause, 'for Thine is the kingdom, and the power, and the glory for ever. Amen.' This clause is not used by Roman Catholics. Of the two gospels—that of Matthew and that of Luke—in which the prayer is contained, that of Luke has not this clause; and even in the Gospel of Matthew it is found only in the later MSS., in which it cannot be doubted that it is a modern interpolation. It was retained, however, in Luther's German translation, and in the Authorized Version, whence its use became common among Protestants.

Many polyglot collections of the Pater-Noster have been published from the 16th c. downwards, the most remarkable of which are those of John Chamberlayne in 150 languages (1715), of Conrad Gesner in 200 (1748), and that of Padre Hervaz in 307 (1787).

PA'TERSON, a city of New Jersey, U.S., at the falls of the Passaic River, on the Morris Canal, and New York and Erie Railway, 17 miles north-west of New York, a city with 25 corporations or firms engaged in the manufacture of silk, machine factories, paper-mills, and factories of carriages, cotton, flax, hemp, &c., to which the falls of the Passaic furnish water-power. The manufacture of locomotives is conducted on an extensive scale. The city contains county buildings, an academy, 2 banks, 6 newspapers, and 39 churches. Pop. (1870) 33,579; (1880) 50,887.

PATERSON, WILLIAM, the most celebrated, after John Law (q. v.), of the commercial schemers of the 17th c., was, like Law, a Scotchman, and was born in the parish of Tinwald, Dumfriesshire, in 1658. His early career is obscure, but before he was thirty he was a merchant, carrying on considerable transactions with the West Indies and other countries. It was he who first projected the Bank of England (incorporated in 1694), and he was one of the original directors. He is best known, however, in connection with the famous Darien Scheme (q. v.), of which he was the prime mover, and which obtained the royal sanction in 1695. This project came to ruin in a few years; but the scheming activity of P. continued unabated. When in 1701 William resolved to carry the contest with Louis XIV. into the heart of Spanish America, P. was taken into the king's confidence, and, but for that monarch's death, might have seen his dreams of Darien realized. He had a considerable hand in the union of Scotland with England, and was elected to the first united parliament by the Dumfries burghs. By a special act of parliament in 1715, he was awarded £18,241 as idemnity for his losses by the Darien Scheme; but he did not long live to enjoy it, for he died in 1719.—See *W. Paterson*, by S. Bannister (1858); *The Birthplace of W. P.*, by W. Pagan (1865).

PATHOLO'GICAL ANATOMY, or the anatomy of diseased organs, is included in, but must not be confounded with pathology, as until comparatively lately was often the case. It is merely a section—although a most important section—of pathology, contributing (as Professor Vogel has well remarked) 'to practical medicine the solid materials from which to construct a basement, without having the power to erect a perfect edifice.' Pathological anatomy enables the surgeon to decide whether a suspicious tumor is malignant or of a comparatively harmless nature, and in many other ways is of the greatest importance to surgery; and although at first sight it might appear to be of small importance in relation to Therapeutics, this is not in reality the case. Scientific treatment necessarily demands an accurate knowledge of the material changes which lie at the foundation of the various morbid symptoms. Hence pathological anatomy not only forms a portion of the positive basis of Therapeutics, but it also points out the processes by which the different altered parts may be gradually restored to their normal condition. It not merely indicates what requires healing, but in many cases also the course that must be be adopted in order to aid the curative tendency of nature. It likewise serves as a check on therapeuctics, exposing in a most conclusive manner, the absurdity of many pretended methods of cure. It points out, for example, that in a certain stage of inflammation of the lungs (Pneumonia) a fibrinous fluid separates from the blood, and by its coagulation renders a portion of the tissue of the lung impermeable to air; and further that it requires several days for this coagulated matter to resume the fluid condition and to be removed. If any one should assert—and such assertions have often been made—that in this stage of the disease he could apply a remedy which would cure the patient in a few hours, a very slight knowledge of pathological anatomy would show the folly of such an assertion. The best English works on this subject are Vogel's *Pathological Anatomy of the Human Body*, and Jones and Sieveking's *Manual of Pathological Anatomy*.

PATHO'LOGY (from the Gr. *pathos*, disease, and *logos*, a discourse) is that department of medicine, which treats of the doctrine of morbid actions or diseases. In this country the term is so far restricted as not to include the causes, treatment, &c., of diseases, but the most eminent French and German writers regard it as equivalent to 'the Theory and Practice of Medicine,' and consider it as treating not only of the classification, causes, symptoms, and physical signs of diseases, but as also including their seat, the phenomena which precede and follow them, their progress, their duration, their modes of termination, the different forms in which they occur, their complications, the changes to which they give rise in the solids and fluids of the body, and their treatment.

PA'TMOS, a bare and rocky island in the Ægean Sea, about 45 miles in circumference. It belongs to the group called the Sporades, lies to the south of Samos, and is now called Patino, but in the middle ages *Palmosa*, although there is now only one palm-tree in the whole island. It is celebrated as the place to which the apostle John was exiled, and where he saw the visions recorded in the Book of Revelation. On the top of a mountain stands the famous monastery of 'John the Divine,' half way up to which a cave is pointed out to the traveler in which, according to tradition, the apostle received his revelations. See Ross's *Reisen auf den Griechischen Inseln des Agäischen Meeres*, and Guérin's *Description de l'Ile de Patmos*, &c. (Paris, 1856).

PA'TNA, or more correctly, PATTANA (i. e., the town), an important trading town of Hindustan, chief town of a British district and division of the same name in Bahar, Presidency of Bengal, stands on the right bank of the Ganges, and 397 miles by land N.W. of Calcutta. The city proper, forming a quadrangle, extends a mile and a half along the river-side, and is half that extent in breadth. P. is generally supposed, however, to include the suburbs, which stretch on each side of it, on the S. bank of the Ganges. The European quarter is on the W. of the town proper. Here are a church, chapel, Roman Catholic cathedral; government offices; school; the Nabob's palace; the great tank; and several noteworthy mosques and tombs. The streets of P. are covered with mud and slime in winter, and its air is thickly impregnated with choking dust in summer. Pop. (1871) 158,900.

P., under the former name of *Padmavadi*, is supposed to have been the capital of Bahar, 419 years B.C. Here, at an early period, the English established factories, and traded in opium, rice, &c. In 1763, disputes about transit-duties arose between the Company's servants and the native government. A war ensued, resulting in the British taking possession of the district. P. was the headquarters of the Wahabi or Mussulman conspiracy in 1864. Chief seat of the opium trade; trade also in table-linen, wax-candles, toys, bird-cages, and talc-pictures.—The division of P. has an area of 23,732 sq. m., and a pop. of (1872) 13,122,743; the district, an area of 2101 sq. m., and a pop. of 1,559,638.

PATOIS (of uncertain derivation), the French term applied to corrupt dialects of a language spoken by the uneducated. See DIALECT.

PATON, SIR JOSEPH NOEL, R.S.A., one of the most distinguished living Scottish artists, was born in Dunfermline in 1823. It is understood that in early life he employed himself in making designs for the damask manufacturers of his native place, and for the muslin and lace embroiderers of Paisley. He, however, soon turned his attention to the walk of art proper, and his cartoon sketch, 'The Spirit of Religion,' gained one of the three premiums at the Westminster Hall competition in 1845. Two years thereafter, his oil-picture of 'Christ bearing the Cross,' and his 'Reconciliation of Oberon and Titania,' jointly gained the prize of £300. He subsequently executed a companion-picture to the 'Reconciliation,' entitled the 'Quarrel of Oberon and Titania;'

and both now adorn the Royal Scottish Academy's galleries in Edinburgh. These pictures made the artist's reputation. Although somewhat hard and dry in color, and without any retiring and shadowy depth, they are full of brilliant fancy; and the multitudes of figures, and the variety of fairy incident, affect the spectator much in the way that the constant sparkle of Congreve or Sheridan affects the reader. He has since painted much more simply and powerfully. 'Dante Meditating the Episode of Francesca,' was exhibited in Edinburgh in 1852; and the 'Dead Lady,' a work of great and solemn pathos, in 1854. In 1855, his great picture, 'The Pursuit of Pleasure,' was exhibited in that city, where it was much criticised and much admired. He has since painted 'Home from the Crimea,' a *replica* of which is in the possession of Her Majesty; and 'In Memoriam,' a scene from the Indian mutinies; and for the Association for the Promotion of the Fine Arts in Scotland, a series of picture-illustrations of the 'Dowie Dens o' Yarrow.' Among his other pictures of importance are 'Dawn: Luther at Erfurt,' 'The Fairy Raid,' 'Faith and Reason,' 'Gethsemane,' 'Christ and Mary at the Sepulchre,' 'The Man of Sorrows,' 'Mors Janua Vitæ,' 'The Spirit of Twilight,' 'Thy Will be Done' (1879), &c. Many of his works have been engraved, and are deservedly popular. Along with his brother he illustrated Aytoun's *Lays of the Scottish Cavaliers*, and in 1864 he executed twenty illustrations of the *Ancient Mariner*. P. was appointed Queen's Limner for Scotland in 1865, received the honor of knighthood in 1867, and in 1876 was made LL.D. by Edinburgh University. He has published two volumes of poems.

PATO'NCE, Cross, in Heraldry (Lat. *patens*, expanding), a cross with its terminations expanding like early vegetation or an opening blossom.



Patonce.

PA'TOS, Lago des. See Rio Grand do Sul.

PATRAS (ancient *Patræ*, Turk. *Baliabadra*), a fortified seaport, and the most important trading town in the west of Greece, in the government of Achaia and Elis, stands on the eastern shore of the gulf of the same name, 12 miles south-south-west of Lepanto. It is overlooked by the strong citadel—on the site of the ancient Acropolis—crowning a ridge, on the southern slopes of which the ancient city, as well as the modern one before the revolution, was built. The P. of to-day stands on a level space close to the sea. The plain of P. is exceedingly valuable for the currants grown, and which are the most important export of the town. Its harbor, though protected by a mole, is unsafe, and exposed to heavy seas. Earthquakes frequently occur, and most of the houses are on that account only of one story. Capotes are made here of mixed wool and goat's hair; and, besides currants, oil, valonia, raw silk and cotton, wool, hides, wax, &c., are exported. P. is by far the most important commercial town on the continent of Greece, though it suffered severely during the Greek revolution. Pop. about 24,000.

Patræ is the only one of the 'twelve cities' of Achaia which still exists as a town; but most of its relics have been swept away by earthquake and revolution.

PA'TRIA POTE'STAS is the term used to express the power which the civil law gave to the Roman father over his children, and which has been the foundation of the greatly modified paternal authority recognized in modern systems of jurisprudence. The right of a parent to control his child not come to years of discretion is a part of natural law, but the more extensive *patria potestas* of the Romans was probably a relic of those early times in which families, or tribes considered as families, led a wandering pastoral life in dread of each other, under the guidance of a chief, whom it was necessary to invest with an almost unlimited authority.

By the Roman law, the *patria potestas* was acquired naturally, by the birth of a child in wedlock, or civilly, by legitimation or adoption. An unemancipated son or daughter, a grandchild by a son, or any other descendant by males, was viewed as a part of the parent's property. In early times a father had the power of life and death over his children: by the Laws of the Twelve Tables he could sell them as slaves, or could transfer them to another family by adoption. Under the republic, the despotic authority exercised by fathers over their offspring was practically limited to a considerable extent by the censors, and several emperors issued constitutions to restrain the cruelties often perpetrated by fathers towards their children. First the right of sale, and then that of life and death was taken away. Alexander Severus restricted the right of the father to moderate chastisement, and Constantine declared that the father who should kill his son was to be held guilty of murder. By the early Roman law, the son, being in his father's power, could not acquire property for himself; his acquisitions all belonged to his father; hence he was incapable of making a testament. There were, however, particularly in later times, modes by which he could acquire *peculium*, or property which should be independent of his father. A father might give his son property to trade on, which would be his own; and latterly a son acquired for himself whatever he gained in military service, or by the discharge of certain civil functions. In all matters belonging to the *jus publicum* a son was independent of his father; he could vote at the elections, hold the most important offices of state, or command the army. He could also be a tutor, tutory being considered *munus publicum*. In later times, a son promoted to the consular dignity ceased to be under the restraints of paternal control, but, unlike an emancipated son, he retained his rights of succession. Lawful children were entitled to aliment from their parents; an obligation attached in the first instance to the father and mother, and, failing them, to the grandfather. Until the time of Justinian, illegitimate children had only a claim for support against their mother; that emperor gave them a right to demand aliment from their father.

In no modern system has the paternal power been carried so far as under the Roman law. According to the French 'Code Civile,' a child is under the authority of his parents till majority or emancipation; up to that time he cannot quit the paternal residence without leave of his father, except for enrolment in the army at 18 years of age. Majority is attained at the age of 21, but a minor is emancipated by marriage. At 15, a minor may be emancipated by his father, or, if his father be dead, by his mother, by a simple declaration before a magistrate. The father possesses somewhat extensive powers of chastisement. He may obtain a warrant to arrest his child under 16, and detain him in prison for a month; and an order may be obtained for the incarceration for six months of a child above 16, on cause shown to the satisfaction of the magistrate. Parents are entitled to the usufruct of their children's property till the age of 18 or emancipation, subject to the burdens of maintenance and education; but this right does not extend to property acquired by the industry of the children, or bequeathed by a stranger under the condition of an exclusion of parental interference.

By the law of England, a father is guardian to his lawful children in minority, though this right ceases to some extent at 14. He has the power of moderate chastisement. As guardian, he receives the rents of any real estate which the child may possess, which he must account for when majority is attained. The paternal power never extends beyond majority, and to some effect, marriage acts as an emancipation. A father may by deed appoint a guardian to such of his children as are unmarried at his death till they attain majority.

In Scotland a father has a general control over the persons of his children during pupilarity; that is, till the age of 14 in the case of sons, and 12 in the case of daughters. He may fix their place of residence, direct their education, and inflict reasonable chastisement. The limits of the *patria potestas* as regards children who have attained puberty, but are under 21 years of age, are not very exactly defined; but it seems to be understood that in ordinary circumstances minors are not entitled to choose their own place of residence in defiance of paternal authority. The father is administrator-in-law, and tutor and curator of his children, unless in the case of an estate left by a stranger and placed under separate management. This guardianship ceases on majority, or on the marriage of a daughter.

PA'TRIARCH (Gr. *patriarches*, the head of a tribe) is the name given to the heads of the families in the antediluvian period of Scripture history, and is still more familiar as the designation in Jewish history of the three progenitors of the Jewish people, Abraham, Isaac, and Jacob. In the later history of the Jews, too, after the destruction of Jerusalem, the name was used to designate the heads of the Sanhedrim, one of whom, the patriarch of the west, resided at Tiberias, in Galilee, and the other, the patriarch of the Eastern Jews, at Babylon. The most familiar use of the word, however, is in the history of the Christian church. It is the name given to the bishops of certain great Metropolitan (q. v.) Sees, who not only held rank beyond other metropolitans, but also enjoyed a jurisdiction almost identical with that of the metropolitan in his own province over all the metropolitans themselves (with their provinces) included in their district, which was called a Patriarchate. The name patriarch originally seems to have been given commonly to bishops, or at least was certainly given in a less special sense than what it eventually assumed; nor can the date at which the title first assumed its now received use be exactly determined.

It is certain, however, that the name and the office were both recognized before the Council of Nice, at which time, as we learn from the sixth canon, the patriarchal sees, acknowledged by 'ancient customs' were three in number, Rome, Antioch, and Alexandria. After the translation of the seat of empire to Byzantium, thenceforward called Constantinople, that see, originally subject to the metropolitan of Heraclea, obtained, first metropolitan, and afterwards patriarchal rank; and eventually established a precedency over the patriarchs of Antioch and Alexandria, being second only to Rome. The contests between the

patriarchs of Rome and Constantinople were among the chief causes of the GREEK SCHISM (q. v.). To these four patriarchates was added a fifth, in the year 451, that of Jerusalem, which was formed out of the ancient patriarchate of Antioch. The limits of these five patriarchates can only be loosely assigned. The authority of a patriarch was, in the main, that of a metropolitan, but extended over the metropolitans themselves. He had a right to consecrate the metropolitans, and to preside over the councils of his patriarchate. After the Greek Schism, and particularly after the establishment of the Latin Kingdom of Jerusalem, Latin prelates were appointed with the title and rank of patriarch in the four great Eastern sees. It was hoped that the union of the churches, effected at the Council of Florence, would have put an end to the contest thus created; but that union proved transitory, and the double series of patriarchs has been continued to the present day. The Nestorian and Eutychian sections of the Eastern Churches, too, have each their own patriarch, and the head of that portion of the former, which in the 16th c. was reconciled with the Roman see, although known by the title of *Catholicos*, has the rank and authority of patriarch. After the separation of the Russian Church from that of Constantinople, the name and authority of the metropolitan in the end was transformed into that of patriarch. But the office was suppressed by Peter the Great.

Besides these, which are called the Greater Patriarchates, there have been others in the Western Church known by the name of Minor Patriarchates. Of these the most ancient were those of Aquileia and Grado. The latter was transferred to Venice in 1451; the former was suppressed by Benedict XIV. France also had a patriarch of Bourges; Spain, for her colonial missions, a patriarch of the Indies; and Portugal a patriarch of Lisbon. These titles, however, are little more than honorary.

In the non-united Greek Church, the ancient system of the three patriarchates of Constantinople, Antioch, and Jerusalem is nominally maintained, and the authority of the patriarchs is recognized by their own communion. But the jurisdiction-limits of the patriarch of Constantinople, who is acknowledged as the head, have been much modified. The Russo-Greek Church withdrew from him partially in the 17th, and finally in the 18th century. That of Greece proper has been practically separated since the independence of the kingdom of Greece; and some years since it formally declared its independence. The patriarchs of Jerusalem and Antioch have few followers of their own rite.



Patriarchal Cross.

PATRIARCHAL CROSS, a cross which, like the patriarchal crosier, has its upright part crossed by two horizontal bars, the upper shorter than the lower. A cross patriarchal fimbriated or was a badge of the Knights Templars.

PATRI'CIAN (Lat. *patricius*, from *pater*, father), a name given to the members of Roman *gentes*, of whom the *populus Romanus* consisted, and to their descendants by blood and adoption. *Patres* and *patricii* were in the early days of Rome synonymous; they were so named from the *patrocinium* which they exercised over the whole state, and all classes of whom it was composed. Niebuhr's researches have established that, until the *plebs* became a distinct order, the patricians were the entire citizens or *populus* of Rome; a select number of them were senators; and the original inhabitants, reduced to a condition of servitude, were known by the name of *clientes* or *plebs*. The amalgamation of the three tribes of Ramnes, Tities, and Luceres, gave rise to a distinction between *patres majorum gentium* and *patres minorum gentium*—the latter term being applied to families recently elevated to an equality with the old patrician class. On the establishment of the plebeians as a distinct order, sharing certain rights with the patricians, the patriciate became an aristocracy of birth, in the exclusive possession of a number of important privileges. A long struggle between the two orders ended in the attainment by the plebeians of a political equality, and the establishment of a new aristocracy of *nobiles* based on wealth and office. Under Constantine, the dignity of *patricius* became a personal title; not hereditary, but conferring very high honor and certain privileges. It was created at Constantinople, and not confined to Romans or subjects of the empire, but sometimes bestowed on foreign princes. These patricians, unlike the old Roman order, were distinguished in dress and equipage from the ordinary citizens. The popes in after times conferred the same title on eminent persons and princes, including many of the German emperors. In several of the Germanic kingdoms the title of patrician was bestowed on distinguished subjects; and in some parts of Italy the hereditary nobility are still styled patricians.

PATRICK, ST., a distinguished missionary of the 5th c., commonly known as the Apostle of Ireland. There is some uncertainty as to the date and place of his birth. The year of his birth is variously assigned to the years 377 and 387, of which the latter, if not even a later date is more probable. Of the place, it is only known for certain, from his own confession, that his father had a small farm near Bonavem Taberniæ; and in one of the ancient lives he is said to have been born at Nemthur. Arguing on these data, connected with other collateral indications, some writers assign his birthplace to the present Boulogne-sur-Mer; others to a place in the estuary of the Clyde (called from him Kilpatrick) at or near the modern Dumbarton. His father, he himself tells, was a deacon named Calpurnius; his mother, according to the ancient biographers, was named Conches or Conchessa, according to some of these authorities, a sister of St. Martin of Tours. P.'s original name is said to have been Succat, Patricius being the Roman appellative by which he was known. In his 16th year he was seized, while at his father's farm of Bonavem Taberniæ, by a band of pirates, and with a number of others was carried to Ireland, and sold to a petty chief, in whose service he remained for six years; after which he succeeded in effecting his escape, and probably after a second captivity, went to France, where he became a monk, first at Tours, and afterwards in the celebrated monastery of Lerins. In the year 431 he went to Rome, whence he was sent by the pope of the day, Celestine, to preach in Ireland; Palladius, who had been sent as missionary to that country a short time before, having died.

Such is the received account of his mission; but Dr. Todd, his latest biographer regards this statement as erroneous, and fixes the date of his coming to Ireland eight years later. He was ordained in France, and arrived in Ireland in 432. His mission was eminently successful. He adopted the expedient of addressing himself first to the chiefs, and of improving, as far as possible, the spirit of clanship, and other existing usages of the Irish for the furtherance of his preaching; nor can it be doubted that he had much success in Christianizing the ancient Irish system of belief and of practice. By degrees he visited a large portion of the kingdom, and baptized great numbers as well of the chieftans as of the people. According to the accounts of his Irish biographers, he founded 365 churches, and baptized with his own hand 12,000 persons. He is said also to have ordained a vast number of priests, and to have blessed very many monks and nuns. After he had been about 20 years engaged in his missionary enterprise, he is said to have fixed his see at Armagh about the year 454; and having procured two of his disciples to be ordained bishops, he held probably more than one synod, the decrees of which have been a subject of much controversy. He died at a place called Saul, near Downpatrick; and his relics were preserved at Downpatrick down to the period of the Reformation. The place is still venerated by the people. The date of his death is much disputed; the Bollandists placing it in 460, while Ussher holds it to have been 493. Dr. Todd inclines strongly to the latter opinion, in which case P.'s age would have been 126, or at least 116.

The only certainly authentic literary remains of St. P. are his 'Confession' and a letter, both of very rude Latinity, but of much historical interest. The letter is addressed to Coroticus, who is supposed to have been a Welsh chieftain named Caradoc (from whom Cardigan is named), who had made a descent on the Irish coast, and slain or carried off, with circumstances of great cruelty, a number of the Irish, many of whom were neophytes. These, with some other remains ascribed to him, as also decrees of synods, were published in Wilkins's *Concilia*, and separately by Ware, *Opuscula S. Patricii Adscripta* (1656) and by Villanueva (Dublin), 1835). The latest biography of St. P. is that of the Rev. J. H. Todd, 1 vol. 8vo. (Dublin, 1863.)

PATRICK, ST., ORDER OF, a national order of knighthood for Ireland, established by George III. on the 5th of February 1783, and enlarged in 1833. As originally constituted it consisted of the Sovereign, the Grand-master, (who was always the lord-lieutenant of Ireland for the time being) and 15 Knights. By the statutes of 1833 the number of knights was increased to 22.

The *Collar* of the order (of gold) is composed of roses alternating with harps, tied together with a knot of gold, the roses being alternately white within red, and red within white, and in the center is an imperial crown surmounting a harp of gold, from which the badge is suspended. The *Badge*, or *Jewel*, is of gold and oval; surrounding it is a wreath of shamrock proper on a gold field; within this is a band of sky-blue enamel charged with the motto of the order, QUIS SEPARABIT MDCCLXXXIII. in gold letters; and within this band a saltire gules (the cross of St. Patrick), surmounted by a shamrock or trefoil slipped vert, having on each of its leaves an imperial crown or. The field of the cross is either argent, or pierced and left open.

A sky-blue *Ribbon*, worn over the right shoulder, sustains the badge when the collar is not worn. The STAR, worn on the left side, differs from the badge only in being circular in place of oval, and in substituting for the exterior wreath of shamrocks eight rays of silver, four of which are larger than the other four. The MANTLE is of rich sky-blue tabinet, lined with white silk, and fastened by a cordon of blue silk and gold with tassels. On

the right shoulder is the HOOD, of the same materials as the mantle.

The order is indicated by the initials K. P.



Order of St. Patrick.

PATRIPA'SSIANS (Lat. *pater*, father, and *passus*, suffered), the name of one of the earliest classes of anti-Trinitarian sectaries, who, in maintaining the oneness of the Godhead, held that all that is ascribed in the Scriptures, according to the Trinitarian exposition, to any of the Three Persons, is in reality true of the one Principle, whom alone these sectaries admitted, being in consequence called 'Monarchians' (Gr. *monos*, one, and *arche*, principle). The leader of this sect was Praxeas, a native of Phrygia, who lived in the end of the 2d century. The name P., for which the Greek equivalent was *Patropaschites*, was in some sense a sobriquet, being founded on what their antagonists regarded as the absurd consequence derivable from their doctrine—viz., that as it was true to say that Jesus, in whom dwelt the Logos, or the Son, suffered, therefore it would be true on their principles to say that the Father suffered. The sect in this particular form was chiefly known in Rome; but their principles are in the main the same with those of the Sabellians. In Rome, Praxeas was succeeded by Noetus, but the party does not appear to have been numerous or influential.

PATRO'CLUS. See ACHILLES.

PATRO'L is a detachment of five or six soldiers, fully armed, sent out, under a sergeant, from the mainguard or picket to traverse the streets of a garrison town, &c., and arrest disorderly persons or soldiers out of barrack without proper passes. Prisoners are taken to the guard-house, and brought before the town-major. In a besieged fortress, *patrols* are strong bodies of men employed to promenade the lines of defence, and watch against any assaults on the part of the enemy.

PA''TRON (Lat. *patronus*, from *pater*, father), among the Romans originally signified a citizen who had dependents, who were called *clients*, attached to him. Before the time of the Laws of the Twelve Tables, the most frequent use of the term *patronus* was in opposition to *libertus*, these two words being used to signify persons who stood to one another in the relation of master and manumitted slave. The Roman was not denuded of all right in his slave when he freed him; a tie remained somewhat like that of parent and child, and the law recognized important obligations on the part of the *libertus* towards his patron, the neglect of which involved severe punishment. In some cases the patron could claim a right to the whole or part of the property of his freed man. The original idea of a patron apart from the manumitter of slaves continued to exist. A Roman citizen, desirous of a protector, might attach himself to a patron, whose client he thenceforward became; and distinguished Romans were sometimes patrons of dependent states or cities, particularly where they had been the means of bringing them into subjection. Thus the Marcelli were patrons of the Sicilians, because Claudius Marcellus had conquered Syracuse and Sicily.

The patron was the guardian of his client's interest, public and private; as his legal adviser, he vindicated his rights before the courts of law. The client was bound, on various occasions, to assist the patron with money, as by paying the costs of his suits, contributing to the marriage portions of his daughters, and defraying in part the expenses incurred in the discharge of public functions. Patron and client were under an obligation never to accuse one another; to violate this law amounted to the crime of treason, and any one was at liberty to slay the offender with impunity. One obvious effect of the institution of *clientela* was the introduction of an element of union between classes of citizens who were otherwise continually brought into opposition to each other. As the patron was in the habit of appearing in support of his clients in courts of justice, the word *patronus* acquired, in course of time, the signification of advocate or legal adviser and defender, the client being the party defended; hence the modern relation between counsel and client.—*Patron*, in after times, became a common designation of every protector or powerful promoter of the interests of another; and the saints, who were believed to watch over the interests of particular persons, places, trades, &c., acquired in the middle ages the designation of their patron saints. The saint in whose name a church is founded, is considered its patron saint.

The term Patron has also been applied to those who endowed or supported churches and convents. See PATRONAGE ECCLESIASTICAL.

PA'TRONAGE, ECCLESIASTICAL, the right of presenting a fit person to a vacant ecclesiastical benefice. The patron, in the original and more strict sense, was the person who founded or endowed the church. In the early ages of Christianity, the countries where the new religion had been adopted were parcelled out into large districts or dioceses, under the superintendence of a bishop, who usually resided in the neighborhood of one of the religious houses. Within such district the bishop had the nomination of the priests, who supplied religious instruction to the people. The priests were paid out of the episcopal treasury, and traveled about in the exercise of their duties, having their residence with the bishop, and forming that *episcopi clerus* which constituted the notion of cathedral churches and monasteries in their simplest form. Occasionally a bishop endowed a church in his diocese, and attached a priest permanently to it; and in Gaul, in the 5th c., a bishop who founded a church in a neighboring diocese was allowed to appoint an incumbent of his choice. As Christianity became more universal, and the population increased, the means of worship supplied by the bishoprics, the monasteries, and occasional episcopally endowed churches, became inadequate for the demands of the people, and the proprietors of lands began to build and endow churches in their own possessions. In such cases the chaplain or priest was not paid by the bishop, but allowed to receive for his maintenance, and for the use of his church, the whole or a part of the profits of the lands with which the founder had endowed it, and the offerings of those who frequented the church for worship. A district was defined by the founder, within which the functions of the officiating priest were to be exercised; and both the burden and the advantages of his ministry were limited to the inhabitants of that district.

As these pious foundations tended both to the advancement of religion and to the relief of the episcopal treasury, they were encouraged by the bishops, who readily consecrated the churches thus established, and consented that the incumbent should be resident at the church, and receive the tithes and offerings of the inhabitants and what endowment the founder had annexed to the church. Eventually, it came also to be stipulated with the bishop that the founder and his heirs should have a share in the administration of the property, and have the right to nominate a person in holy orders to be the officiating minister whenever a vacancy occurred. It also became a not unusual arrangement that when owners of estates rebuilt such churches as were dependent on the cathedral, or undertook to pay the incumbent, to the relief of the cathedral, the right of presentation was transferred from the bishop to these persons, who thenceforward stood in the same relation to these churches as if they had been the original founders. Out of these private endowments arose the parochial divisions of a later time, which thus owe their origin rather to accidental and private dotation than to any legislative scheme for the ecclesiastical subdivision of the country. The bounds of a parish were at first generally commensurate with those of a manor, and the lord of the manor was the hereditary patron. The person enjoying the privileges of a founder was called *patronus* and *advocatus*. He had a pre-eminent seat and a burial-place in the church; he enjoyed a precedence among the clergy in processions; his name and arms were engraved on the church and on the church-bells, and he was specially named in the public prayers. He had the right to a certain portion of the church funds, called *patronagium*, and enjoyed the fruits of the benefice during a vacancy.

In the course of time it sometimes happened that, with the concurrence of all parties interested, the patronage, and the church with its revenues and appurtenances, were made over to a religious house, which thus became both patron and perpetual incum-

bent of the parish, while the immediate duties of the cure were devolved on a vicar or stipendiary curate. In France, the right of patronage was often extended to churches not originally private foundations by the necessities of the sovereigns, which led them to take possession of church property, and bestow it in fee on laymen, who appropriated the greater part of the revenues, and took the appointment of the clergy into their own hands. For a length of time, not merely the nomination but the investiture of the clergy came to be exercised by lay patrons, a state of matters which roused the indignation of successive popes and councils: until it was at last ruled by the third and fourth Lateran Councils (1179 and 1215 A.D.) that the presentation of the patron should not of itself suffice to confer any ecclesiastical benefice, even when qualified by the discretionary power of rejection given to the bishop, when the presentee was a layman. It was declared necessary that the presentee should not merely have the temporalities of the benefice conferred on him by induction, but also be invested with the spiritualities by institution.

When the bishop was patron of the benefice, the ceremonies of induction and institution were united in that of collation. With the growth of the papal power, however, a practice arose by which the right of presentation or induction, which had nominally been left to the patrons, became in some degree nugatory. Towards the close of the 12th c., letters of request, called mandates or expectatives, began to be issued by the popes to patrons, praying that benefices should be bestowed on particular persons. What had at first been requested as a favor was soon demanded as a right, and a code of rules was laid down with regard to grants and revocations of expectatives. In the 13th c. the patronage of all livings whose incumbents had died at the court of Rome (*vacantia in curiâ*) was claimed by the pope; and as ecclesiastics of all ranks from every part of Europe frequently visited Rome, the number of benefices *vacantia in curiâ* was always very great. Clement V, went so far as broadly to declare that the pope possessed the full and free disposal of all ecclesiastical benefices. The practice next arose of the pope making reversionary grants, called provisions of benefices, during the lifetime of the incumbent, and reserving what benefices he thought fit for his private patronage. By means of permissions to hold benefices *in commendam*, and dispensations for non-residence and holding of pluralities, upwards of fifty benefices were often held by one person; and throughout all Europe the principal benefices were filled by Italian priests, nominees of the popes, who were often ignorant of the very language of the people among whom they ministered.

In the 14th c. these claims encountered much opposition. England took the lead in an organized resistance, which was in the end successful. A series of English statutes was passed, beginning with the Statute of Provisors, 25 Edw. III., c. 6, solemnly vindicating the rights of ecclesiastical patronage, and subjecting to severe penalties (see PRÆMUNIRE) all persons who should attempt to enforce the authority of papal provisions in England. The principles adopted by the third and fourth Lateran Councils have since been substantially the law of patronage in Roman Catholic countries. A lay patron is, by the canon law, bound to exercise his right of presentation within four, and an ecclesiastical patron within six months, failing which the right to present accrues *jure devoluto* to the bishop of the diocese. Patronage has always been more or less subject to alienation, transmission, and the changes incident to other kinds of property. The modern practice of patronage in the Roman Catholic church is detailed under the head PROVISION (q. v.).

In England, where the modified canon law, which was in use before the Reformation, is still in force, the rights of patrons do not materially differ from those which they possess in Roman Catholic countries. For some details regarding the right of presentation in England, see ADVOWSON.

In Scotland, at the Reformation, the rights of patrons were reserved, and presbyteries were bound by several statutes to admit any qualified person presented by the patron. The principle of these statutes was retained in the enactments introducing Episcopacy. On the establishment of Presbytery under favor of the civil war, patronage was abolished by act 1649, c. 23, and the election of the clergy was committed to the kirk-session. At the Restoration, this statute fell under the act rescissory, and patronage was replaced on its former footing. On the reintroduction of Presbytery at the Revolution, patronage was again cancelled, and the right to present conferred on the Protestant heritors and the elders of the parish, subject to the approval or rejection of the whole congregation. In consideration of being deprived of the right of presentation, patrons were to receive from the parish a compensation of 600 merks (£33, 6*s*. sterling), on payment of which they were to execute a formal renunciation of their rights. Only three parishes effected this arrangement with the patron, and patronage was permanently restored in all the parishes where no renunciation had been granted by 10 Anne, c. 12. This act, with modifications introduced by 9 and 7 Vict. c. 61, was law till 1874. If a patron failed to present for six months after the occurrence of a vacancy, the right to present fell to the presbytery *jure devoluto*. The presentee, before he acquired a right to the emoluments of the benefice, required to be admitted to it by the presbytery of the bounds. He was first appointed to preach certain trial sermons, after which a day was fixed within six weeks for moderating in his call. On that day the people were invited to sign a written call to the presentee to be their minister, and however few the signatures to the call might be, the presbytery were in use to pronounce a formal judgment sustaining it. They then proceeded to examine into the qualifications of the presentee, and provided the result were satisfactory, the ordination followed (if he had not been previously ordained), and he was formally admitted minister of the parish by the presiding minister.

Soon after the above-mentioned act of Queen Anne, a feeling which had sprung up in favor of popular election, in opposition to patronage, led to various acts of resistance to the settlement of presentees, and brought about two considerable secessions from the Church of Scotland. It continued for a length of time to be a subject of dispute how far the right of the church to judge of the fitness of presentees could entitle her to make rules tending to disqualify them, and in particular whether she could legally make the dissatisfaction of the congregation a disqualification. For a long time prior to 1834, there had been no attempt to give effect to any dissent on the part of the congregation. In that year the law of patronage again became a ground of contention, when a majority of the General Assembly embodied their views on the subject in the so-called Veto Act, which declared that no minister was to be imposed on a congregation when a majority of heads of families and communicants should dissent from his admission. The decision of the Court of Session, confirmed by the House of Lords, finding this act to be *ultra vires* of the General Assembly, led to the secession of 1843 and formation of the *Free Church* (q. v.). After that event, an act, 6 and 7 Vict. c. 71, commonly called Lord Aberdeen's Act, was passed to fix by a legislative provision the effect which the church courts were in future to be entitled to give to the dissent of the congregation in the collation of ministers. It was there enacted, that after the trial sermons, the presbytery should give to the parishoners, being members of the congregation, an opportunity to state objections which did not infer matter of charge to be proceeded against according to to the discipline of the church. The presbytery were either to dispose of the objections, or to refer them to the superior church judicatory; and if they were considered well founded, the presbytery might reject the presentee. No power was given to reject him on the ground of mere dislike by any portion of the congregation.

By an act of parliament in 1874, patronage was abolished, and the right of choosing their minister transferred to the congregation, provision being made to compensate the previous patron to the extent of one year's stipend of the parish.

In the Protestant churches of Germany, Sweden, and Denmark, patronage exists to some extent, subject to restrictions, which differ much in different localities. The right to present is sometimes divided between the patron and the consistory. The parishioners have in many instances a voice; the appointment may be entirely in their hands, or they may have merely a right to reject the presentee after he has been subjected to the ordeal of a trial sermon; and in either case this right may be exercised, according to local usage, either by the parishioners at large, by a committee of their number, or by the bürgermeister. When there is no patron, the choice generally rests with the consistory in East, and with the parishioners in West Germany. Induction by the superintendent completes the right of the presentee.

In the Greek Church the right to present is generally in the hands of the bishops, excepting in Russia, where lay patronage exists to a limited extent.

PATRONY'MIC (Gr, *pater*, father, and *onoma*, name), properly a name taken from one's father, but generally applied to such names as express descent from a parent or ancestor. In Sanskrit, Greek, and Latin, patronymics are very numerous. They may be derived from the name of a father, mother, grandfather, or remoter ancestor, as Atrides, i. e., (Agamemnon), son of Atreus; Philyrides, i. e., (Chiron), son of Philyra; Æacides, i. e., (Achilles), grandson of Æacus. The names of the founders of nations have also been used to form a sort of patronymic, as when the Romans are called Romulidæ. In Greek and Latin the commonest termination of patronymics are *ides* and *is*. Patronymics have no fewer than thirteen recognized terminations in Sanskrit. A number of the surnames in use in modern times are patronymics, as Johnson, the son of John; Thomson, the son of Thomas.

Originally these names fluctuated from generation to generation, as still is, or very recently was, the case in Shetland, where Magnus Johnson's son calls himself John Magnusson or Manson. In the course of time, it was generally found more convenient to take a surname from one well-known ancestor, which should de-

scend unchanged to the children of the bearer of it. The termination *s* is sometimes used as equivalent to son, as in Jones, Rodgers. To patronymics belong Norman, Highland, Irish, and Welsh surnames with the prefixes *Fitz*, *Mac*, *O*, and *Ap*, respectively. In many cases the *Mac* of the Highlands of Scotland ceased to have a fluctuating character only a few generations ago. In 1465, an act of the parliament of Ireland was directed against the use of patronymics. Every Irishman 'dwelling betwixt or among Englishmen in the counties of Dublin, Myeth, Uriel, or Kildare,' was ordered 'to take to him an English surname of a town, as Sutton, Chester, Trym, Skryne, Corke, Kinsale; or color, as White, Blacke; or arte or science, as Smith or Carpenter; or office, as Cooke or Butler; and that he and his issue should use the same.' In Wales it was long the practice to use a string of ancestral names, each with the syllable *Ap* prefixed to it. Camden relates that 'in the time of King Henry VIII. an ancient worshipful gentleman of Wales being called at the pannell of a jury by the name of Thomas Ap William Ap Thomas Ap Richard Ap Hoel Ap Evan Vaghan, &c., was advised by the judge to leave that old manner; whereupon he afterwards called himself Moston, according to the name of his principal house, and left that surname to his posteritie.' See NAME.



Pattée.

PATTÉE, CROSS, in Heraldry (Lat. *patulus*, spreading), also called Cross Formée, a cross with its arms expanding towards the ends, and flat at their outer edges.

PATTI, ADELINA MARIA CLORINDA, a popular operatic singer of Italian extraction, born at Madrid April 9, 1843. After a course of professional study, she sang at an early age in New York. Her *début* in London took place in 1861 as Amina in *La Sonnambula;* and she has ever since been looked upon as one of the first singers of the day. Her voice is an unusually high soprano, of rich bell-like quality, and remarkable evenness of tone; to these qualities she adds purity of style and high artistic finish. Equally at home in the tenderness of deep passion and the sprightly vivacity of light comedy, she has also sung with success in oratorio. She has also won golden opinions on the continent wherever she has appeared, receiving, in 1870, the Order of Merit from the Emperor of Russia. Her greatest success is generally considered to be in the part of Marguerite in Gounod's *Faust*. In May 1868, she married the Marquis de Caux, from whom she was divorced in 1876. She had never retired from the stage.

PATTI, CARLOTTA, sister of the above, is also one of the leading singers of the day, though a slight degree of lameness has prevented her from appearing much in opera. Her voice is a soprano of unusual compass, and of a clear silvery quality, and much power in the upper register. Her peculiarly high notes, and a graceful *abandon* of manner, have brought her into favor with the public, though, in quality of tone, she does not come up to her sister. She made her *début* in London in 1862, but had for some time before been in the enjoyment of a high reputation in the United States.

PATUXENT, a river of Maryland, U. S., rises 20 miles east of Frederick City, and after a south-easterly course of 90 miles, empties by a broad estuary into Chesapeake Bay.

PAU, a flourishing town of France, capital of the department of Basses-Pyrénées, on the right bank of the Gave-de-Pau, 105 miles south-south-east of Bordeaux. It occupies a rocky height, cloven into two portions by a ravine through which a streamlet flows into the Gave-de-Pau, and united by a high bridge. Toward the south it commands most magnificent views of the Western Pyrénées; indeed, for mountain views its situation is hardly surpassed by that of any town in France. As seen from this town, the distant Pyrénées rise in peaks, cones, and serrated ridges, and present an outline as varied as it is strikingly beautiful. The town contains a palace of justice, a promenade, Royal Square, with a bronze statue of Henri IV., beautiful theater, university-academy, museum, and library of 25,000 vols. Linen and cloth manufactures are the chief branches of industry; in the vicinity, Jurançon wine (good but strong) is grown. Many swine are fed in the vicinity, and from the pork the famous *Jambers de Bayonne* are made. Pau is a favorite resort of the English, especially during winter, and is a general rendezvous for those who wish to explore the Pyrénées. Pop. (1876) 27,553.

The principal building, however, of Pau, and that to which it owes its existence, is the old castle which stands on the ridge overlooking the river, and forms both the most conspicuous and most interesting feature of the town. It has five towers, united by an outer wall, and is supposed to have been founded by Gaston de Foix about the year 1363. Pau was the capital of the kingdom of Bearn, and its castle was the birthplace of the famous Henri IV.

PAUCH'ONTI TREE (*Isonandra polyandra*), a large forest-tree, of the same genus with the gutta-percha tree, and producing a substance similar to gutta-percha, abundant in some of the forests at the base of the Western Ghauts in India. It is now supposed that there are several species of *Isonandra* in Western India, the produce of all which has begun to be sent to the market as gutta-percha, although it is said that none of the kinds is equal in quality to the true gutta-percha, obtained from *Isonandra gutta*. The wood of the P. tree is very heavy, and its tenacity is equal to that of teak. A P. tree having been tapped in 40 places, from the base to 60 feet high, has yielded in twelve hours about eight pints of sap, each pint being equal to about a pound of gutta-percha.

PAUL, the great apostle of the Gentiles, was born of Jewish parents at Tarsus, in Cilicia, and inherited from them the rights of Roman citizenship. His original name was Saul. He was educated first in his native city, then in the zenith of its reputation for its schools of literature and philosophy, where he doubtless learned to speak and write Greek; and afterwards, to be perfected 'in the law of his fathers,' was sent to Jerusalem, where he studied under Gamaliel, a great Jewish doctor, and became one of the strictest, most zealous, and most ardent Pharisees. Whether it was here or at Tarsus that he acquired his knowledge—which we have no reason to believe was ever very deep—of the philosophy and literature of Greece, cannot be ascertained. According to the wholesome rule observed among the Jews, that every person should learn some trade, Saul became a tent-maker, and at this trade he afterwards labored (Acts xviii. 3) for his support. A few years after the death of Jesus, he became as might have been expected from his training and temperament, a furious adversary of the new sect of Christians.

We are told (Acts vi. 9) that the Jews of the Cilician synagogue at Jerusalem were among those who disputed with Stephen, and it is natural to suppose that the young and brilliant zealot, eager for disputation, was conspicuous among the crowd of Jewish students who poured out of their synagogues (of which, according to the Talmud, there were 480 in the holy city), in the insolence of their youth and scholarship, to crush the ignorant followers of the Nazarene. This supposition is rendered highly probable by the fact, that he was present at the martyrdom of Stephen, which followed almost immediately, having charge of the raiment of them that slew him. He now became a prominent actor in the great persecution of the Christians that broke out at Jerusalem. The mysterious circumstances that led to and attended his conversion are familiar to all readers of the Acts of the Apostles, and need not be recapitulated here. After a solitary sojourn in Arabia—perhaps to calm his perturbed spirit in communion with God, and to solemnly prepare himself for his new mode of life—on his return to Damascus, he changed his name to Paul, and resumed or began (it is not quite clear which) his apostolic labors. Naturally, he became an object of intense hostility to the unbelieving Jews in that city. They resolved to kill him; but his friends contrived a way of escape, and he fled to Jerusalem, where at first he was received with suspicion by the disciples, but afterwards, through the kind offices of Barnabas, with great cordiality. He now 'spoke boldly in the name of Christ,' disputing also against the 'Grecians'—i. e., the Hellenistic Jews—with dangerous success, for his opponents sought to take his life. Again he was obliged to flee, and betook himself to his birthplace, Tarsus, where he seems to have remained till Barnabas brought him to Antioch (not far off), to assist in the great work of evangelization going on in that city.

After a short visit to Jerusalem in the year of the famine, 44 A.D., they were set apart by the prophets and elders of the church at Antioch for the evangelization of the more distant Jews. From Seleucia they proceed on their first missionary expedition to the southern districts of Asia Minor, Pamphylia, Pisidia, and Lycaonia, where they met, especially in some places, with considerable success, in preaching the gospel. It is very interesting to notice how gradually the light of Christianity dawned on the mind of the apostle. He did not grasp all at once its grand design. It was not even by abstract reflection that he arrived at it. Circumstances of quite an outward sort forced him to the sublime conclusions of his creed. It was when the Jews of Pisidian Antioch, enraged at his preaching the gospel indiscriminately to their Gentile fellow-townsmen and themselves, 'contradicted and blasphemed' him, that he boldly announced Christ as the universal Redeemer. After the return of P. and Barnabas to Antioch, they continued to labor in that city for a long time, till dissensions having arisen about the circumcision of Gentile converts, he, along with Barnabas and others, was chosen to go up to Jerusalem, to get the opinion of the apostles and elders there on the question, about 51 A.D. P. and Barnabas now returned to Antioch, where they continued to teach and preach, till a yearning grew up in the heart of the former to revisit his Gentile converts in Asia Minor. In his second expedition, P. was accompanied by

Silas instead of Barnabas, and traversed the whole of Asia Minor from south to north, evangelizing with great success, after which the two missionaries crossed the Ægean and landed in Europe, planting at Philippi, the capital of Thracian Macedonia, the first Christian Church in that continent. The details of his visits to Thessalonica, Berea, Athens, and Corinth are, doubtless, familiar to our readers, and need not be given here. We can only notice his appearance at Athens, where, on Mars' Hill, before a crowd of the citizens, among whom were Epicurean and Stoic philosophers, he delivered that magnificent discourse in which he declared to the Athenians the character of the 'unknown' God.

On his return to Asia Minor he visited Ephesus, where, as usual, he 'reasoned' with the Jews in their synagogue; sailed thence to Cæsarea, in Palestine, and proceeded to Jerusalem 'to keep the feast;' after which he again returned to Antioch, the center from which his operations radiated. Thus closed his *second* evangelistic journey.—The third journey of P. commenced probably about 54 A.D., and extended over much the same district as the previous one. At Ephesus, where he remained for a period of two years and three months, his efforts were powerfully seconded by the eloquence of the great Alexandrian convert, Apollos. Here it is recorded (Acts. xix.) that 'God wrought special miracles by the hand of Paul, so that from his body were brought unto the sick handkerchiefs or aprons, and the diseases departed from them, and the evil spirits went out of them.' In explanation of this very curious procedure, which has a disagreeable resemblance to ordinary legerdemain, it has been suggested, that as Ephesus was a city noted for its exorcisms, spells, and incantations—the famous *Ephesia Grammata* sold at a high price to the ignorant and superstitious populace—this style of miracle was an accommodation to their belief in magic and dæmonism, and intended to show them, according to their own way of regarding things, the superiority of Christ's power to that of the evil spirits of heathen worship. From Ephesus, P. went up to Jerusalem with a presentiment that heavy evils were about to fall upon him through the ever-maddening malice of the Jews. The Jewish populace were goaded into the wildest fury by the very sight of Paul.

The captain of the Roman guard, Claudius Lysias, had to interfere to save him from being torn to pieces; but as forty Pharisees had sworn neither too eat nor drink till they had taken his life, he was sent by night, under a strong escort, to the Roman governor, Felix, at Cæsarea, where he was unjustly detained a prisoner for two years. Having finally appealed to the Roman emperor, according to the privilege of a Roman citizen, he was sent to Rome. On the voyage thither, he suffered shipwreck at Melita (probably Malta), in the spring of 61 A.D. At Rome, he was treated with respect, being allowed to dwell 'for two whole years in his own hired house.' His first thoughts were, as usual, directed towards his Jewish brethren in the city; but, on the whole, he made little impression on them. Whether he ever left the city or not, cannot be positively demonstrated, but it is believed by many critics, from a variety of considerations, that he did obtain his liberty about 64 A.D., and that he made journeys both to the east and to the west, revisiting Asia Minor, and carrying out his long-cherished wish of preaching the gospel in Spain. Meanwhile occurred the mysterious burning of Rome, generally attributed to Nero, who threw the blame on the Christians, and in consequence, subjected them to a severe persecution. Among the victims was P., who, according to tradition, suffered 67 A.D.—See *Life and Epistles of St. P.*, by Conybeare and Howson; Baur's *Paulus;* Lipsius, *Der Apostel Paulus* (1869); Renan, *Saint Paul* (1869); Pfleiderer, *Der Paulinismus* (1873; transl. 1878); Farrar, *St. Paul*, (2 vols. 1879.)

PAUL was the name of five popes. PAUL I. (757—763 A.D.) and PAUL II. (1464—1471) were unimportant.—PAUL III., pope at a critical time, was originally named Alessandro Farnese, and was born at Carino, in Tuscany, in 1468. Having been created cardinal, he served in several important trusts, and eventually became bishop of Ostia and Dean of the Sacred College. On the death of Clement VII., in 1534, he was elected pope, just at the crisis when the world was alive with expectation of the general council which was to decide all the controversies at that time agitating the public mind of Europe. After some delays, P. convoked the council to meet at Mantua in 1542; but it did not actually assemble (in Trent) until 1545. These delays are by some charged upon P.; but it can hardly be doubted that much of it was due to the difficulties of the times. The bull of excommunication and deposition which he issued in 1538 against Henry VIII. of England, is one of the last examples of the exercise of the temporal power claimed by the medieval popes. In the contest of Charles V. with the Protestant League in Germany, P. sent a large force to support him, and he opposed the pacification proposed by the emperor upon the basis of the INTERIM (q. v.). P.'s conduct in aggrandizing the fortune of his son, Pietro Luigi Farnese, has been severely criticised by historians; the more so, that his son was born out of wedlock, in the early youth of his father. P. died November 10, 1549, in his 82d year.—PAUL IV., named John Peter Caraffa, a member of the noble family of that name, was born in Naples in 1476. His early career was distinguished for ascetic rigor. He was appointed Bishop of Chieti, in which see he labored most earnestly for the reformation of abuses, and for the revival of religion and morality. With this view, he established, in conjunction with several congenial reformers, the congregation of secular clergy called THEATINES (q. v.), and was himself the first superior. It was under his influence that Paul III. organized the tribunal of the Inquisition in Rome.

On the death of Marcellus II. in 1555, although in his seventy-ninth year, he was elected to succeed. He entered upon the wider career of reformation which his new position opened for him with all the ardor of a young man, and with all the stern enthusiasm which had characterized him during life. He enforced vigorously upon the clergy the observance of all the clerical duties, and enacted laws for the maintenance of public morality. He established a censorship, and completed the organization of the Roman Inquisition; he took measures for the alleviation of the burdens of the poorer classes, and for the better administration of justice, not sparing even his own nephews, whom he banished from Rome, on account of their corrupt conduct and profligate life. His foreign relations, too, involved him in much labor and perplexity. He was embroiled with the Emperor Ferdinand, with Philip II. of Spain, with Cosmo, Grand Duke of Tuscany. Having condemned the principles of the Peace of Augsburg, he protested against its provisions. Under the weight of so many cares, his great age gave way. He died August 18, 1559, in his 84th year. At his death, the populace broke out into an insurrectionary tumult, which lasted till the conclave for the appointment of his successor.—PAUL V., originally named Camillo Borghese, was born in Rome in 1552. In his early life, he was a distinguished canonist and theologian; and after the ordinary prelatical career at Rome, he rose first to the post of nuncio at the Spanish court, and afterwards to the cardinalate under Clement VIII. On the death of Leo XI. in 1605, Cardinal Borghese was elected to succeed him. His pontificate is rendered memorable by the celebrated conflict with the republic of Venice, into which he was plunged at the very outset of his career.

The original ground of dispute was the question of the immunity from the jurisdiction of civil tribunals conceded to the clergy, who claimed to be tried by ecclesiastical tribunals alone. This claim the senate resisted; and further causes of dispute were added by a mortmain law, and a law prohibiting the establishment of new religious orders or associations unless with the sanction of the senate. Each party remaining inflexible in its determination, P. issued a brief, directing a sentence of excommunication against the doge and senate, and placing the republic under an interdict, unless submission should be made within twenty-four days. The senate persisted, and an animated conflict, as well of acts as of writing ensued, in the latter of which the celebrated Fra Paolo Sarpi, on the side of the republic, and on the papal side, Bellarmino and Baronius, were the leaders. Preparations were even made for actual hostilities; but, by the intervention of Henry IV. of France, the dispute was accommodated, and peace restored in 1607, although dissatisfaction afterwards arose on the subject of the nomination of a patriarch. A misunderstanding of a similar nature arose between the pope and the crown in France as to the rights of censorship on books, and as to the receiving of the disciplinary decrees of the Council of Trent; but it was removed by mutual explanations. His administration was vigorous and enlightened, and he did a great deal for the promotion of useful public works, for the embellishment of the city, the restoration and preservation of antiquities, the improvement of the museums and libraries, and, above all, for the pious and charitable institutions of Rome. P. died in his 69th year, January 28, 1621.

PAUL, VINCENT DE, one of the most eminent saints of the modern Catholic Church, was born of humble parentage at Ranquines, in the diocese of Dax, in the year 1576. The indications of ability which he exhibited led to his being sent to school at Toulouse. He became an ecclesiastical student, and was admitted to priest's orders in 1600. On a voyage which he was making from Marseille to Narbonne, his ship was captured by corsairs, and he with his companions sold into slavery at Tunis, where he passed through the hands of three different masters. The last of these, who was a renegade Savoyard, yielded to the exhortations of Vincent, resolved to return to the Christian faith, and with Vincent, made his escape from Barbary. They landed in France in 1607. Having gone thence to Rome, he was intrusted with an important mission to the French court in 1608, and continued for some time to reside in Paris as the almoner of Marguerite de Valois. The accident of his becoming preceptor of the children of M. de Gondy, the commandant of the galleys at Marseille, led to his being appointed almoner-general of the galleys in

1619. It was at this time that the well-known incident occurred of his offering himself, and being accepted, in the place of one of the convicts, whom he found overwhelmed with grief and despair at having been obliged to leave his wife and family in extreme destitution. Meanwhile he had laid the foundation of what eventually grew into the great and influential congregation of Priests of the Missions; an association of priests who devote themselves to the work of assisting the parochial clergy by preaching and hearing confessions periodically in those districts to which they may be invited by the local pastors.

The rules of this congregation were finally approved by Urban VIII. in 1632; and in the following year the Fathers established themselves in the so-called Priory of St. Lazare, in Paris, whence their name of *Lazarists* is derived. From this date, his life was devoted to the organization of works of charity and benevolence. To him Paris owes the establishment of the Foundling Hospital, and the first systematic efforts for the preservation of the lives, and the due education of a class theretofore neglected, or left to the operation of chance charity. The pious Sisterhood of Charity is an emanation of the same spirit, and Vincent was intrusted by St. Francis of Sales with the direction of the newly-founded order of Sisters of the Visitation. The queen, Anne of Austria, warmly rewarded his exertions, and Louis XIII. chose him as his spiritual assistant in his last illness. He was placed by the queen-regent at the head of the *Conseil de Conscience*, the council chiefly charged with the direction of the crown in ecclesiastical affairs; and the period of his presidency was long looked back to as the golden era of impartial and honest distribution of ecclesiastical patronage in France. Vincent was not, in any sense of the word, a scholar, but his preaching, which (like that of the Fathers of his congregation of Lazarists) was of the most simple kind, was singularly affecting and impressive. He left nothing behind him but the *Rules or Constitutions of the Congregation of the Mission*, 1658; *Conferences* on these Constitutions, 4to; and a considerable number of letters, chiefly addressed to the priests of the mission, or to other friends, on spiritual subjects. He died at the advanced age of 85, at St. Lazare, September 27, 1660, and was canonized by Clement XII. in 1737. His festival is held on the 19th July, the day of his canonization.

PAUL (Petrowitsch), Emperor of Russia, the second son of the unfortunate Peter III. and the Empress Catharine II., was born in 1754, became heir-apparent on the death of his elder brother in 1763, and succeeded his mother on the imperial throne in 1796. The tragical death of his father when he was still a child, and the neglect and want of confidence with which his mother treated him, exerted a baneful influence on the character of P., who was kept in compulsory seclusion while Catharine shared the administration of the government with her favorites. In 1776, P., on the death of his first wife, a princess of Hesse-Darmstadt, married the Princess Dorothea of Würtemberg, by whom he had four sons—the late Emperors Alexander and Nicholas, and the Grand Dukes Constantine and Michael, and several daughters. After spending some years in traveling with his wife through Germany, France, and Italy, P. was recalled by his mother, who assigned to him the palace of Gatchina, 30 miles from St. Petersburg, as his settled residence, while she took his children under her own immediate care. The death of the empress in 1796 released him from his unnatural restraint, and he ascended the throne with no practical acquaintance with the mechanism of government, and no knowledge of the people whom he was called to rule over. A determination to change everything that had existed under the previous reign, and to wreak vengeance on the murderers of his father, were the predominating influences that guided his actions; and his earliest measures, which were the disgrace of his father's murderers, and the pardon of all Polish prisoners, gave hopes of a good reign; but the capricious violence of character and incapacity for business which P. betrayed, soon disappointed the hopes that he had awakened. No department of the state was free from his frivolous interference, and no class of the nation exempt from the effect of his arbitrary legislation. While he irritated the soldiery by vexatious regulations in regard to their dress, he offended the nobles by imperious enactments as to the ceremonials to be observed in his presence. His foreign policy was marked with similar caprice.

After having adopted a system of neutrality in the war between France and the rest of Europe, he suddenly declared in favor of the allied powers, and sent an army of 56,000 men under Suwaroff into Italy. The success of his general encouraged him to send a second army of equal strength to co-operate with the Austrians; but their defeat in 1799 induced P. to recall Suwaroff with the Russian troops; and having retired from the allied coalition without having given any reason for his conduct, he quarrelled with England, because she would not comply with his whimsical demand for the surrender of Malta, and his own recognition as Grand Master of the Order of Malta, and entered into a close alliance with Bonaparte, who was then First Consul. The jealousy and hatred of England by which both were actuated, proved a powerful bond of union between them; and in furtherance of their scheme of uniting all the smaller maritime powers into one vast confederation against England, P. concluded a convention with Sweden and Denmark for the purpose of opposing the right insisted on by England of searching neutral vessels. The result was that the English government sent a fleet into the Baltic under Nelson to dissolve the coalition, at the close of March 1801. P. was preparing to give material aid to the Danes, when a conspiracy was formed at St, Petersburg to put a stop to the capricious despotism under which all classes of men in Russia were groaning, The conspirators, whose numbers included Count Pahlen, the most influential man at court, General Beningsen, Uwarow, and many other distinguished nobles and officers, appear originally to have intended only to force P. to abdicate, but his obstinate disposition led to a scuffle, in which the emperor was strangled, March 24, 1801.

PAULDING, James Kirke, an American author, was born at Pleasant Valley, New York, August 22, 1779. His father was a farmer, descended from the early Dutch settlers. Self-educated, and early developing a tendency to literature, he was a friend of Washington Irving, and wrote a portion of *Salmagundi*. During the war of 1812, he published the *Diverting History of John Bull and Brother Jonathan;* in 1813, a parody of the *Lay of the Last Minstrel*, entitled *A Lay of the Scotch Fiddle;* and in 1814, a more serious work, *The United States and England*, a defence against articles in the *Quarterly Review*. This work attracted to him the attention of President Madison, and caused him to be appointed a member of the Board of Naval Commissioners. In 1817, he published a defence of the southern states and of slavery in *Letters from the South, by a Northern Man;* in 1819, a new series of *Salmagundi;* in 1822, *A Sketch of Old England, by a New England Man;* and in 1824, *John Bull in America or the New Munchausen*, a satire on the writings of certain British tourists. This was followed by *Konigsmarke*, a novel (1825); *Merry Tales of the Three Wise Men of Gotham* (1826); *The New Pilgrim's Progress* (1828); *Tales of a Good Woman* (1829); *Book of St. Nicholas* (1830). These works, mostly humorous and satirical, had various degrees of local popularity; but in 1831 he produced *The Dutchman's Fireside*, a novel that was reprinted in England, and translated into French and Dutch; and in 1832, *Westward Ho!* which attained to a similar popularity. These were followed by a *Life of Washington* (1835), *Slavery in the United States* (1836), in which the institution is defended on social, economical, and physiological grounds. He held at this period the lucrative post of Navy Agent at New York, and was by Mr. Van Buren appointed Secretary of the Navy, which gave him the position of cabinet minister. At the close of Mr. Van Buren's presidency in 1841, Mr. P. retired to a country residence at Hyde Park, New York, where he wrote *The Old Continental*, a novel (1846); *The Puritan and his Daughter* (1849); and with his son a volume of Plays and Fairy Tales. He died at Hyde Park, New York State, April 6, 1860.

PAULI'CIANS, an ancient sect of the Eastern Empire, who, by Catholic writers, are reckoned an offshoot of the Manichæans (q. v.). According to Peter of Sicily and Photius, the sect originated in Armenia from two brothers named Paul (from whom it is alleged to have received its name) and John, who flourished in the 4th century. Others trace it to an Armenian named Paul, who lived under Justinian II. The P. were at all times treated with much suspicion, and repressed with great severity, by the eastern emperors; Constans, Justinian II., and Leo the Isaurian especially labored to repress them, and, indeed, with the exception of Nicephorus Logotheta (802—811), it may be said that all the emperors, with more or less rigor, persecuted them. Their greatest enemy, however, was Theodora (841—855), who, having ordered that they should be compelled to return to the Greek Church, had all the recusants cruelly put to the sword or driven into exile. A bloody resistance, and finally an emigration into the Saracen territory, was the consequence; and it is from the Paulician settlers in Bulgaria (Catholic historians) that the Manichæan doctrines which tinged the opinions of most of the medieval sects, are supposed by Roman Catholic historians to have found their way into the eastern provinces of the Western Empire. Even so late as the 17th c., according to Mosheim (ii. 238), there was a remnant of this sect existing in Bulgaria.

It is proper, however, to notice that a very different view of the character and doctrines of the P. has been advocated by such modern writers on ecclesiastical history as Gieseler and Neander, according to whom they had their origin from one Constantine of Mannanalis (near Samosata), an Armenian, who had received a present of two volumes—one containing the four gospels, and the other the epistles of Paul—and who afterwards assumed the name of Paul, in testimony of his great veneration for that apostle. The distinctive characters of his doctrine and that of his followers were the rejection of the worship of the Virgin, the saints and the cross, the denial of the material presence of Christ in the Eucha-

rist, and the assertion of a right freely to search the Scriptures; and the charge of Manichæism was falsely brought against them by their persecutors.

PAULLI'NIA. See GUARANA BREAD.

PAUL'S (ST.) CATHEDRAL in London is noted from its being the largest and most magnificent Protestant church in the world, and second only to St. Peter's in Rome among the religious structures of modern times. The site of the present building was occupied about 610 by a Christian church dedicated to St. Paul. This church continued till 1083, when it was destroyed by fire. From its ruins arose a much more splendid edifice—the immediate precursor of the present cathedral. In 1137, the building suffered severely from fire; but, that being the great age for splendid churches, it was soon restored with great magnificence, the bishops and the people contributing most liberally to defray the cost. Old St. Paul's was the largest church in the country, being 690 feet in length, 130 in breadth, and about 150 feet high. The total height of the stone tower and the spire, covered with lead, which surmounted it, was 520 feet. The cloister was 90 feet square, with a beautiful chapter-house in the center. In 1666, the great fire of London completely destroyed the old cathedral, along with a large portion of the city and most of the churches; and thereafter, Sir Christopher Wren was employed to design about 50 of the new churches, and, among others, the new cathedral.

In 1673, he submitted several designs for a new cathedral to the king, who selected one, and ordered a model of it on a large scale to be prepared. This was done by Wren, and the model still exists. Its plan is in the form of a Greek cross, having a large dome over the center, supported on eight arches. This was, however, eventually departed from; and the new design was modelled on that of a Gothic cathedral, with an interior length of 460 feet, width 240 feet across transepts, and a nave 94 feet wide. The dome, and the eight supporting arches of the model, are preserved; but in the new design the angle arches lead to no spacious compartment, but to small dark passages only; while the upper portions of these great arches are blocked up with other arches, introduced for constructive purposes, but very destructive of the architectural effect. The plan of supporting the dome on eight arches had the charm of novelty, and also of simplicity of construction, but it made the arches themselves too small in proportion to the great span of the dome. The constructive skill displayed by Wren in this building is universally acknowledged and admired, but it is thought that he has allowed the mechanical exigences of the work to interfere too much with its decorative requirements. The dome, for example, is constructed on a new and most masterly principle, the thrust of the vault being counterbalanced by the weight of a brick cone, which is carried up to support the stone lantern over the exterior dome. But in order to carry this out with the least expenditure possible, the drum, or plain cylindrical wall under the dome, is sloped inwards, so that the columns with which it is decorated appear to the spectator below to be falling inwards, thus producing a painful and disagreeable effect. Great exception is taken to the fact, that the external dome is of *wood*, and not of stone, and so liable to premature decay; but the same may be said of the wooden roofs over the vaults of Gothic cathedrals; and by making it of wood, Sir Christopher was enabled to raise it to a height which makes it one of the noblest buildings of the kind in the world.

The design of the nave, from the classic vaulting with which it is covered, is necessarily to a great extent a failure. When domes, or intersecting vaults, are used in a classic building, the compartments must be about square; there can therefore be but a small number of nave piers, as compared with those of a Gothic cathedral, and the perspective effect of the latter is thus entirely awanting. The same is the case at St. Peter's. The dome is particularly successful, and is admitted to be the finest in existence; no other being so graceful and varied in outline and yet so massive in general effect. Its height from the pavement to the top of the cross is 404 feet. The west front, as seen from Ludgate Hill, is most striking; the two campaniles group most harmoniously with the dome, and, together with the portico, produce a most pleasing and remarkable effect. This front must, however, be condemned, along with the screen-walls, if strictly criticised. The upper portico *appears* to indicate an upper story where there is none, and the actual construction and true form of the building are not expressed at all. St. Paul's is the burial-place of many heroes and men of distinction, whose tombs are in the crypt, and whose monuments adorn the interior of the cathedral. Amongst these are Nelson and Wellington, Collingwood, Abercromby, Moore, Howe, St. Vincent, Picton, Rodney, and many other celebrated soldiers and sailors; Howard, Johnson, Reynolds, Barry, Opie, West, Astley Cooper, Sir William Jones. Sir Christopher Wren, and other distinguished civilians. Several of the monuments are by Flaxman, Chantrey, Bacon, and Rossi; but it must be confessed that they savor generally too much of heathen mythology, to be appropriate in a Christian cathedral.

PAU'LUS ÆGINE'TA, a celebrated Greek physician, was born in the island of Ægina, and flourished during the conquests of the Calif Omar in the 7th century. Of his life we know almost nothing more than that he pursued his medical studies first at Alexandria, and afterwards in Greece and other countries. His forte lay in surgery and obstetrics, in the latter of which departments of medicine his practice was great. He abridged the works of Galen, and was deeply read in those of Ætius and Oribasius, while he always exercised an independent judgment in forming his conclusions. His description of diseases are brief and succinct, and also complete and exact. He often grounds his explanation of morbid phenomena on Galen's theory of the cardinal humors; while in surgery his writings abound with novel and ingenious views. His works—the principal of which is commonly called *De Re Medica Libri Septem* (Lond. 1834)—have passed through many editions, of which the best is that completed at Lyon in 1567, and they have also had many translators, of whom the best in English is Dr. Francis Adams.

PAULUS DIACONUS (also called PAULUS LEVITA, both surnames being derived from his ecclesiastical office), one of the most learned men of his time, and the greatest Lombard historian, was born of a noble Lombard family at Friuli about 730. His father's name was Warnefrid. He received a superior education at Pavia, at the court of the Lombard king Ratchis, and appears to have continued at court during the reigns of his successors, Aistulf and Desiderius, and to have accompanied Adelperga, the daughter of Desiderius, whose education he had conducted, to the court of her husband, Duke Arichis of Beneventum. For her he wrote, in 781, after he had, become an ecclesiastic, one of his principal works, his *Historia Romana*, a work of no authority, as it is a mere compilation from works which we possess, but which was greatly used during the whole of the middle ages, as the many manuscripts, recensions, and continuations of it, attest. An edition of the genuine text is still awanting, but a great part of it is given in Muratori's *Rerum Italicarum Scriptores*, vol. 1 (Milan, 1728).

In 781, P. became a monk of Monte Casino; but afterwards went to France, and won the esteem of Charlemagne in a high degree by his character and learning. He aided that monarch in his schemes for the promotion of learning, and introduced the study of the Greek language into France. He made a collection of homilies from the best sources, at the emperor's desire, known as the *Homilarium*, often printed between 1482 and 1569, and translated into German and Spanish. At the request of Angilram, Bishop of Metz, he also wrote a history of the Bishops of Metz, *Gesta Episcoporum Mettensium* (printed in Pertz's *Monumenta Germaniæ Historica*, vol. 2), the first work of the kind on the north of the Alps, but the example of which was soon very generally followed. In 787, he returned to his convent, where he remained till his death, which is said to have taken place in 797. In the latter years of his life, he wrote his History of Longobards (*De Gestis Langobardum, Libri* 6), but did not live to complete it, bringing down the history only to the death of Liutprand in 744. There are several editions of this work, the best of which is contained in the work of Muratori. It is characterized by remarkable candor, and a style unusually pure for that age. The high repute in which this work also was long held, is attested by the great number of manuscripts and continuations. P. was likewise the author of a number of theological works, and of some hymns and letters still extant.

PAULUS, HEINRICH EBERHARD GOTTLOB, a German theologian of great note in his day, and one of the leaders of the Rationalists at the close of the last and the first quarter of the present century, was born at Leonberg, near Stuttgart, 1st September 1761. He gave himself to the study of oriental languages at Göttingen, and afterwards prosecuted it in London and Paris. In 1789, he was called to the professorship of Oriental Languages at Jena, and in 1793 became Professor of Geology, on the death of Döderlein. Here he especially signalized himself by the critical elucidation of the Scriptures of the Old and New Testament, in so far as they presented oriental characteristics. The result of his labors may be seen in his *Philologisch-kirtischen und historischen Commentar über das Neue Testament* (4 vols. Lüb. 1800—1804); *Clavis über die Psalmen* (Jena, 1791); *Clavis über den Jesaias*, and other writings belonging to this period of his literary activity. In 1803, he removed to Würzburg; in 1808, to Bamberg; in 1809, to Nürnberg; and in 1811, to Ansbach. During these various changes, he had ceased to be a professor, and become a director of ecclesiastical and educational affairs; but in 1811 he accepted the professorship of Exegesis and Ecclesiastical History at Heidelberg. In 1819, he started a kind of historico-political journal entitled *Sophronizon*, in which he continued to write for about ten years. His contributions were marked by weighty sense, modera-

tion, and knowledge of his various subjects, and won him great applause at the time.

As a theologian, he is generally looked upon as the type of pure unmitigated rationalism—a man who sat down to examine the Bible with the profound conviction that everything in it represented as supernatural was only natural or fabulous, and that true criticism consisted in endeavoring to prove this. From his numerous writings we select for mention the following: *Memorabilien* (Leip. 1791—1796); *Sammlung der merkwurdigsten Reisen in den Orient* (7 vols. Jena, 1792—1803); *Leben Jesu, als Grundlage einer reinen Geschichte des Urchristenthums* (2 vols. Heidelb. 1828); *Aufklärende Beiträge zur Dogmen-Kirchenund Religionsgeschichte* (Bremen, 1830); and *Exegetisches Handbuch über die drei ersten Evangelien* (3 vols. Heidelb. 1830—1833.) P. died 10th August, 1851, at the advanced age of 90—having lived long enough to see his own rationalistic theory of Scripture give place to the 'mythical' theory of Strauss, and that in its turn to be shaken to its foundations partly by the efforts of the Tübingen school, and partly by those of Neander and the 'Broad Church' divines of Germany. See P.'s *Skizzen aus meiner Bildungs-und Lebensgeschichte zum Andenken an mein 50-jähriges Jubiläum* (Heidelb. 1839), and Reichlin Meldegg's *H. E., G. Paulus und Seine Zeit* (2 vols. Stuttg. 1853).

PAU'PER COLONIES are establishments at Frederiksoord and Veenhuizen in the Netherlands province of Drenthe, and at Willemsoord and Ommerschans in Overyssel. They were erected by a benevolent society to employ poor people in cultivating land and various industries. In 1858, the society suspended payments, and the state took the temporary management, arranged with the creditors, and finally retained Ommerschans and Veenhuizen, leaving Fredericksoord and Willemsoord to be managed by the society.

January 1, 1875, the government colonies contained 2809 persons. There were 2223 men and 507 women; 54 boys and 36 girls under 16 years. Protestants, 1948; Roman Catholics, 834; Jews, 38. Could read and write, 2071; able for work, 2657. They have all been convicted, by a magistrate, of begging; and are employed in agriculture and various handicrafts. Peat is largely prepared; coffee-bags and other coarse fabrics are manufactured. Rye, oats, buckwheat, potatoes, &c., cover 2000 acres, and 1200 are in grass. These institutions are a great expense to the nation, but have reduced the numbers and improved the social condition of destitute people.

The colonies of the benevolent society extend to about 6000 acres, and the inhabitants are either tenant cotters, with about 7 acres of land to each house, or labor for the company. The cotter families pay for a house and land a yearly rent of £4, 3s. 4d.; the use of a cow being also obtained for a small hire. The factory-workers weave sacking, coarse cottons and linens, make baskets, mats, straw-hats, &c. There are two Protestant churches, a Roman Catholic chapel, and a synagogue. These colonies have not been self-supporting, and are partly maintained by the annual contributions of 5070 members, gifts, legacies, &c. January 1, 1875, pop. 1956. Land produce, hay, rye, oats, buckwheat, potatoes, oak wood and bark, &c. Stock—303 cows and oxen, 34 calves, 27 horses, 251 sheep, and 40 swine. In 1874, 1028 acres were cultivated. The property, stock, &c. of the society are valued at £78,615, and the debts at £12,300. The position of the colonists has been greatly improved, and their homes show signs of industry and comfort. When working in the factories, a tenth part of their earnings is placed in a reserve fund to be paid to them in winter or in time of sickness.

PAUSA'NIAS, a famous Spartan regent and general, the son of Cleombrotus, and nephew of Leonidas. He commanded the confederate Greeks in the important battle of Platæa (479 B.C.), in which the Persians were totally routed, and their leader, Mardonius, slain. He then marched his troops against Thebes, and compelled the inhabitants to give up the chiefs of the Persian party to him for punishment. Elated by this victory, however, he became in an extreme degree haughty and vain-glorious, took all the credit to himself, and allowed none to the Athenian generals, Aristides and Kimon, who commanded under him, and treated all the other Greeks as if the Spartans were their lords. Nevertheless, he still continued his conquests, capturing Cyprus and Byzantium. It was here he first began to play false to Greece. He entered into secret negotiations with Xerxes, with the view of becoming ruler, under the Persian monarch, of the whole country, and in his journey through Thrace, even adopted the dress and luxurious habits of a Persian satrap, and surrounded himself with a body-guard of Persians and Egyptians. Being recalled, on account of these things, by the Spartans, his former services procured his acquittal. He then returned to Byzantium, where he renewed his traitorous intrigues, was expelled from the city for a criminal assault upon a Byzantine lady, withdrew to the Troad, and there continued his treachery. He was a second time called to account by the Spartan ephors, but again escaped, though with greater difficulty. Yet his passion for the sovereignty of Greece, even though at the expense of the national liberties, once more drove him to play the traitor. He tried to stir up the Helots, but was taken in his own net. A Helot betrayed him. When P. found his position desperate, he took refuge in a temple of Athene. Hereupon the people blocked up the gate of the temple with heaps of stones, and left him to die of hunger, his own mother depositing the first stone.

PAUSANIAS, one of the most eminent of Greek geographers and historians, was probably a native of Lydia in Asia Minor, and was born some time in the 2d century. He traveled through almost all Greece, Macedonia, and Italy, and also through part of Asia and Africa, and composed from his observations and researches an Itinerary, entitled *Hellados Periegesis*, in ten books, describing the different parts of Greece, and giving a particular account of the monuments of art and of the legends connected with them. His style is by no means pure; but in matters of his own observation he is most trustworthy, and his work is, on many subjects, one of the most valuable sources of information that we possess. There are numerous editions of his work; the oldest was printed at Venice in 1516 by Aldus; and the most recent is that by J. H. C. Schubart and C. Walz (3 vols. Leip. 1838—1840). Translations of P. exist in English, German, and French.

PA'VEMENT, flat stones or 'flags' used for the flooring of halls, kitchens, and other apartments, and frequently for footpaths; also the stone covering of the roadway of streets. The stones used for flags vary in different districts, according to the geological formation of the neighborhood. The pavements now most commonly used in England and Scotland are the Arbroath and Caithness stones—the former a softer and more agreeable stone than the latter, which is exceedingly hard and slippery when wet. Pavement should be carefully laid on a solid dry foundation, and set in a good bed of concrete or lime, and the joints pointed with cement. It may also be laid on small dwarf walls, built of brick, so as to support all the edges—this is a good method for keeping the floor dry.

The PAVING OF STREETS is of early date, and is, in fact, necessary to any considerable degree of civilization and traffic. The Romans paved their streets in the same elaborate and solid manner in which they paved their highways. See ROADS. Portions of the ancient pavement of the streets of Rome are in use to the present day, and the pavement of Pompeii remains entire. It is laid with large blocks of stone of polygonal shape (like Cyclopean masonry), very carefully fitted together, and of considerable depth, and below there is a carefully prepared basis, often composed of several distinct strata. Some of the Italian towns—Florence, for instance—have still pavement of this description, and no foot-pavement.

The medieval cities were almost all unpaved till about the 12th c., when the main streets of the chief towns began to be protected with stone. The plan now adopted is nearly the same in all the cities of Europe. The first thing to be done is to secure or make a solid foundation. This is done, where the natural substratum is not of a solid kind, by laying the street with a solid bed of concrete, having a slope from the middle to the sides to throw off the water. On the concrete is placed the real pavement, which is composed of blocks of granite, trap, or other tough rock. These should be rectangular, and the deeper the better. They are generally about 10 inches to 12 inches in depth, and 6 inches or 7 inches broad, and from 1 to 2 feet in length. They should be all bedded and jointed in strong mortar. This is not often done, as it is thought sufficient to bed the stones in sand and grout them with hot lime on the top. It is clear, however, that the more equal the stones are *in depth*, and the more solidly they are bedded, the longer they will last. Other materials besides stone have been tried for the paving of streets—such as blocks of wood with the end up, and blocks of cast iron. The wooden pavement is delightfully easy, and not noisy, but in wet weather it is exceedingly slippery. Cast-iron is too hard, and causes too much jolting and noise.

The great obstacle in the way of really good pavement in modern streets is the necessity of frequently breaking it up for the laying and repairing of pipes for gas, water, &c. The true remedy —and, in the end, the cheapest—would be to have, in the chief streets at least, sub-ways or tunnels for drains and pipes, accessible without breaking up the pavement.

PAVI'A, a city of Northern Italy, capital of the province of the same name, on the left bank of the Ticino, 20 miles south of Milan, and 7 miles above the confluence of the Ticino and the Po. A covered bridge of eight arches connects the city with the suburb of *Borgo Ticino*, on the right bank of the river, and from this bridge the *Strada Nuova*, or *Corso*, the principal thoroughfare, leads north, and extends to the outskirts. The city is large, surrounded by walls, and has an imposing appearance, bearing the impress of antiquity. In former times, it was called the 'city of

a hundred towers;' but the palace of Theodoric, and the tower where Boëthius wrote the treatise *De Consolatione Philosophiæ*, no longer exist; among the remaining ones are those of Belcredi and Del Maino, which are each 169 feet high. Its oldest church, and perhaps the oldest in Italy, is that of San Michele, which, although the date of its foundation is uncertain, is first mentioned in 661. The cathedral, containing some good paintings, was commenced in 1484, but was never finished. In a beautiful chapel attached to it, are the ashes of St. Augustine, in a sarcophagus ornamented with 50 bassi-rilievi, 95 statues, and numerous grotesques. In the Church of San Petro in Ciel d'Auro are deposited the remains of the unfortunate Boëthius. The Certosa of P., the most splendid monastery in the world, lies four miles north of the city. It was founded in 1396, contains many beautiful paintings, and abounds in the richest ornamentations. It has an octagonal cupola, painted ultramarine, and enameled in gold. It was sacked by the French in 1796. Its church is in the form of a Latin cross, and is 249 feet long, and 173 feet wide.

The university of P. is said to have been founded by Charlemagne in 774, and was one of the most famous seats of learning during the middle ages. Its efficiency was much increased by Galeazzo Visconti, who bestowed many privileges upon it in the year 1396. It consists of numerous colleges, and attached to it are a library of 120,000 vols., a numismatic collection, anatomical, natural history, and other museums, a botanic garden, a school of the fine arts, &c. The university is attended by about 700 students. It has numbered among its professors Alciati, Fidelfo, Spallanzani, Volta, Scarpa, Foscolo, and Monti. The other chief edifices comprise private palaces, theater, gymnasium, &c. P. carries on a good trade in wine, rice, silk, and cheese. Pop. (1881) 29,836.

P., the ancient *Ticinum* (afterwards *Papia*, whence the modern name), was founded by the Ligurii; it was sacked by Brennus and by Hannibal, burned by the Huns, conquered by the Romans, and became a place of considerable importance, at the end of the Roman empire. Then it came into the possession of the Goths and Lombards, and the kings of the latter made it the capital of the kingdom of Italy. It became independent in the 12th c., then, weakened by civil wars, it was conquered by Matthew Visconti in 1345. Since that period, its history is merged in that of the conquerors of Lombardy. Here, in 1525, the French were defeated by the imperialists, and Francis I. (q. v.) taken prisoner; but in 1527, and again in the following year, it was taken and laid waste by the French. It was stormed and pillaged by Napoleon in 1796, and came into the possession of Austria by the peace of 1814. Since 1859, it has been included within the kingdom of Italy.—The province of P. has an area of 1290 sq. m.; pop. (1872) 448,435.

PAVIA. See HORSE-CHESTNUT.

PAVI'LION, a portion of a building, under one roof, of a tent-like form, with the slope of the roof either straight or curved. This form is much used in France—the higher parts of the new buildings at the Louvre are good examples of pavilions. Pavilion roofs are sometimes called French roofs.

PAVLOGRA'D, a town of South Russia, in the government of Ekaterinoslav, and 38 miles east-north-east of the town of that name, on the Voltcha, an affluent of the Dnieper. It was founded in 1780, during the reign of the Empress Catharine II., and its first colonists were the Zaporogsky Cossacks. But in 1782, a great portion of the English garrison of Fort Magon in Minorca, having been subdued by the Spaniards, and being forced by the terms of their capitulation to renounce the English service, obtained liberty from the Empress Catharine to settle in Pavlograd. The garrison was composed chiefly of Corsicans. Pop. of the town (1880) 11,500.

PAVO'NIDÆ, a name sometimes used to designate the family of gallinaceous birds more commonly called *Phasianidæ* (q. v.), sometimes applied as a designation to a portion of that family separated from the rest on very slight grounds, the chief distinction being the greater expansion of the tail. See PEACOCK and POLYPLECTRON.

PAWL, on shipboard, is a catch or hook to prevent the capstan from flying round backwards during a pause in the heaving. A similar catch is used in the common windlass.

PA'WNBROKING (Du. *pand*, Ger. *pfand*, Fr. *pan*, a pledge). The business of lending money on pawns or pledges appears to have been carried on in England by certain Italian merchants or bankers as early at least as the reign of Richard I. By the 12th of Edward I., a messuage was confirmed to these traders where Lombard Street now exists; the name being, according to Stow, derived from the Longobards who used to congregate there for business purposes. Subsequently, these merchant adventurers became known generally by the name of Lombardens. Their wealth became proverbial. Among the richest of them were the celebrated family of the Medici; from whose armorial bearings it is conjectured that the pawnbroking insignia of the three balls have been derived. The bankers of Lombard Street appear to have exercised a monopoly in pawnbroking until the reign of Elizabeth. The trade is first recognized in law by the act 1st James I. c. 21. In the perilous days of Charles I. the goldsmiths were very frequently chosen as the custodiers of plate and money; which circumstance seems to have suggested to them the profitable business of lending on pawns and discounting bills. From this time, the oppression and extortion often exercised by brokers has continued to attract much public attention and discussion; and an effort has been made, both in England and on the continent, to obviate the evil by the establishment of what are called Monts de Piété, the object of which is to advance small sums to the very poor at a moderate interest. See MONT DE PIÉTÉ. In England, after many abortive efforts, a Mont de Piété office was started in 1708; but in 1731 it came to a disastrous end. The bubble mania of 1824—1825 gave rise to a similar scheme. In this instance upwards of £400,000 was subscribed; but the undertaking miscarried, and the capital was lost. A similar fate attended the Irish Monts de Piété, of which there were eight in 1841. In 1848, they had all disappeared except one, which lingered to 1853; when it also expired. It would thus seem hopeless to attempt to establish a pawnbroking office in England on any other footing than an ordinary commercial one. The cause of failure will be found to lie, generally, in the great difficulty of conducting a commercial undertaking on charitable principles, with sufficient energy and ability to compete successfully with others originating in the ordinary motives which lead men to engage in trade.

It hardly admits of dispute that the pawn-shop, in its practical working, is an evil—necessary, it may be, but still an evil; and the having recourse to it is strongly to be discouraged. There are, doubtless, cases where men are driven to pawn their goods from causes which are not discreditable, and which do not render it certain that they are on the road to ruin; but such cases are rare exceptions to the general rule. Besides making borrowing too easy, and thus encouraging the fatal habit of anticipating income, the pawn-shop is, in nine cases out of ten, the door to the drinking-shop. Even where the one does not directly lead to the other, it generally does so in the end. That 'borrowing dulls the edge of husbandry' applies with a force increasing in a geometrical ratio as we descend in the scale of society. Admitting, however, that with all its tendency to demoralize, pawnbroking is, in many cases, of value in tiding over unforeseen pecuniary difficulties, it is sufficient to say, that so long as improvidence prevails among large classes of society, and so long as even the most prudent are liable to unforeseen accidents, the accommodation of the pawn-shop is to a certain extent a necessity, and like other demands of the public will continue to be supplied. Nor are those who supply this demand to blame, any more than the caterers for many other expenses which economists pronounce to be wasteful. The fault, where there is a fault, is in those who borrow, not in those who lend. The legislature, accordingly, instead of trying to put down pawnbroking, has wisely confined itself to putting it under stringent regulations so as to prevent as far as possible its abuse.

Pawnbrokers are restricted in their business as regards loans under £10, by the statute 35 and 36 Vict. c. 93, which repealed all the prior statutes, and defined new offences, and it also extends to 'leaving-shops.' The statute requires them to take out a license (for which they pay £7, 10s.), and keep exhibited outside their names and business, fixes the rate of interest, and makes it necessary that a table of interest should be put up in a conspicuous part of the shop, to keep books with correct entries of the name and place of abode of the owners of goods, &c. If the owner of goods has just cause to suspect that such goods have been pawned at a particular shop, the justices of the peace may grant a search-warrant, and if found, the goods may be restored to the owner. Pawnbrokers are expressly prohibited from taking in pledge linen, apparel, or unfinished goods, intrusted to any person to wash, manufacture, make up, &c., and also any goods under circumstances which should have aroused their suspicions. Goods which have been in pledge for a year may be sold, and the pawnbroker may bid for them, if done openly. If the duplicate is lost, the owner of the goods may obtain a fresh one on verifying the fact of his being the owner before a justice of the peace. If the money borrowed be tendered with interest within the year, the pawnbroker is bound to deliver them up, otherwise a justice of the peace may by order compel him to do so. The mode of selling forfeited goods is prescribed by the statute, for all pledges above ten shillings, to be by auction—the catalogues to contain the names of the pawnbrokers, and the month when the goods were pawned, and the number entered in the pawnbroker's books. The result of the sales is to be entered in the books of the pawnbroker and auctioneer, and the surplus is to be paid on request to the owner of the goods if claimed within 3 years. In the case of pledges below ten shillings, the pawn-

broker becomes the absolute owner after 12 months. Pawnbrokers are not to take goods in pawn from persons under the influence of drink, or under the age of 12.

In case of penalties imposed on pawnbrokers for offences against the act, the complainant, if the party aggrieved, and then only, generally gets half. In case of fire the pawnbroker broker is liable to the owner for the value of the goods (after deducting the amount of loan and profit), and 25 per cent. on the amount of the loan; but this only if the claim be made within 12 months after the pawning.

The greatest pawnbroking establishment in the world is the Mont de Piété of Paris. It trades with borrowed capital, and with the profits of former years temporarily capitalized. Recent statistics are not at hand; but it has been reported to receive in one year 1,431,575 pledges, valued at £1,036,371, including renewals, and the average charge was about 15 per cent. per annum. Taking one of the largest offices in England out of London, we find that in one year it received 142,835 pledges, valued at £36,560, including renewals, and the average charge was 25 per cent. per annum. Various circumstances render the difference between the rates really much less than these figures indicate; still there is no doubt that the interest charged on small loans is lower at the Mont de Piété of Paris, than in the pawnbroking offices in this country; but this convenience is limited by the fact of the French establishment taking no loans under three francs.

What used to be called in England the 'dolly shop,' and in Scotland the 'wee pawn' system was carried on by brokers, ostensibly buying and selling. They received articles as bought; there being a distinct understanding that the seller was to have an opportunity of repurchasing within a limited time, at an understood increase of price. The general understanding was a penny a shilling a week; a month being usually allowed to redeem the article. The 'wee' broker was commonly resorted to because the article was below the regular dealer's class of goods. The 'wee pawn' was happily abolished in Scotland ten or twelve years ago.

PAWTU'CKET, a town of Rhode Island, U. S., on both sides of the Pawtucket River, 4 miles north of Providence. A fall of 50 feet on the river, and its proximity to the sea, caused it to be selected by Samuel Slater, in 1790, as the site of the first cotton factory in the United States. It now contains 13 cotton mills, machine shops, and manufactures of yarn, fire-engines, belting, jewelry, &c. There are 18 churches, 3 banks, 2 newspapers, a public library, with extensive steam-boat and railway connections. Pop. (1870) 6619; (1881) 19,030. A part of North Providence was annexed to P. in 1874.

PAX, called also PACIFICALE and OSCULATORIUM (Lat. *osculor*, I kiss), the 'Kiss of Peace,' and also a sacred utensil, employed in some of the solemn services of the Catholic Church in the ceremony of giving the so-called 'kiss of peace' during the mass. The practice of saluting each other—the men, men, and the women, women—during public worship, and particularly in the *agape*, or love-feast, is frequently alluded to by ancient writers, as Cyril of Jerusalem, Catech. xv., and St. Augustine, Serm. 227. All the ancient liturgies, without exception, refer to it as among the rites with which the Eucharist was celebrated; but they differ as to the time and the place in the Eucharistic service in which it is introduced. In the Eastern liturgies it is before, in the Western after the Offertory (q. v.) and in the Roman it immediately precedes the communion. The ceremony commences with the celebrating bishop or priest, who salutes upon the cheek of the deacon; and by him the salute is tendered to the other members, and to the first dignitary of the assistant clery. Originally the laity also were included, but this has long since been abandoned. It is when the mass is celebrated by a high dignitary that the utensil called the pax is used. The pax is sometimes a crucifix, sometimes a reliquary, sometimes a tablet with a figure sculptured or enamelled upon it. Having been kissed by the celebrant, and by him handed to the deacon, it is carried by the latter to the rest of the clergy. In ordinary cases, the pax is given by merely bowing, and approaching the cheek to the person to whom it is communicated. The pax is omitted in the mass of Maundy-Thursday (q. v.), to express horror of the treacherous kiss of Judas.

PAXO, one of the Ionian Islands, lies 10 miles south-west of the coast of Albania, and 9 miles south-south-east of the island of Corfu. It is about 5 miles long, and about 2 miles broad. The capital, or rather the chief village, is Port Gaio (pop. 2000), on the east coast. Olives, almonds, and vines are grown, and the island is famous for its oil. Water is sometimes very scarce. Pop. of the island about 3600.

PAXTON, SIR JOSEPH, English architect and horticulturist, was born at Milton-Bryant, near Woburn, Bedfordshire, in 1803. He was sent to Woburn Free School, but left it at an early age, and obtained employment as a working gardener. He entered the service of the sixth Duke of Devonshire, at Chiswick, and was thence transferred to Chatsworth, where he became the duke's chief gardener. His abilities as a horticulturist found ample scope in the beautiful gardens of Chatsworth, and are further attested by *Paxton's Magazine of Botany*, of which he was editor, as well as other works on plants and flowers. The experience he obtained in designing capacious glass conservatories at Chatsworth led him to propose a Crystal Palace of glass and iron for the Great Exhibition (q. v.) of 1851. It was the first time these materials had been employed on so extensive a scale, and visitors found an inexhaustible theme of admiration in a fairy palace so novel, beautiful, and magnificent. His design obtained for him great popularity and the honor of knighthood. The Crystal Palace of 1851 was removed from Hyde Park, but became the germ of the nobler and more splendid Palace at Sydenham, the construction of which he superintended; the grounds were also laid out by him. Crystal palaces for exhibitions of artistic and industrial objects have since 1851 been constructed at Dublin, New York, Paris, Manchester, &c. In 1854, P. was returned to parliament on the liberal interest for Coventry, which he represented for about ten years. He was a member of many learned societies in Europe, and his works on horticulture and botany are much esteemed. He died in 1865.

PAY'MASTER-GE'NERAL is an officer of the British ministry, but not of the cabinet, charged with superintending the issue of all moneys voted by parliament. He is virtually the paymaster of the public service, having no control over the sums issued, paying merely on the order of the department concerned; and receives £2000 a year as chancellor of the duchy of Lancaster. He is always either a peer or a member of the House of Commons, and changes with the ministry. Of late years the office has been held in conjunction with that of Vice-president of the Board of Trade. The paymaster-general is assisted by a deputy and a staff of clerks, the annual cost of the whole department amounting to about £25,000. The first notice of this office is in the early part of the reign of Charles II., when the paymaster-general was nothing more than the sole paymaster of the army. The present extensive duties of the office have been added by degrees during the 19th century.

PAYMASTER, MILITARY AND NAVAL.—Military paymasters are either 'Control' or 'Regimental.' Of the latter, who constitute by far the more numerous class, there is one to every brigade of artillery, regiment of cavalry, and battalion of infantry. The paymaster holds no other commission, but the appointment is nearly always conferred upon some person who has previously held a combatant rank in the army. The functions of paymaster comprise issuing and accounting for the pay of officers and men, and having charge generally of all the finances of the corps. In discipline, the paymaster is responsible to the officer commanding the regiment; but in all money matters he looks for orders to the War Office alone. He commences with a pay of 12*s.* 6*d.* a day, with the relative rank of captain; and after twenty years' service attains the pay of £1, 2*s.* 6*d.* a day and relative rank as major. Regimental paymasters were first appointed during the French war.

Control paymasters have financial charge in the military districts or sub-districts. They form a separate department under the Surveyor-general of the Ordnance, comprising paymasters, deputy paymasters, and assistant paymasters.

The NAVAL PAYMASTER is for a ship what the military paymaster is for a regiment; but he adds to these duties some of those performed in the army by the quartermaster, commissariat, and military storekeeper, for he has charge of the provisions, clothing, and miscellaneous stores, as well as of mere money. Paymasters are commissioned officers, receiving from 14*s.* to £1, 13*s.* a day, and ranking, according to service, with lieutenants, commanders, and captains. Up to the year 1844, paymasters were styled pursers, and were paid by profits they made on certain of the ship's charges. At a still earlier period these pursers had been warrant-officers.

PAYMASTER-SERGEANT, in the army, is a non-commissioned officer, whose duty it is to act as clerk to the paymaster. He ranks with other staff-sergeants, and receives from 1*s.* 11*d.* to 2*s.* 1l*d.* a day, according to his corps, with an increase of 6*d.* after three years' uninterrupted service as paymaster-sergeant.

PAYNISING, a process for preserving and hardening wood, invented by a Mr. Payne. It consists in placing well-seasoned timber in an air-tight chamber, and then, when, by means of a powerful air-pump, the wood is deprived of its air, a solution of *sulphuret of calcium*, or of sulphuret of barium is admitted, and readily fills up the empty vessels all through the wood. The air-pump is again used, and the superfluous moisture is drawn out, and a solution of sulphate of iron is injected; this acts chemically upon the sulphuret of barium or of calcium, and forms all through the wood either the insoluble sulphate of barium (heavy spar) or of lime (gypsum). The addition of these mineral materials renders the wood very heavy, but it becomes also very durable, and almost incombustible.

PAZ (La) DE AYACU'CHO, a town of Bolivia, South America, capital of a dep. of the same name, about 20 miles from the south shore of Lake Titicaca, is situated on the east declivity of the Andes, at an elevation of 12,000 feet above the sea, on both sides of a deep ravine, here crossed by nine bridges. The whole city is subdivided into sections by numerous ravines. The streets are generally irregular and steep; there are some good public buildings, several educational institutions, a noble cathedral, and many other churches. It is the seat of a bishop and a university. La P. is the largest city, and the principal commercial emporium of Bolivia—the exports consisting of gold, bark, and other products of the country; and the imports of manufactured goods, the bulk of which comes through Peru. This city, whose original name was Nuestra Senora de la Paz, was founded in 1548. The name was changed in 1825 to its present form, in honor of the national victory of Ayacucho (q. v.). Pop. at census of 1880, 26,000, the greater part of which is Indian.

PEA (*Pisum*), a genus of plants of the natural order *Leguminosæ*, suborder *Papilionaceæ*, closely allied to the genus *Lathyrus* (q. v.), from which it differs chiefly in the triangular style. Two species, supposed to be natives of the south of Europe and of the East, are very extensively cultivated for their seeds (peas), which are the best of all kinds of pulse; the Common Pea or Garden Pea (*P. sativum*) in gardens, and the Field (*P. arvense*) in fields; both of them climbing annuals, with pinnate leaves, ovate leaflets, and branching tendrils in place of a terminal leaflet; the Garden Pea distinguished by having two or several flowers on each flower-stalk, the flowers either red or white, more generally white, and the seeds subglobular; the Field Pea having one flower on each flower-stalk, the flowers always red, and the seeds angular from crowding and compression in the pod. But it is not improbable that they are truly one species, of which the Garden Pea has, through cultivation, departed furthest from the original type. Peas have been cultivated in the East from time immemorial, although the ancient Greeks and Romans do not seem to have been acquainted with this kind of pulse, the cultivation of which was apparently introduced into Europe very early in the middle ages; and its cultivation extends from warm climates, as India, even to the Arctic regions, the plant being of rapid growth and short life.

The seeds of the Garden Pea are used for culinary purposes both in a green and in a ripe state; also the green succulent pods of some varieties, known as Sugar Peas or Wyker Peas, in which the membrane lining the inside of the pod—parchment-like in most kinds—is much attenuated. Field peas are used both for feeding cattle and for human food. For the latter purpose, peas are often prepared by being *shelled*, or deprived of the membrane which covers them, in a particular kind of mill; they are then sold as *Split Peas*, and are much in use for making *Pea Soup*. They are also ground into meal, which is used in various ways, chiefly for making a kind of pottage and of unleavened bread. In the countries bordering on the Mediterranean, peas are roasted in order to eating.

There are innumerable varieties both of the Field Pea and the Garden Pea, those of the latter being so much the products of horticultural art, that they cannot be preserved without the utmost attention. Some of the kinds of garden peas have long stems, and require for their support stakes of six or eight feet in height; others are of humbler growth; and certain dwarf kinds, preferred as most convenient in many gardens, succeed very well without stakes. The largest kinds are sown in rows about four feet asunder. In Britain, garden peas are sown at different times from February to June, in order to secure a supply of green peas during a considerable part of summer and autumn; and in the southern parts of the island they are also sown in the end of autumn, a very little protection being sufficient for them during the winter. Certain small kinds, of very rapid growth, known as *Early Peas*, are preferred for the first sowing, although less productive than many others. The varieties known as *Mammoth Peas* are remarkable for their size and tenderness in a green state, but shrivel as they ripen.

Branches of trees are generally used for pea-stakes, when they can be obtained, and nothing can be better; but in lieu of them, strings are sometimes stretched between poles along the rows. Field peas are sometimes sown alone, and allowed to support each other, where the soil is not very rich, but are very generally sown with beans, to which they cling.

Chalky and other calcareous soils are particularly suitable for peas, and in other soils a good field crop is seldom obtained unless the land has been well limed, or manured with gypsum. The free use of lime is supposed, however, to be unfavorable to the quality of garden peas intended to be used green.

Peas are cultivated to a considerable extent as a field crop in Britain, but are best adapted to those districts in which the climate is least moist, the seeds being very apt to grow in the pods when moist weather prevails in autumn, by which the crop is injured or destroyed. The most productive kinds, being also in general the most bulky in straw, are very apt to lodge before the pods are filled, in wet seasons, and particularly on rich land. The crop is, therefore, rather a precarious one.

The haulm or straw of peas is used for feeding cattle; and for its sake, field peas are often reaped before they are quite ripe, great care being taken in stacking the straw to provide for ventilation, so that it may not *heat*. Pea haulm is more nitrogenous and more nutritious than hay.

Land to be sown with field peas should be very *clean*, and in particular free of couch grass; otherwise the best management cannot prevent its becoming more foul whilst bearing the pea crop. The seed ought always to be sown in rows, twelve inches apart, or, in rich soils, eighteen or twenty inches apart. Various means are employed for sowing peas; they are not unfrequently ploughed under each second furrow; but the seed ought not to be buried more than four inches under the surface, and indeed that depth is too great; although many farmers sow their peas deeper than they otherwise would, to place them beyond the reach of wood pigeons. All possible means ought to be used to keep the land free of weeds. In some districts, peas are generally sown broadcast, which renders it impossible to do anything for this purpose. In the harvesting of peas, the sheaves are generally left loose till the haulm is somewhat dry. In drying, it shrinks very much. Broadcast peas are often cut with the scythe, and the harvesting of them is managed much as that of hay.—*Winter Field Peas*, a variety with very small seeds, are much cultivated in France and Germany, being sown in October, enduring the severest frosts without injury, and ripening very early.

Besides being one of our most important agricultural and horticultural crops, peas are largely imported into Britain, the quantity sometimes reaching 120,000 quarters. We receive them from Denmark, Prussia, the Hanse Towns, Holland, Morocco, United States, British North America; and of these, Denmark and our North American colonies send the greater part. As an article of food, if not taken too often or without other food, peas are very valuable, as they contain a large percentage of *casein*, which is a flesh-forming principle.

This principle in the pea has been called *legumin*, but chemists are now generally agreed that it is identical with the casein of cheese. The following is an analysis of one hundred parts of pea meal:

Water	14·1
Casein	23·4
Starch	37·0
Sugar	2·0
Gum	9·0
Fat	2·0
Woody Fibre	10·0
Mineral Matter	2·5
	100·0

The unripe peas of the garden varieties are amongst our most esteemed vegetables, and the meal of the white or yellow varieties used in soups is a highly nutritious and agreeable food.

A plant found on some parts of the shores of Britain, as well as of continental Europe and North America, and known as the Sea Pea, has been commonly referred to the genus *Pisum*, and called *P. maritimum*, although botanists now generally refer it to *Lathyrus*. It much resembles the common pea; has large reddish or purple flowers on many-flowered stalks; and its seeds have a disagreeable bitter taste. Its abundance on the sea coast at Orford, in Sussex, is said to have saved many persons from death by famine in 1555.—The other species of *Pisum* are few. But the name P. is often given to species of other papilionaceous genera. The Sweet Pea and Everlasting Pea are species of *Lathyrus*. The Chick Pea (q. v.) is a species of *Cicer*.

PEA BEETLE, or PEA CHAFER (*Bruchus pisi*), a coleopterous insect, very destructive to crops of peas in the south of Europe and in North America. It is about a quarter of an inch long, black, variegated with bright brown hairs, and with white spots and dots on the wing-cases. It lays its eggs in the young pods, one for each pea, and the larva eats its way into the pea, and completely hollows it out.

PEABODY, George, an American merchant whose name deserves to be held in remembrance on account of his munificent philanthropy, was born at Danvers, Massachusetts, February 18, 1795. His parents were poor, and his only education was received at the district school. At the age of 11 he was placed with a grocer, and at 15 in a haberdasher's shop in Newburyport. When 22 years old, he was a partner with Elisha Riggs in Baltimore. In 1827 he first visited England, where he settled permanently ten years later. Withdrawing from the Baltimore firm in 1843, he established himself in London as a merchant and money-broker, and accumulated a large fortune. As one of three commissioners appointed in 1848 by the state of Maryland to ob-

tain the restoration of its credit, he refused all payment, and received a special vote of thanks from the legislature of that state. In 1851 he supplied the sum required to fit up the American Department at the Great Exhibition. In the following year he sent a large donation, afterwards increased to 270,000 dollars, to found an Educational Institute, &c., in his native town of Danvers (which is now called Peabody). He contributed 10,000 dollars to the first Grinnell Arctic Expedition; 1,400,000 dollars to the city of Baltimore for an Institute of Science, Literature, and the Fine Arts; 8,000,000 dollars for the promotion of education, endowment of libraries, &c., in the U. S.

From 1862 to 1868, he gave £350,000 for the benefit of the London poor, and in his will he left £150,000 for the same purpose; half a million in all, which has been employed in building dwellings for the working-classes. He died in London in 1869.

PEACE, ARTICLES OF THE, in English Law, are certain complaints made against a person who threatens another with bodily injury, and the redress given is to bind the threatening party over with sureties to keep the peace. All justices of the peace have, by their commission, authority to cause persons to find sufficient security to keep the peace, and an ancient statute also gives authority. Hence any one who is threatened either in person or property, or in the person of his wife or child, may go before a justice of the peace and complain on his oath of the fact. The justice is to consider if the language used amounted to a threat, and if he is satisfied that it does, he issues his warrant to bring the party before him, who is then heard in explanation, and if it is not satisfactory, he is ordered to find sureties. If he cannot do so, he is committed to prison for a limited time, or until the next quarter-sessions. The party, when he finds sureties, is bound over for a term not exceeding twelve months. If he has entered into recognizances (i. e., given a bond with sureties), and he breaks the peace, he forfeits his recognizance, and the sureties' goods can be seized to pay the amount of the bond.

PEACE, OFFENCES AGAINST THE PUBLIC, are those offences which consist in either actually breaking the peace, or constructively doing so by leading indirectly to a breach. These offences are now usually known under the heads of unlawful assemblies, seditious libels and slanders, riots, affrays, challenges to fight, forcible entry and detainer, and libel and slander. Those who take part in an unlawful assembly commit a misdemeanor against the public safety. All persons assembled to sow sedition, and bring into contempt the constitution, are an unlawful assembly. Thus it was held that an attempt to hold a national convention was illegal, for it was impossible to anticipate with certainty the peaceable result of such a meeting. It is, however, somewhat difficult to define precisely what amounts to an illegal assembly, except by saying that it points to some course inconsistent with the orderly administration of the laws. It is the duty of all individual citizens to resist and oppose any unlawful assembly; but the duty rests primarily with the magistrates of the district, who are indictable for breach of duty in not taking active and immediate steps to put down riots. Thus the mayor of Bristol was indicted for not suppressing the riots at the time of the Reform Bill. The magistrates ought to call at once upon special constables to be sworn in, and if these are insufficient, to call for the aid of the military. Seditious libels are also offences against the peace, as inciting directly to a breach. Such are libels vilifying the Sovereign or the Houses of Parliament, or the courts of justice, or even a foreign sovereign, as in the case of Peltier, who was tried for a libel against the Emperor Napoleon I., the tendency of such libel being to breed misunderstanding between our own sovereign and the foreign sovereign. A riot is the most active form of an offence against the public peace.

To constitute a riot, there must be at least three persons engaged together in pursuance of an illegal purpose. Riots often originate in an attempt to redress summarily some private wrong. On such an occasion, before extreme measures are resorted to, and as a test of the good faith of those who are spectators, instead of parties, and by way of full notice to all concerned, the justices of the peace may read the Riot Act, 1 Geo. I. st. 2, c. 5, which commands all persons to disperse within one hour after a proclamation is read, otherwise they will be guilty of felony. Persons not removing within one hour thereafter may be arrested, and carried before a justice, and committed to prison. It is, however, possible that the justices may make a mistake in thinking that to be an illegal assembly which is not so, for the mere reading of the Riot Act does not alter the character of the assembly, and accordingly if the party arrested prove at the trial that it was no illegal assembly he will be discharged. An affray is also an offence against the public peace, being a public assault, i. e., an asssult committed in presence of third parties, for this is apt to lead to further breaches of the peace by others joining in it. Thus prize-fights and duels are affrays, and all present at them are principal offenders, and may be arrested by a constable and bound over to keep the peace, and punished by fine and imprisonment besides. So challenges to fight, provocations to fight, and forcibly entering into a house, are misdemeanors against the public peace.

PEACH (*Amygdalus Persica*), a tree much cultivated in temperate climates for its fruit; a native of Persia and the north of India; of the same genus with the ALMOND (q. v.), and distinguished by oblongo-lanceolate serrulate leaves; solitary flowers, of a delicate pink color, appearing before the leaves; and the sarcocarp of the drupe succulent and tender, not fibrous as in the almond. This difference in the drupe has been made by some the ground of a generic distinction, but there are intermediate states, so that others have doubted if the P. and almond are even specifically distinct. The NECTARINE differs from the P. only in having a smooth fruit, whilst that of the P. is downy, or velvety, and is a mere variety, probably produced and certainly preserved by cultivation. Both peaches and nectarines are divided into *freestones* and *clingstones*. In the former the flesh of the fruit parts from the stone; in the latter it adheres to it. The Freestone P. is the *Pêche* of the French, the Clingstone P. their *Pavie;* the Freestone Nectarine they call *Pêche lisse*, and the Clingstone Nectarine *Brugnon*. Of all these there are many sub-varieties, the finer ones being perpetuated by budding, which in Britain is generally on plum or almond stocks. There is a remarkable variety of Chinese origin, with the fruit compressed and flattened, and with almost evergreen leaves. The P. is much cultivated in the south of Europe, in many parts of the East, in the warmer temperate parts of North and South America, in Australia, &c., as a standard tree; in general, it is rather a small tree with a full head; in Britain, it is generally trained on walls, and in the northern parts of it on flued walls or in hot-houses, although even in Scotland excellent peaches are ripened on open walls without artificial heat. The Nectarine is rather more tender than the peach.

In the extensive P. orchards of New Jersey, Pennsylvania, Maryland, and other states of North America, which sometimes contain 10,000 or 20,000 trees, the fruit is often of very inferior quality, from want of care in cultivation—the orchards being planted by simply depositing the seed in the ground; and much of the fruit is used for making a spirituous liquor called *Peach Brandy;* much of it is dried in ovens, or in drying-houses furnished with stoves, or, in the more southern states, in the sun, each fruit being divided into two parts, and the stone taken out, and when dried it is sent to market to be used for pies; the refuse of the orchards is used for feeding swine.—The P. is a very pleasant and refreshing fruit, and in a stewed form is useful in slight cases of constipation. The leaves, when fresh, have the smell and taste of bitter almonds; and by bruising them, mixing the pulp with water, and distilling, the *Peach Water* is obtained which is so much esteemed by many for flavoring articles of cookery. They have been employed as a sedative and as a vermifuge. The seeds almost entirely agree in their properties with bitter almonds; the flowers exhale an odor of bitter almonds; and both seeds and flowers are employed in the manufacture of a liqueur called *Persico*.

PEACH-WOOD, or LIMA-WOOD, a dye-wood imported from South America, supposed to be the produce of a species of Cæsalpinia, allied to that which yields the Nicaragua wood. It yields a fine peach color, whence its name, and is now much used in muslin and calico printing and dyeing.

PEA'COCK, or PEAFOWL (*pavo*), a genus of gallinaceous birds of the family *Pavonidæ*, or *Phasianidæ*, of which only two species are known, natives of the East Indies; birds of large size, and remarkable for magnificence of plumage. The bill is of moderate size, somewhat arched towards the tip; the cheeks



Peacock.

nearly naked; the head crested; the tarsi rather long, and armed with a single spur; the wings short; the upper tail-coverts prolonged far beyond the tail, and forming a splendid train—popularly called the *tail*—which is capable of being erected and spread

out into a great disk, the true tail being at the same time erected to support it. The Common P. (*P. cristatus*) has for crest a kind of aigrette of 24 upright feathers, with slender almost naked shafts and broad tip. The tail consists of 18 brown stiff feathers, and is about six inches long. The train derives much of its beauty from the loose barbs of its feathers, whilst their great number and their unequal length contribute to its gorgeousness, the upper feathers being successively shorter, so that when it is erected into a disk, the eye-like or moon-like spot at the tip of each feather is displayed. The lowest and longest feathers of the train do not terminate in such spots, but in spreading barbs, which encircle the erected disk. The blue of the neck, the green and black of the back and wings; the brown, green, violet, and gold of the tail; the arrangement of the colors, their metallic splendor, and the play of color in changing lights, render the male P. an object of universal admiration—a sentiment in which the bird himself evidently participates to a degree that is very amusing, as he struts about to display himself to advantage, and labors to attract attention, affording a familiar proverbial image of ostentation and pride. When the disk is erected, the P. has the power of rattling the shafts of its feathers against each other in a very peculiar manner, by a strong muscular vibration.

The Peahen is much smaller than the male bird, has no train, and is of dull plumage, mostly brownish, except that the neck is green. As in some other gallinaceous birds, the female has been known, in old age, to assume the plumage of the male. Individuals with white plumage not unfrequently occur, in which even the eye-like spots of the tail are but faintly indicated; and pied peacocks, having the deep blue of the neck and breast contrasted with pure white, are sometimes to be seen. The P. is generally supposed to have been known to the Hebrews in the time of Solomon, but it is not certain that the word commonly translated *peacocks* in the account of Solomon's importations from Tarshish (2d Chron. ix. 21) does not signify *parrots*. It is commonly stated that it first became known to the Greeks on the occasion of Alexander's expedition to India, but Aristophanes mentions it in plays written before Alexander was born. The P. became common among the Greeks and Romans; a sumptuous banquet in the latter days of Roman greatness was scarcely complete without it; and wealth and folly went to the excess of providing dishes of peacocks' tongues and peacocks' brains. Throughout the middle ages, also, a P. was often presented at the tables of the great, on great occasions, the skin with the plumage being placed around the bird after it was cooked. The P. is now common in most parts of the world; generally kept, however, except in warm countries, for ornament rather than for profit, although both the flesh and the eggs are very good. It readily partakes of all the ordinary food provided for the poultry-yard, and is fond of buds and succulent vegetables. It is hardy enough even in cold climates, except that few eggs are laid, and the young are difficult to rear, but the adult birds sit on trees or on the tops of houses, stacks, &c., during the keenest frosty nights, never, if they can avoid it, submitting to the confinement of a roosting-place, like that of the common fowl.

Peacocks are found in almost all parts of India, Siam, &c., and the multitudes in which they occur in some districts are wonderful. 'About the passes in the Jungletery district,' Colonel Williamson says, in his *Oriental Field Sports*, 'whole woods were covered with their beautiful plumage, to which a rising sun imparted additional brilliancy. The small patches of plain, among the long grass, most of them cultivated, and with mustard then in bloom, which induced the birds to feed, increased the beauty of the scene; and I speak within bounds when I assert that there could not be less than 1200 or 1500 peafowls, of various sizes, within sight of the spot where I stood for near an hour.' Sir James Emerson Tennent, also, in his work on Ceylon, says that 'in some of the unfrequented portions of the eastern province, to which Europeans rarely resort, and where the peafowl are unmolested by the natives, their number is so extraordinary that, regarded as game, it ceases to be "sport" to destroy them; and their cries at early morning are so tumultuous and incessant as to banish sleep, and amount to an actual inconvenience.'—The harsh cry of the P. seems to have been imitated in its Greek name *Taos*, and probably has given rise also to the Latin *Pavo* and the English *pea*-cock. The P., in a wild state, always roosts on trees, but makes its nest on the ground. When alarmed, as it feeds on the ground, it cannot readily take wing, and is sometimes run down by dogs or by horsemen.—The other species of P. is the JAPAN P. or JAVANESE P. (*P. Japonensis, Javanicus*, or *muticus*), a native of some of the south-eastern parts of Asia and neighboring islands. It is nearly equal in size to the Common P., but of less brilliant although very similar plumage. The cheeks and around the eyes are yellow; the neck, and other fore parts, greenish with golden reflections. The crest is longer than that of the Common P., its feathers less equal, and webbed along their whole length.

PEACOCK-STONE, the name under which the dry cartilaginous ligaments of some large lamellibranchiate molluscs, as the pearl oyster, are sold by jewelers. They are used for ornamental purposes, although not so much as formerly; and far more on the continent of Europe, particularly in Portugal, than in Britain. They have opaline reflections, and are therefore sometimes called *Black Opal*.

PEA CRAB (*Pinnotheres*), a genus of brachyourous crustaceans, with nearly circular and not very hard carapace. They are of small size, and interesting from their living within the mantle-lobes of lamellibranchiate molluscs, a circumstance which was well known to the ancients, and gave rise to many curious fables. A species (*P. veterum*) is very common in the *pinnæ* of the Mediterranean, and was imagined to render important services to its host in return for its lodging, keeping a lookout for approaching dangers, against which the blind pinna itself could not guard, and particularly apprising it, that it might close its shell when the cuttle-fish came near. It is curious to find this repeated by Hasselquist, in the middle of last century, as a piece of genuine natural history. Whether the P. C. lives at the expense of the mollusc, and sucks its juices, is uncertain. It is certain that the flesh of such molluscs is palatable to pea crabs, and they eat it greedily in the aquarium. The friendship of the P. C. and the pinna is of course as fabulous as that of the lion and jackal, or of the rattlesnake, the owl, and the prairie-dog. A species of P. C. (*P. Pisum*) is very common within the mantle-lobes of the Common Mussel on the British coasts. Species are found in almost all parts of the world.

PEA MAGGOT, the caterpillar of a small moth (*Tortrix* or *Grapholitha pisi*), which lays its eggs in young pods of peas. The caterpillar lives in the pods, and eats the peas. This moth is very common in Britain, and in wet seasons the pods of peas are often found very full of its caterpillar.

PE'AN (Old Fr., *pannes*, furs), one of the furs born in Heraldry, differing from Ermine only in the tinctures: the ground being sable, and the spots of gold.



Pean.

PEA ORE, a form of compact brown iron ore (hydrated peroxide of iron), consisting of round smooth grains, from the size of mustard-seed to that of small pease. Sometimes the grains are still smaller and flattish. This iron ore is very abundant in some places in France, and is smelted.

PEAR (*Pyrus communis*), a tree of the same genus with the Apple (see PYRUS) and like it one of the most extensively cultivated and valuable fruit-trees of temperate climates. The leaves are ovate, serrated, smooth on both surfaces, and without glands; the flowers are produced in corymbs, which may almost be called umbels, and are smaller than those of the apple; the styles are distinct and not combined at the base, as in the apple; and the fruit is hemispherical at one end, tapering gradually away, more or less rapidly, to a point at the other. The pear-tree grows wild in woods and copses in Britain, on the continent of Europe, and throughout the temperate parts of Asia. In its wild state it is usually either a large shrub or a small tree, thorny, and with small austere fruit. In cultivation it is without thorns, becomes a tree of 40 or 50 feet high, sometimes more; and its stem attains a diameter of three feet. Cultivation has wrought even greater changes in the size and quality of its fruit. The pear has been cultivated from remote antiquity. Its cultivation was probably introduced into Britain by the Romans. The cultivated varieties are extremely numerous; and many new ones of great excellence have recently been produced. The *Jargonelle Pear* may be mentioned as one of the most esteemed of the varieties long known in Britain. Some of the kinds called *Bergamot* and *Beurré* are highly esteemed.

Many new kinds have recently been introduced into Britain from France and Belgium. The varieties of pear differ much in hardiness and in fitness for particular soils; although a deep, moderately strong, dry, loamy soil is the best for this fruit. The finer varieties are cultivated in Britain as wall-trees. Pears succeed well as espaliers. They are generally grafted on seedling stocks of the wild pear, but sometimes on the rowan, and sometimes on the quince. Pears grafted on quince stocks are the best for shallow soils. The flowers and fruit of the pear are mostly produced on spurs, which spring from branches of more than one year old. Various modes of training and pruning are practised for pear-trees. Among the varieties of pears are some which ripen early in autumn, and some which do not ripen till the beginning of winter, and which even require to be mellowed by keeping for a short time; whilst some of the kinds cannot easily be kept for more than a few days. In general, pears cannot be kept so long nor so easily as apples. Pears are sometimes made into a preserve with syrup; and sometimes cut into pieces, and dried in the sun or in an oven, to be afterwards used in pies, a practice very prevalent in France.—A very agreeable fermented liquor called *Perry*

is made from pears, in the same manner as Cider from apples; and pear orchards for this purpose are to be seen in some parts of England, especially in Worcestershire and Herefordshire. The varieties of pear cultivated for making perry are all rather austere, and those which yield the best perry are far too austere to be palatable.—The wood of the pear-tree is reddish, very hard, fine-grained, and valuable to turners and joiners. It is often dyed black in imitation of ebony which it then greatly resembles.

Besides the varieties of pear usually referred to *Pyrus communis*, some are occasionally cultivated which are generally regarded as distinct species. Such are the AURELIAN PEAR (*P. salvifolia*), a native of France, with leaves much narrower than the common pear, and a long fruit which is used for making perry; the SNOWY PEAR (*P. nivalis*), a native of the Alps of Austria, with oval obtuse leaves, white and silky beneath, and a globose fruit, which is very acid till it becomes quite ripe, or is beginning to decay, when it is very sweet; the SAND PEAR (*P. sinensis*), a native of China and Cochin-China, with heart-shaped, shining, almost evergreen leaves, and apple-shaped warted fruit, very gritty, and fit only for baking, cultivated in gardens in India, but hardy in Britain. The PASHIA (*P. Pashia* or *P. variolosa*) is a native of the Himalaya; the fruit of which is only edible when bletted or partially decayed. The PALTOO (*P. lanata*) is another Himalayan species with edible fruit. Both are quite hardy in Britain.

PEAR, PRICKLY. See PRICKLY PEAR.

PEARL, a peculiar product of certain marine and fresh-water molluscs or shell-fish. Most of the molluscous animals which are aquatic and reside in shells are provided with a fluid secretion with which they line their shells, and give to the otherwise harsh granular material of which the shell is formed, a beautifully smooth surface, which prevents any unpleasant friction upon the extremely tender body of the animal. This secretion is evidently laid in extremely thin semi-transparent films, which, in consequence of such an arrangement, have generally a beautiful iridescence, and form in some species a sufficient thickness to be cut into useful and ornamental articles. The material itself in its hardened condition it called *nacre* by zoologists, and by dealers Mother-of-pearl (q. v.).

Besides the pearly lining of the shells, detached and generally spherical or rounded portions of the nacre are often found on opening the shells, and there is great reason to suppose these are the result of accidental causes, such as the intrusion of a grain of sand or other substance, which, by irritating the tender body of the animal, obliges it in self-defence to cover the cause of offence, which it has no power to remove; and as the secretion goes on regularly to supply the growth and wear of the shell, the included body constantly gets its share, and thereby continues to increase in size until it becomes a pearl. The Chinese avail themselves of the knowledge of this fact to compel one species of fresh-water mussel, *Unio Hyria*, to produce pearls. In order to do this, they keep the Unios in tanks, and insert between the shell and the mantle of the animal either small leaden shot or little spherical pieces of mother-of-pearl. These are sure to receive regular coatings of the nacreous secretion; and after a time look like pearls formed under ordinary circumstances. These curious people also practice another trick upon these animals; they insert small images of the Buddha stamped out of metal, which soon become coated with the pearl secretion, and are cemented by it to the shells; to those ignorant of its origin, the phenomenon is a supernatural testimony to the truth of Buddhism. Examples of these curiosities are to be found in many of our museums.

A plan of making pearls was suggested to the Swedish government by Linnæus. It consisted in boring a small hole through the shell of the river mussel, and inserting a grain of sand, so as to afford a nucleus for a pearl. The plan at first succeeded sufficiently well to prove its practicability, and he was rewarded by a sum of money (£450), but it failed as a profitable speculation, and was abandoned.

The exact nature of the secretion has never been satisfactorily determined; it is, however, ascertained that is is deposited in thin films, which overlie each other so irregularly, that their sharply serrated edges, when magnified, present the appearance represented in fig. 1; and to this peculiar disposition of the plates, the beautiful iridescence of common pearls is attributed. Their formation was a great puzzle to the ancients, amongst whom they were very highly prized. Dioscorides and Pliny mention the belief that they were drops of dew or rain which fell into the shells when opened by the animal, and were then altered by some power of the animal into pearls. This opinion, which obtained all over the east, is thus charmingly alluded to by Moore:

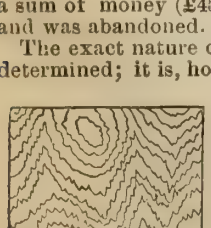


Fig. 1.

'And precious the tear as that rain from the sky,
Which turns into pearls as it falls in the sea.'

The most famous pearls are those from the east; the coast of Ceylon, or Taprobane, as it was called by the Greeks, having from the earliest times been the chief locality for pearl fishing. They are, however, obtained now of nearly the same quality in other parts of the world, as Panama in South America, St. Margarita in the West Indies, the Caromandel Coast, the shores of the Sooloo Islands, the Bahrein Islands, and the islands of Karak and Corgo in the Persian Gulf.

The pearls of the Bahrein fishery are said to be even finer than those of Ceylon, and they form an important part of the trade of Bassora. These, and indeed all the foreign pearls used in jewelry, are produced by the Pearl Oyster (q. v.). The shells of the molluscs which yield the Ceylon, Indian, and Persian ones, are sometimes as much as a foot in diameter, and are usually about nine inches. Those of the New World, although the shells are smaller and thicker, are believed to be the same species. The chief locality of the Ceylon pearl fishery is a bank about 20 miles long,

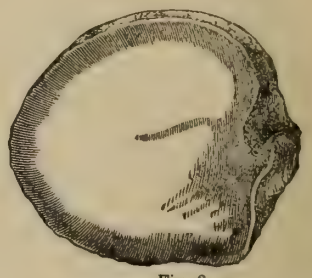


Fig. 3.

10 or 12 miles from shore, opposite to the villages of Condatchy and Arippo on the northern coast. The season of the fishery lasts about three months, commencing at the beginning of February, and is carried on under government regulations. The boats employed are open, and vary in size from 10 to 15 tons burden; they put out at night, usually at 10 o'clock, on a signal gun being fired from the fort of Arippo, and make for the government guard vessel, which is moored on the bank, and serves the double purpose of a guard and a light-ship. The divers are under the direction of a manager, who is called the Adapanaar, and they are chiefly Tamils and Moors from India.

For each diver there is provided a diving-stone, weighing about 30 pounds, which is fastened to the end of a rope long enough to reach the bottom, and having a loop made for the man's foot; and in addition to this, a large network basket, in which to place the pearl oysters as he collects them. These are hung over the sides of the boat; and the diver, placing his foot in the loop attached to the stone, liberates the coils of the rope, and with his net-basket rapidly descends to the bottom. To each boat there is usually allotted a crew of 13 men and 10 divers, 5 of whom are descending whilst the others are resting. This work is done very rapidly; for, notwithstanding the stories to the contrary, the best divers cannot remain longer than 80 seconds below, and few are able to exceed 60. The greatest depth they descend is 13 fathoms, and the usual depth about 9 fathoms. When the diver gives the signal by pulling the rope, he is quickly hauled up with his net and its contents. Accidents rarely happen; and as the men are very superstitious, their safety is attributed to the incantations of their shark-charmers, performed at the commencement of the fishing. Sir E. Tennant, however, attributes the rarity of accidents from sharks, usually so abundant in tropical seas, to the bustle and to the excitement of the waters during the fishery frightening away those dreaded creatures. The divers are sometimes paid fixed wages, others agree for one fourth of the produce. When a boat load of oysters has been obtained, it returns to shore, and the cargo, sometimes amounting to 20,000 or 30,000, is landed and piled on the shore to die and putrify, in order that the pearls may be easily found.

The heaps are formed in small walled compartments, the walls surrounding each being about one or two feet in height. Several of these compartments surround a small central enclosure, in which is a bath, and they slope towards this bath, and are each connected with it by a small channel, so that any pearls washed out from the putrefying mass by the rain may be carried into the bath. When the animals in the shells are sufficiently decomposed, the washing commences, and great care is taken to watch for the loose pearls, which are always by far the most valuable; the shells are then examined, and if any attached pearls are seen, they are handed over to the clippers, who, with pinchers or hammer, skilfully remove them. Such pearls are used only for setting; whilst the former, being usually quite round, are drilled and strung, and can be used for beads, &c. The workmen who are employed to drill the pearls also round the irregular ones, and polish them with great skill. The method of holding the pearls during these operations is very curious; they make a number of

holes of small depth in a piece of dry wood, and into these they fit the pearls, so that they are only partly below the surface of the wood, which they then place in water. As it soaks up the water and swells, the pearls become tightly fixed, and are then perforated, &c. These operations are all carried on on the spot.

For many miles along the Condatchy shore, the accumulation of shells is enormous, and averages at least four feet in thickness. This is not to be wondered at, when it is remembered that this fishery has been in active operation for at least 2000 years. The place itself is exceedingly barren and dreary, and, except during the fishing season, is almost deserted; but at that time it presents an exceedingly animated spectacle; thousands of people, of various countries and castes, are here drawn together—some for the fishery, others to buy pearls, and others to feed the multitude. They chiefly reside in tents, so that it appears a vast encampment.

The pearls vary much in size; those as large as a pea, and of good color and form, are the best, except unusually large specimens, which rarely occur, the most extraordinary one known being the pearl owned by the late Mr. Hope, which measured two inches in length, and four in circumference, and weighed 1800 grains. The smaller ones are sorted into sizes, the very smallest being called seed-pearls. A considerable quantity of these last are sent to China, where they are said to be calcined, and used in Chinese pharmacy. Amongst the Romans, the pearl was a great favorite, and enormous prices were paid for fine ones. One author gives the value of a string of pearls at 1,000,000 sesterces, or about £8000 sterling. The single pearl which Cleopatra is said to have dissolved and swallowed was valued at £80,729; and one of the same value was cut into two pieces for earrings for the statue of Venus in the Pantheon at Rome. Coming down to later times, we read of a pearl, in Queen Elizabeth's reign, belonging to Sir Thomas Gresham, which was valued at £15,000, and which he is said to have treated after the fashion of Cleopatra; for he powdered it and drank it in a glass of wine to the health of the Queen, in order to astonish the ambassador of Spain, with whom he had laid a wager that he would give a more costly dinner than could the Spaniard.

During the occupation of Britain by the Romans this country became famous for its pearls, which were found in the fresh-water mussel of our rivers. See FRESHWATER MUSSEL. Generally the pearls of this mollusc are small, badly colored, and often valueless; but occasionally they occur of such beauty as to rival those of the pearl oyster. Some years ago, in the Scotch rivers, the search for pearls was prosecuted vigorously, especially by a merchant named Unger, of Edinburgh, who had brought Scotch pearls into great repute. He collected specimens ranging, as was stated, from £5 to £90 each, and formed a necklace said to be worth £350. In Scotch pearls of the highest quality, there is a pleasing pinkish tint, which is very permanent. The fishing for pearl mussels is by no means so dangerous or troublesome as for pearl oysters; usually they are found in the beds of streams, shallow enough to wade in, and so clear that they can be seen at the bottom. If too deep to remove with the hand, they are easily captured by putting a stick between their gaping shells, which instantly close upon it, and can be drawn out with it. So profitable did this pursuit become, that a great many persons engaged in it.

Very fine river pearls, known on the continent as Bohemian pearls, are found in the rivers Moldau and Wottawa. There is also a fresh-water pearl fishery in Bavaria, where the river Iltz yields at times very fine specimens. Even the most inferior pearls have a market-value; for pearls can only be properly polished with pearl dust, and the inferior pearls are powdered for the purpose of polishing and rounding the finer ones.

False pearls are very admirable imitations, made by blowing very thin beads or bulbs of glass, and pouring into them a mixture of liquid ammonia, and the white matter from the scales of the Bleak, and sometimes of the Roach, and Dace. The proper way to prepare the pearl-matter is first to remove the scales of the lower part of the fish; these must then be very carefully washed, after which they are put to soak in water, when the pearly film falls off and forms a sediment at the bottom of the vessel, which is removed and placed in liquid ammonia for future use. This pearl mixture, when of the best quality, is very costly, being as much as £4 or £5 per ounce. For use, it is diluted with ammonia and injected into the glass beads, so as to thinly coat them inside; afterwards the better kinds have melted white wax poured in, which renders them much more durable. The French and Germans produce in this way imitations of the finest oriental pearls of such beauty, that the most practised eye can hardly detect the difference. The bleak is procured in considerable quantities for this purpose from the Thames and other rivers in England. See BLEAK.

The invention of artificial pearls is due to a Frenchman named Jaquin, in the time of Catharine de' Medici, and the manufacture is now chiefly carried on in the department of the Seine, where great improvements have lately been made, especially in the art of giving the irregular forms of large pearls to the glass-bulbs, and thus increasing the resemblance, and in removing the glassy appearance caused by the exterior glass coating, by exposing it for a short period to the action of the vapor of hydrofluoric acid. Mucilage of fine gum-arabic is also used instead of wax, which increases the translucency, gives greater weight, and is not liable to melt with the heat of the wearer's body—a defect to which those filled with wax are very liable.

Roman pearls differ from other artificial pearls, by having the coating of pearly matter on the outside, to which it is attached by an adhesive substance. The art of making these was derived from the Chinese.

PEARL, a river of Mississippi, U. S., which rises about 100 miles north-north-east of Jackson, and, flowing south through the state, separates it in its lower course from Louisiana, and empties into Mississippi Sound, near the outlet of Lake Pontchartrain. It flows nearly 300 miles through a fertile cotton country, and is navigable to Jackson, the capital.

PEARL ASHES. See POTASH.

PEARL BARLEY. See BARLEY.

PEARL OYSTER (*Avicula* or *Meleagrina margaritifera*), a lamellibranchiate mollusc, of the family *Aviculidæ*, generally found—great numbers together—attached to submarine rocks at a considerable depth on the coasts of tropical countries, and important as producing almost all the pearls and all the mother-of-pearl of commerce. It is sometimes called the PEARL MUSSEL; but the family to which it belongs differs considerably both from that of mussels and from that of oysters, the valves of the shell being unequal, the hinge-line straight and long, and the animal furnished with two abductor muscles, one of them small, and with a foot by which it produces a byssus. The P. O. is of an oblique oval form, longitudinally ribbed, and with concentric foliations when young which disappear when it is old. It attains a large size, and there are several varieties, the most important of which are noticed in the article MOTHER-OF-PEARL. The whole inside of the shell is covered with a thick layer of nacre or mother-of-pearl, compact and beautiful, forming indeed the chief part of the shell, and exhibiting very considerable variety of color, most frequently white, but sometimes blood-red. Pearls are formed of the same substance (see PEARL), and are generally, if not always, produced by eggs which have become abortive, and which remain lodged within the mollusc instead of being ejected into the sea.

The P. O. is too rank and coarse to be eaten. When taken from the sea it is commonly laid out in the sun to die, that the pearls may be sought for after the shell opens.

The P. O. is not the only mollusc which produces pearls. The *Placuna placenta*—an oyster (family *Ostreadæ*) with thin transparent shell, which is used in China and elsewhere as a substitute for window glass—produces diminutive pearls. The Fresh-water Mussel (q. v.) of Britain produces pearls sometimes of considerable beauty and value; and instances have occurred of pearls being found in pinnæ, &c., and even in limpets.

PEARL SHELLS. See MOTHER-OF-PEARL.

PEARL WHITE. See WHITE COLORS.

PEARSON, JOHN, an English prelate of high celebrity, was born in 1612 at Snoring, in Norfolk, of which place his father was rector, educated at Eton and King's College, Cambridge, where he took the degree of M.A. in 1639, and in the same year took orders, and was collated to a prebend in Salisbury Cathedral. In 1640 he was appointed chaplain to Finch, lord-keeper of the great seal, and on the outbreak of the civil war became chaplain to Lord Goring, and afterwards to Sir Robert Cook, in London. In 1650, he was appointed minister of St. Clement's, Eastcheap, London; and in 1659, published the great work by which he is now remembered, *An Exposition of the Creed*. It was dedicated to his flock, to whom the substance of it had been preached some years before in a series of discourses. The laborious learning and the judicial calmness displayed by the author in this treatise have long been acknowledged, and command the respect even of those who think his elaborate argumentation tedious and not always forcible. It is generally reckoned one of the ablest works produced in the greatest age of English theology—the 17th century. During the same year, P. published *The Golden Remains of the Ever Memorable Mr. John Hales of Eton*.

At the Restoration, honors and emoluments were lavishly showered upon him. Before the close of 1660 he received the rectory of St. Christopher's, in London; was created D.D. at Cambridge; installed Prebendary of Ely and Archdeacon of Surrey; and made Master of Jesus College, Cambridge. In 1661, he obtained the Margaret professorship of Divinity, and was one of the most prominent commissioners in the famous Savoy conference; in 1662, he was made Master of Trinity, Cambridge, and in 1673, was promoted to the bishopric of Chester. The year before he had published his *Vindiciæ Epistolarum S. Ignatii*, in answer to

M. Daillè, who had denied the genuineness of the epistles. It was imagined for years that P. had triumphed over his opponent. The history of the controversy, however (see IGNATIUS), has shown that Daillè was right and P. wrong. In 1684, appeared his *Annales Cyprianici*. He died July 16, 1686. P.'s *Opera Posthuma Chronologica* were published by Dodwell (Lond. 1688), and his *Orationes, Conciones et Determinationes Theologicæ* contain much valuable matter, for, as Bentley used to say, P.'s 'very dross was gold.' Bishop Burnet thought him 'in all respects the greatest divine of his age.'

PEASANT WAR, in German history, the name given to that great insurrection of the peasantry which broke out in the beginning of the year 1525, and which Zschokke has described as the 'terrible scream of oppressed humanity.' The oppression of the peasants had gradually increased in severity, as the nobility became more extravagant and the clergy more sensual and degenerate. The example of Switzerland encouraged the hope of success, and from 1476 to 1517 there were risings here and there amongst the peasants of the south of Germany. A peasant rebellion, called from its cognizance, the *Bundschuh* (Laced Shoe), took place in the Rhine countries in 1502, and another, called the 'League of Poor Conrad,' in Würtemberg, in 1514, both of which were put down without any abatement of the grievances which occasioned them. The Reformation, by the mental awakening which it produced, and the diffusion of sentiments favorable to freedom, must be reckoned amongst the causes of the great insurrection itself; although Luther, Melanchthon, and the other leading reformers, whilst urging the nobles to justice and humanity, strongly reprobated the violent proceedings of the peasants. The Anabaptists, however, and in particular Münzer, encouraged and excited them, and a peasant insurrection took place in the Hegau in 1522. Another, known as the 'Latin War,' arose in 1523 in Salzburg, against an unpopular archbishop, but these were quickly suppressed.

On January 1, 1525, the peasantry of the abbacy of Kempten, along with the townspeople, suddenly assailed and plundered the convent, compelling the abbot to sign a renunciation of his rights. This proved the signal for a rising of the peasants on all sides throughout the south of Germany. Many of the princes and nobles at first regarded the insurrection with some measure of complacency; because it was directed in the first instance chiefly against the ecclesiastical lords; some, too, because it seemed likely to promote the interests of the exiled Duke of Würtemburg, who was then upon the point of reconquering his dominions by the help of Swiss troops; and others, because it seemed to set bounds to the increase of Austrian power. But the Archduke Ferdinand hastened to raise an army, the troops of the empire being for the most part engaged in the emperor's wars in Italy, and intrusted the command of it to the Truchsess Von Waldburg, a man of stern and unscrupulous character, but of ability and energy. Von Waldburg negotiated with the peasants in order to gain time, and defeated and destroyed some large bodies of them, but was himself defeated by them on the 22d of April, when he made a treaty with them, not having, however, the slightest intention of keeping it.

Meanwhile the insurrection extended, and became general throughout Germany, and a number of towns took part in it, as Heilbronn, Mühlhausen, Fulda, Frankfurt, &c., but there was a total want of organization and co-operation. Towards Easter, 1525, there appeared in Upper Swabia a manifesto, which set forth the grievances and demands of the insurgents. They demanded the free election of their parish clergy; the appropriation of the tithes of grain, after competent maintenance of the parish clergy, to the support of the poor and to purposes of general utility; the abolition of serfdom, and of the exclusive hunting and fishing rights of the nobles; the restoration to the community of forests, fields, and meadows, which the secular and ecclesiastical lords had appropriated to themselves; release from arbitrary augmentation and multiplication of services, duties, and rents; the equal administration of justice; and the abolition of some of the most odious exactions of the clergy. The conduct of the insurgents was not, however, in accordance with the moderation of their demands. Their many separate bands destroyed convents and castles, murdered, pillaged, and were guilty of the greatest excesses, which must indeed be regarded as partly in revenge for the cruelty practised against them by Von Waldburg. A number of princes and knights concluded treaties with the peasants conceding their principal demands. The city of Würtzburg joined them, but the Castle of Leibfrauenberg made an obstinate resistance, which gave time to Von Waldburg and their other enemies to collect and strengthen their forces. In May and June 1525, the peasants sustained a number of severe defeats, in which large bodies of them were destroyed.

The Landgraf Philip of Hesse was also successful against them in the north of Germany. The peasants, after they had been subjugated, were everywhere treated with terrible cruelty. In one instance a great body of them were perfidiously massacred after they had laid down their arms. Multitudes were hanged in the streets, and many were put to death with the greatest tortures. Weinsberg, Rothenburg, Würtzburg, and other towns which had joined them, suffered the terrible revenge of the victors, and torrents of blood were shed. It is supposed that more than 150,000 persons lost their lives in the Peasant War. Flourishing and populous districts were desolated. The lot of the defeated insurgents became harder than ever, and many burdens of the peasantry originated at this period. The cause of the Reformation also was very injuriously affected. See Sartorius *Versuch einer Geschichte des Deutschen Bauernkriegs* (Berl. 1795); Ochsle, *Beiträge zur Geschichte des Deutschen Bauernkriegs* (Heilbronn, 1829); Wachsmuth, *Der Deutsche Bauernkrieg* (Leip. 1834); and Zimmermann, *Allgemeine Geschichte des grossen Bauernkriegs* (3 vols. Stuttg. 1841—1843).

PEA-STONE, PI'SOLITE, or PI'SIFORM LIMESTONE, is a kind of calcareous spar or limestone, which occurs in globules from one-eighth of an inch to half an inch in diameter, imbedded in a cement of similar substance. There is generally a grain of sand in the center of each globule as the nucleus, around which it has been formed, and the concentric plates of its structure are easily visible. Sometimes the nucleus is merely a bubble of air. P. is found in great masses near the hot springs of Carlsbad, in Bohemia. It is sometimes used for ornamental purposes.

PEAT, a substance formed by the decomposition of plants amidst much moisture, as in marshes and morasses; and sometimes described as a kind of *Humus* (q. v.), formed by the accumulation of the remains of mosses and other marsh-plants. The remains of the plants are often so well preserved in it, that the species can be easily distinguished. Reeds, rushes, and other aquatic plants may usually be traced in peat, and stems of heath are often abundant in it; but it chiefly consists, in the northern parts of the world, of different species of *Sphagnum* (q. v.), or Bog-moss. Mosses of this genus grow in very wet situations, and throw new shoots in their upper parts, whilst their lower parts are decaying and being converted into peat; so that shallow pools are gradually changed into bogs. It was at one time believed that bogs owed their origin to the destruction of forests, the fallen trees impeding the natural drainage, and causing the growth of those marsh-plants of which peat is formed; and this theory was supported by reference to instances supposed to be authenticated by tradition—as that of the moor of Hatfield in Yorkshire, now consisting of about 12,000 acres of peat, and said to have been a forest of firs, till 'the Romans under Ostorius, having slain many Britons, drove the rest into the forest,' which was then destroyed by the victors.

There are, however, satisfactory proofs that peat has accumulated in many places around trees; and firs remaining in their natural position have been found to have six or seven feet of peat under their roots, although other trees, as oaks, are commonly found with their stumps resting on the soil beneath the peat. Yet it is not improbable that the destruction of forests may, in some instances, by impeding the course of the streams which flowed through them, have caused the stagnation of water from which the growth of peat resulted. Some of the largest mosses and fens of Europe occupy the place of forests, which were destroyed by order of Severus and other Roman emperors; and some of the British forests, now mosses, as well as some of those of Ireland, were cut because they harbored wolves or outlaws. The overthrow of a forest by a storm in the 17th c., is known to have caused the formation of a *peat-moss* near Loch Broom, in Rossshire. Layers of trees are not unfrequently found in peat, which seem to have been suddenly deposited in their horizontal position, and sometimes to have been felled by human hands. It is not improbable, however, that sometimes peat has been formed where the soil has been exhausted by the long-continued growth of one kind of tree. The growth of peat is often rapid: bogs have been known to increase two inches in depth in a year. The surface of a bog sometimes becoming a floating mass of long interlaced fibres of plants, known in Ireland as *Old Wives' Tow*. The vegetation on the surface is sometimes very green and compact, like a beautiful turf.

Peat is vegetable matter more or less decomposed, and passes by insensible degrees into Lignite (q. v.). The less-perfectly decomposed peat is generally of a brown color; that which is more perfectly decomposed is often nearly black. Moist peat possesses a decided and powerful antiseptic property, which is attributed to the presence of gallic acid and tannin, and is manifested not only in the perfect preservation of ancient trees and of leaves, fruits, &c., but sometimes even of animal bodies. Thus, in some instances, human bodies have been found perfectly preserved in peat, after the lapse of centuries.

The formation of peat may be regarded as one of the most important geological changes now in evident progress. It takes place, however, only in the colder parts of the world. In warm

regions, the decay of vegetable substances, after life has ceased, is too rapid to permit the formation of peat. The surface covered by peat is very extensive in all the colder parts of the world; although in the southern hemisphere no moss seems to enter into its composition; and the South American peat is said by Mr. Darwin to be formed of many plants, but chiefly of *Astelia pumila*, a phanerogamous plant of the rush family. The surface covered by peat even in England is considerable; it is greater in Scotland, and very great in Ireland. Extensive tracts are covered with peat even in the southern countries of Europe, and sometimes even near the sea; and in more northern regions, the *mosses* or *bogs* are still more extensive. For their physical characters, and the mode of *reclaiming* them, or converting them into arable land, see BOG.

Mere peat is not a good soil, even when sufficiently drained, but, by the application of lime, marl, &c., it is soon converted into good soil, yielding excellent crops. A mixture of peat is often of benefit to soils otherwise poor. And for many shrubs, as rhododendrons, kalmias, wortleberries, &c., no soil is so suitable as one in great part composed of peat; which is therefore in much request with gardeners in order to the formation of the soil for certain kinds of plants.

Peat is extensively used for fuel. The more perfectly decomposed the vegetable matter is, and the more consolidated that the peat therefore is, the better it is suited for this use. It is the ordinary fuel of great part of Ireland, and is there almost always called *turf*, although the term turf, in its ordinary English sense, is utterly inapplicable to it. To procure peat for fuel, the portion of bog to be operated upon must first be partially dried by a wide open drain; its surface is then pared off with the spade, to the depth of about six inches, to remove the coarse undecomposed vegetable matter; the peat is afterwards cut out in pieces (*peats*) like bricks, by means chiefly of a peculiar implement, called in Ireland a *slane*, and in Scotland a *peat-spade*, resembling a long, narrow, sharp spade, the blade of which is furnished on one side with a tongue set at a right angle to it. This implement is used by the hands alone, without pressure of the foot. The soft peats are conveyed to some neighboring place, where they are set up on end in little clusters to dry.

When sufficiently dry, they are conveyed away, and may be piled in outhouses or stacked in the open air. The operation of *peat-cutting* is always performed in spring or summer.—Where peat for fuel cannot be obtained in the way just described, the black mud of a semi-fluid bog is sometimes worked by the feet of a party of men, women, and children until it acquires such a consistency that it can be moulded by the hand. The process is laborious, but the fuel obtained by it is good.—In countries depending on peat for fuel, a very rainy season sometimes occasions great inconvenience, and even distress, by preventing the cutting and drying of the peat.

Peat is a light and bulky kind of fuel, and cannot be conveyed to considerable distances without too great expense. Efforts have, however, been made, both in Scotland and Ireland, to render it more generally useful, and so to promote the reclaiming of bogs, by compressing it until its specific gravity is nearly equal to that of coal. For this purpose, it is first reduced to a pulp. The compressing of peat has not yet been advantageously prosecuted on an extensive scale.

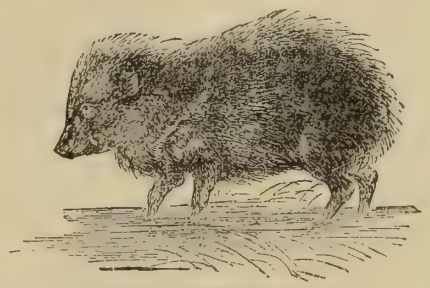
Peat-charcoal, made from uncompressed peat, is very light and inflammable, and therefore unsuitable for many purposes, but for others it is particularly adapted, and no kind of charcoal excels it in antiseptic and deodorizing properties. It is also an excellent manure for many kinds of soil, and great crops have often been obtained by its use. Peat-charcoal is highly esteemed for the smelting of iron, and for working and tempering the finer kinds of cutlery. Charcoal made from compressed peat is in density superior to wood-charcoal, and is capable of being used as coke. The Irish Amelioration Society, some years ago, encouraged the conversion of peat into charcoal, but it seems not to have paid as a commercial speculation, although the resulting charcoal was of good quality. Various companies have been formed for the purpose of obtaining valuable products from the destructive distillation of peat. It appears from researches of Sir R. Kane and others, that 1000 parts of peat yield about 11 of sulphate of ammonia, 7 of acetate of lime, 2 of wood naphtha, 1 of paraffin, 7 of fixed oil, and 3 of volatile oil. The manufacture has not, however, as yet proved sufficiently profitable to be generally adopted, although the distillation of peat has, we believe, been carried on for some years at Athy, near Kildare. For further details on this subject, the reader is referred to a parliamentary *Report on the Nature and Products of the Destructive Distillation of Peat*, published in 1851, and to a paper by Dr. Paul in the 6th volume of *The Chemical News*. A more recent contribution to the subject is *The Peat Mosses of Buchan*—by the Rev. James Peter, minister of Deer (Aberdeen, 1875).

Flower-pots are sometimes made of peat. It is easy to transplant flowers growing in them without loosening the earth from the roots, the pot being readily cut to pieces; and liquid manure applied outside finds its way sufficiently to the roots.

PEA WEEVIL (*Sitona crinita* and *S. lineata*), small coleopterous insects, about a quarter of an inch long, which are very destructive to crops of peas and other kinds of pulse, devouring the leaves and other succulent parts, often soon after the plants appear above ground. Lime, soot, or wood ashes dusted over the plants, protect them in some measure from the ravages of these insects; and hoeing or other stirring of the soil is beneficial, probably by destroying the eggs, larvæ, and pupæ.

PEBBLE (probably allied to *bubble*, from the sound of water running among stones), a small round, water-worn stone of any kind; but with jewelers sometimes an agate—agates being often found as loose pebbles in streams, and those of Scotland in particular being popularly designated *Scotch Pebbles*. Hence the name has come even to be extended to rock-crystal, when not in the crystalline form, and we hear of spectacles with eyes of pebble, &c. Deposits of pebbles (in the sense of water-worn stones), occur among the rocks of all periods, but the pebbles are seldom loose; they are generally cemented together by iron, lime, or silex, forming a pudding-stone of greater or less hardness. Single pebbles are sometimes found in deposits which have been formed at a distance from currents in perfectly still water, as in chalk and fine silt. They must have been floated to their places entangled in the roots of trees, or attached to the roots of large buoyant sea-weeds.—BRAZILIAN PEBBLES (so called from Brazil having been long famous for the purity of its rock crystal), are very pure pieces of Rock Crystal (q. v.), used by opticians for making the lenses of spectacles, &c.

PE'CCARY (*Dycoteles*), a genus of *Pachydermata*, of the family *Suidæ*, much resembling hogs; but having a mere tubercle instead of a tail; only three toes—no external toe—on the hind-feet; the molar teeth and incisors very like those of hogs, but the canine teeth not nearly so long, and not curving outwards. An approach to ruminants is seen in the stomach, which is divided into several sacs; also in the union of the metacarpal and metatarsal bones of



Peccary (*Dycoteles torquatus.*)

the two greater toes into a kind of cannon bone. A glandular opening on the loins, near the tail, secrets a fetid humor. Only two species are known, both natives of South America; and except the tapirs, the only existing pachydermata of the American continent.

The COMMON P., COLLARED P., or TAJAÇU (*D. torquatus*), is found in almost all parts of South America; the WHITE-LIPPED P. (*D. labiatus*) is found in many parts of it. Both are gregarious; the White-lipped P., often assembling in very large herds, and sometimes doing great mischief to maize and other crops. The herds of the White-lipped P. seem to follow a leader, like those of ruminants. The Common P. chiefly frequents forests, and small companies sometimes take up their abode in the hollow of a great tree. The Common P. is about the size of a small hog, grayish; the hairs alternately ringed with black and yellowish white, bristly; and on the neck longer, and forming a mane. A narrow white collar surrounds the neck. The White-lipped P. is considerably larger, of a darker color, with conspicuously white lips. The ears are almost concealed by the hair. Both species are capable of being tamed, but are of irritable and uncertain temper. In a wild state they defend themselves vigorously against assailants, making good use of their sharp tusks, and a whole herd combine for defence. The hunter has often to take refuge from them in a tree. They are omnivorous; and if hurtful to crops, render service by destroying reptiles. Their voice is somewhat like that of the hog, but more sharp. Their flesh resembles that of the hog, but is said to be inferior. The glands on the loins must be cut out immediately after the P. is killed, or their fetid humor infects the whole flesh. No attempts seem yet to have been made for the economic domestication of the peccaries.

PE-CHIH-LE'. See CHIH-LE.

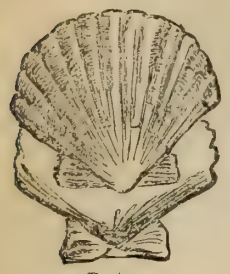
PECK, a measure of capacity for dry goods, such as grain, fruit, &c., used in Britain, and equivalent to 2 imperial gallons,

or 554·548 cubic inches. It is thus the fourth part of a Bushel (q. v.). The old Scotch peck, the 16th part of a boll, when of wheat, was slightly less than the imperial peck; but when of barley, was equal to about 1·456 of it.

PECORA (Lat. cattle), a Linnæn order of Mammalia, now generally called RUMINANTIA (q. v.).

PECOS, a river of Texas, U. S., rises in the mountains near Santa Fé, New Mexico, runs south-easterly 600 miles through New Mexico and Texas, and flows into the Rio Grande-del-Norte, in lat. about 29° 20′ N., long. 102° W.

PECTEN, a genus of lamellibranchiate molluscs, commonly referred to the same family with the oyster (*Ostreadæ*), which is sometimes called *Pectinidæ*. The shell has neither teeth nor laminæ in the hinge; the valves are unequal, one of them being often much more convex than the other; the shape is regular; the hinge is extended by *ears*, and in most of the species both valves have ribs radiating from the umbo to the margin. Hence the name *pecten* (Lat. a comb), from the appearance which they present. The animal has a small foot; some of the species are capable of attaching themselves by a byssus; they are capable also of locomotion by opening and rapidly closing the valves, and in this way can even regain the sea from a short distance by leaping on the shore. Some of the larger species are often popularly called *clams*, a name shared by other bivalves. *P. Jacobæus*, a native of the Mediterranean, is the SCALLOP-SHELL which pilgrims were accustomed to wear in front of their hat, in token of their having visited the shrine of St. James at Compostella. It attains a size of about 4 inches long and 5 inches broad. *P. maximus*, found on many parts of the British coasts, is about 6 inches broad. It is sometimes eaten, but is hard and indigestible. Several other species are British. Species are found in almost all parts of the world.


Pecten.

PECTIC ACID AND PECTINE. See FRUITS.

PECTINIBRANCHIA'TA (Lat. comb-gilled), an order of gasteropodous molluscs, having the gills composed of numerous leaflets or fringes, arranged like the teeth of a comb, and affixed to the internal surface of a cavity which opens with a wide opening above the head. The sexes are distinct. All the P. have two tentacles and two eyes, the eyes often stalked. The mouth is produced into a proboscis, more or less lengthened. The eggs are deposited in a mass, with an envelope often of very remarkable and complicated form, which is produced by coagulation of a viscous albuminous matter secreted by a peculiar gland of the female. The P. are very numerous; the greater number of gasteropods being included in this order; some have a siphon, and some are destitute of it; some have spiral, and some have simply conical shells. Almost all are inhabitants of the sea or its shores; a few are found in fresh water. To this order belong Whelks, Periwinkles, Cones, Volutes, *Calyptraeæ*, &c.

PECTORI'LOQUY is a term of such frequent occurrence in the history of chest diseases as to require a brief notice in this work. If the stethoscope be applied to the chest of a healthy person, and he be requested to speak, the sounds of his voice will be conveyed to the ear of the observer with very different degrees of clearness, according to the part of the chest on which the base of the instrument rests. If, for example, it be applied at the top of the sternum or breast-bone the voice will reach the ear, through the tube with tolerable distinctness. For a short distance on either side of the sternum, just below the collar-bones, and in the arm-pits, the voice is still heard, but the sound is indistinct and confused. Below the third rib, and over the remainder of the chest, the voice only produces an obscure thrilling sound which is known as *pectoral resonance*. In certain morbid conditions the sounds of the voice seem to proceed with distinctness from the walls of the chest directly into the ear; and then, in place of the normal pectoral resonance, we have the physical sign known as Pectoriloquy (from the Latin *pectore*, from the chest, and *loquor*, I speak). It occurs when a tolerably superficial excavation, of moderate or considerable size, lies under the stethoscope; and hence it was at one time regarded as an almost certain indication of advanced consumption, but it is now known that it may also occur when solidified masses of lung lie between a large bronchical tube and the part of the chest on which the instrument rests.

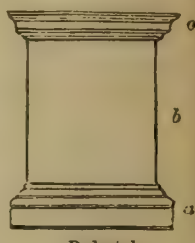
PECULIAR (Fr. *peculier*, i. e., private) is, in English Law, a particular parish or church having jurisdiction within itself, and exempt from the jurisdiction of the ordinary. The Courts of Peculiars in these jurisdictions amount to about 300 in England and Wales, and had jurisdiction in reference to probates of wills before the recent constitution of the Court of Probate. Their jurisdiction is still somewhat obscure.

PEDAL (Lat. *pes*, a foot), any part of a musical instrument acted on by the feet. The pianoforte, the harp, and the organ are furnished with pedals, which, however, serve an entirely different purpose in each instrument. In the pianoforte, their object is to effect a change in the quality or intensity of the sound; the damper pedal prolongs the sound after the finger is lifted from the key, and the shifting or *una corda* pedal softens the tone. The pedals of the harp are the means by which the chromatic changes of intonation are effected. In the organ, the pedals are keys put in action by the feet. The division of the organ which is connected with the foot-keys is called the pedal-organ, and contains the largest pipes. The introduction of pedals in the organ is assigned to a German of the name of Bernhard, who flourished in the 15th c.; they were long of being brought into use in England, but now few organs, except those of the smallest dimensions, are made without them. Pedals are also used in the organ to act on the swell and on the stops. See ORGAN.

PEDALIA'CEÆ. See BIGNONIACEÆ.

PEDAL-POINT, or PEDAL HARMONY. See ORGAN-POINT.

PEDEE', GREAT, a river of North and South Carolina, U.S., rises in the Alleghany Mountains, in the north-west of North Carolina, and running south by east flows through the east portion of South Carolina, and enters the Atlantic through Winyaw Bay at Georgetown. It is navigable to Cheraw, 150 miles, and is about 350 miles in length.—The LITTLE PEDEE, its principal eastern branch, is formed by the confluence of several smaller rivers in the south part of North Carolina.



Pedestal.

PE'DESTAL, a base or block on which columns, statues, &c., are frequently set. The pedestal is much used in classic architecture. Like the column, it has a base, *a*, and a sort of capital or cornice, called the surbase, *c*. The shaft, or plain block, *b*, is called the dado or die.

PEDETES, or HE'LAMYS, a genus of rodent quadrupeds of the family *Muridæ*, allied to Jerboas, but differing from them in some of the characters of their dentition. The hind-legs, although very long, are not so long as in the jerboas. The tail is long. The JUMPING HARE (*P.* or *H. Capensis*) of South Africa is about the size of a rabbit. It can jump 20 or 30 feet at a bound. Its fore-feet are also very strong, and it burrows very expeditiously. The claws are long and strong. The habits of the animal are nocturnal, and it does considerable mischief in corn-fields and gardens.

PEDICELLA'RIÆ are very remarkable minute appendages of the integuments of many of the Echinodermata, having the form of a stalk, with a small two-bladed or three-bladed forceps at its summit. They are of a fleshy substance, with calcareous granules imbedded, and in a living state the blades are continually opening and closing. They were at one time supposed to be parasitic zoophites, but are now generally believed to be organs of the star-fish or sea-urchin, although their use is merely conjectured to be that of keeping the surface of the echinoderm free of algæ and zoophytes. The introduction of a pin's point between the blades causes an immediate closing of them. They are found both on shelly and on comparatively soft integuments, and are always present, and always of a particular form, according to the species of echinoderm, and according to the particular place which they occupy, being crowded chiefly around the spines, and near the mouth of sea-urchins.

PEDICULA'RIS, a genus of herbaceous plants of the natural order *Scrophulariaceæ*, some of which have rather large and finely-colored flowers. Two species, *P. palustris* and *P. sylvatica*, are natives of Britain, common in wet grounds. Both have received the name of Lousewort, the English equivalent of 'pedicularis,' from their supposed influence in producing the lousy disease in sheep; an influence purely imaginary. Their acridity renders them injurious to sheep which eat them. Continental Europe and the northern parts of Asia produce many other species, and some are found in North America. *P. sceptrum*, or King Charles's Sceptre, is one of the principal ornaments of marshy grounds in the most northern countries of Europe.

PEDI'CULUS. See LOUSE.

PE'DIGREE (probably from Lat. *pes*, a foot), a tabular view of the members of a particular family with the relations in which they stand to each other, accompanied or unaccompanied by a notice of the chief events in the life of each, with their dates, and the evidence of the facts stated. Pedigrees are indispensable aids to the student of history. The wars of the Roses, the claim of Edward III. to the crown of France, the relative position of Mary and Lady Jane Grey, the circumstances which brought about the union of the crowns of England and Scotland, the Slesvig-Hol-

stein question, which occupied the attention of all Europe, and many other familiar chapters in the history of nations, as well as of families, cannot be read aright without the aid of pedigrees. The materials to be used in the formation of a pedigree are notes of the facts to be set forth, and a recognized series of signs and abbreviations. These notes comprise the name of every person who is to appear in the pedigree, with such dates and circumstances as it may be considered desirable to record.

Among the commonest abbreviations are *dau.*, for daughter of; *s.* and *h.*, son and heir of; *coh.*, coheir of; *w.*, wife of; *s. p.* (*sine prole*), without issue; *v. p.* (*vitâ patris*), in his father's lifetime; *b.*, born, *d.*, died; *dep.*, deposed; K., king; E., earl, &c. The sign = placed between two names, indicates that they were husband and wife; ± indicates that they had children; under a name signifies that the person had children. All persons of the same generation are to be kept in the same horizontal line; and the main line of descent is, wherever possible, to be indicated by keeping the successive names in a vertical column. Continuous lines indicate the succession of the different generations. The members of the same family are generally arranged in their order of birth in two groups—the sons first, and then the daughters; but where the same father or mother has children by more than one marriage, the children of each marriage ought to form distinct groups. The actual arrangement, however, of a pedigree must always depend on the leading object which it is intended to illustrate.

Tabular genealogies, generally brief, and meant to illustrate some particular claim of right, are found among the records, public and private, of the early middle ages; but after the incorporation of the English Heralds' College, far more attention was devoted to the compilation of pedigrees of families, more particularly with reference to their claims to dignities and heraldic insignia. In the course of the 16th c., the heralds obtained copies of all such accounts of the English families of any distinction as could be supplied to them, and entered them in the books which contain the records of their official proceedings. Royal commissions were issued under the Great Seal to the two provincial king-of-arms, empowering them to visit in turn the several counties of England, in order to collect from the principal persons of each county an account of the changes which had taken place in their respective families in the interval since the last preceding visitation, and to inquire what account could be given of themselves by families who had stepped into the rank of gentry, or had become settled in the county since that period. The register-books kept by the heralds and their assistants contain the pedigrees and arms collected in the course of the visitations, with the signatures of the heads of the families. The pedigrees thus collected contain a vast body of information, interesting not only to the professed genealogist, but to every one who would know anything of the distinguished characters in English history. Some of these books are lost, the rest are scattered among the public and private libraries of the country, the largest collections being in the archives of the College of Arms and the British Museum.

After the beginning of last century, the visitations were discontinued, and there has since been no official and regular collection of pedigrees. A standing order of the House of Lords, in 1767, required that before any peer should be allowed to take his seat, Garter-king-of-Arms was to deliver at the table of the House of Lords a pedigree of his family, to be verified by the Committee of Privileges, and eventually preserved in the records of the House a copy being also registered in the College of Arms. This order was rescinded by Lord Thurlow in 1802, with the view of framing a new one; but, unfortunately, this was never done. Persons sensible of the importance of preserving an authentic account of their descent, frequently record their pedigrees for preservation in the Register of the College of Arms. This register is quite distinct from the heraldic department of that institution, and is open to any one who wishes to preserve evidence of any properly authenticated facts regarding his descent and family.—In Scotland, in the absence of the regular system of visitations which prevailed in England, there is a great deal of evidence regarding the pedigrees of the historical families of the country scattered here and there in public and private collections, including the Advocates' Library and Lyon Office.

A register of genealogies, similar to that of the English Heralds' College, exists in the Lyon Office, in which the pedigrees of applicants, after being proved to the satisfaction of the heraldic authorities, are inserted with the accompanying evidence. 'To what extent the register of genealogies in the Lyon Office may be admitted as a probative document, conclusive of the facts which it sets forth, has not been ascertained by actual decision; but there can be no doubt that, in questions both as to property and honors, it would be regarded as a most important adminicle of proof. The genealogical department of the Heralds' College in London is a very important one, and it is to be regretted that the uses of the corresponding department of the Lyon Office are so little understood and appreciated by the public.'—Lorimer's *Handbook of the Law of Scotland*, 2d edit., p. 446.

PEDIGREE, in point of law, is the legal relationship between individuals which is looked to with regard to the descent of property and honors. The occasion in which it comes into question is where a person dies, in which case his property, if he died intestate, is divided among those who are related by blood. The real property goes to one set of relations, and the personal property to others. See INTESTACY, NEXT OF KIN, SUCCESSION, Paterson's *Comp. of English and Scotch Law*, 251, 257.

PE'DIMENT, the triangular space over the portico at the ends of the roof of classic buildings. It is enclosed by the horizontal and the *raking* cornices, the latter of which follow the slopes of the roof. The pediment may be called the gable of classic buildings. It is frequently enriched with sculpture, for which it forms a fine setting. The doors and windows of classic buildings are often surmounted by pediments, either straight-sided or curved.

PEDLERS. See HAWKERS.

PEDO'METER, an instrument for measuring walking distances. It sometimes has a watch or clock attached. In the patent pedometer of Messrs. Payne, William, & Co., there is a repeating watch, which shows seconds, minutes, and hours, and also the day of the month. They are used by pedestrians, and for measuring streets when the fares of hired carriages are disputed. See ODOMETER.

PEDRO I. (DOM PEDRO D'ALCANTARA), Emperor of Brazil, was the second son of John VI. king of Portugal, and was born at Lisbon, 12th October 1798. On the death of his elder brother in 1801, he became Prince of Beja, and heir to the throne; and after his father's accession to the throne of Portugal and Brazil in 1816, he received the title of Prince of Brazil. He was carried along with the rest of the royal family of Portugal in their flight to Brazil in 1807, and from that time remained in that country. His education, owing to political disturbances, was not carried on systematically, and after his arrival in Brazil, he was left to instruct himself very much according to his own inclination. In 1817, he married the Archduchess Leopoldine of Austria, and on his father's return to Lisbon in 1821, was named Regent of Brazil. At this time, a great political crisis was impending; the Brazilians had been utterly disgusted at the preferment of Portuguese to the highest offices of state and the chief clerical dignities, and their discontent was heightened by the refusal of the Portuguese Cortes to accord to Brazil a liberal constitution similar to that which had been granted to the mother-country, and by its arbitrary command, that P., who was at the head of the liberal party, should at once return to Portugal to complete his education.

P., however, cast in his lot with the Brazilians, despite threats of exclusion from the throne of Portugal, and was chosen, on 12th October 1822, Emperor of Brazil. His government was very vigorous, but a war which broke out between his supporters and the advocates of republicanism, distracted the country for a time, and prevented the liberal measures of the government from taking full effect. In 1825, his title was recognized by the Portuguese Cortes; and the death of his father, in the following year, opened for him the succession to the throne of Portugal. This revived the national spirit of the Brazilian Chambers, who feared that they were about to be again reduced to a dependent state, and P.'s hasty and passionate temper led him to measures which whetted the general discontent. But he merely retained the dignity of king of Portugal long enough to show his right to it, and, after granting a more liberal constitution, immediately resigned in favor of his daughter, Maria II. The disturbances in Brazil still increased, the finances fell into disorder, the emperor's second marriage with the Princess Amelia of Leuchtenburg displeased his subjects; and after making various ineffectual attempts to restore tranquillity, he was compelled, by the revolution of July 1831, to resign the throne in favor of his son, Pedro II., a boy of 5½ years old. P. then sailed for Portugal, where his brother Miguel had usurped the throne; and with the aid of an army which was swelled by French and English volunteers, after a three years' campaign, he drove away the usurper, and restored his daughter to the throne in 1834. But the ceaseless excitement by which he had been surrounded, and the excessive demands on his energies, had produced total exhaustion, and he died 24th September 1834. See BRAZIL; MIGUEL, DOM; and PORTUGAL.

PEDU'NCLE. See FLOWER.

PEEBLES. See PEEBLESSHIRE.

PEEBLESSHIRE, a county in the south of Scotland, also called Tweeddale, from consisting mainly of the upper valley of the Tweed, a river which originates in the county. P. is bounded by Dumfries and Selkirk shires on the S., Lanarkshire on the W., Mid-Lothian on the N., and Selkirkshire on the E. The county is small, containing only 356 square miles, or 227,869 statute acres. Its lowest point above the mean level of the sea is about 450 feet, from which to 1200 feet is the region of cultivation; but the county being a group of hills, is mostly pastoral, with the arable lands chiefly in the valleys. The highest hill is Broad

Law, which reaches an elevation of 2761 feet. Within the county, the Tweed has for tributaries the small rivers Eddleston, Leithen, Quair, Manor, and Lyne, besides many mountain rivulets. P. comprehends sixteen parishes, but several being ecclesiastically united, the number of parish churches, each with a settled minister, is fourteen; the number of parish schools is fifteen. The only town in the county is Peebles, an ancient royal burgh, pleasantly situated on a peninsula formed at the confluence of the Eddleston with the Tweed. The principal villages are Innerleithen, Walker Burn, West Linton, and Carlops.

In 1881, the population of the county was 13,819, of whom 4059 belonged to Peebles, which, distant 22 miles from Edinburgh, is the seat of a sheriff and county administration. It is also the seat of a presbytery. Besides the parish church, the town has several dissenting places of worship, including an Episcopal and a Roman Catholic chapel. It likewise possesses some good schools, has three branch banks, and a number of inns. As a means of literary and social improvement, Mr. W. Chambers, in 1859, made a free gift to this his native town of a spacious suite of buildings, comprising a Reading-room, a Public Library consisting of 15,000 volumes, a Museum, Gallery of Art, and Hall for lectures and concerts—the whole being designated the CHAMBERS' INSTITUTION. Long secluded from general traffic, P. has been lately opened up by railways; and the woollen manufacture has made considerable progress in the parish of Innerleithen. In 1880–81, the valued rental of the county, town included, exclusive of railway property, was £132,081; the valuation of railway property being £19,668. P. abounds in the remains of British hill-forts, Border towers, and other antiquities, and possesses numerous modern mansions of a handsome kind. Formerly, the only account of the shire was a *Description of Tweeddale*, by Dr. Alexander Pennicuik, 1715; reissued with notes, 1815; but in 1864 there was written a *History of Peeblesshire*, by W. Chambers, 1 vol. 8vo., illustrated with maps and wood-engravings.

PEEL, a small but populous and thriving seaport town on the west coast of the Isle of Man. It was formerly called 'Holm,' and was a place of great importance in the island. The herring-fishery, the building of vessels of small tonnage, and the manufacture of nets, are here carried on extensively, and form a source of large profits to the inhabitants. The bay is spacious, and abounds with fish of excellent quality.

At the northern extremity of this bay are several grotesque and romantic caverns. The southern extremity is formed by Peel Island, on which stand the grand old ruins of Peel Castle and St. German's Cathedral. The castle was formerly the frequent residence of the Earls of Derby, then Lords of the Isle of Man, and is expressly named in the original grant of Henry IV. to the Stanley family. Beneath the cathedral is a strong subterranean dungeon, where many noble persons were in former days imprisoned, including Thomas, Earl of Warwick, in the time of Richard II., and Elinor Cobham, Duchess of Gloucester, who was sentenced to perpetual imprisonment in it in the year 1440, and who died within its gloomy recesses. In Sir Walter Scott's *Peveril of the Peak*, constant mention is made of this castle, and indeed it may be said to be the scene of the story. The ruins are yearly visited and admired by thousands of persons from all parts of the United Kingdom. The town of P. is now rapidly extending its boundaries, and bids fair to become a place of considerable commercial importance. Pop. (1871) 3513.

PEEL, SIR ROBERT, a very eminent British statesman, was born, 5th February 1788, near Bury, in Lancashire. His father, Sir Robert Peel (created a baronet in 1800), was the wealthy cotton-spinner, from whom he inherited a great fortune. He was educated at Harrow, and at Christ-Church, Oxford, where he graduated B.A. in 1808—taking a double first-class—and entered the House of Commons in 1809 as member for Cashel, adopting the strong Tory politics of his father. Percival was then prime-minister. P. set quietly about the business-work of the House, feeling his way with that steady prudence and presevering diligence that were the conspicuous features of his character. In 1811, he was appointed Under-secretary for the Colonies; and from 1812 to 1818, he held the office of Secretary for Ireland. In this capacity, he displayed a strong anti-Catholic spirit (whence the witty Irish gave him the nickname of 'Orange-Peel'), and was in consequence so fiercely, or, shall we say, ferociously attacked by O'Connell, that even the cool and cautious Secretary was driven to send the agitator a challenge. The police, however, prevented the duel from taking place.

From 1818 till 1822, P. remained out of office, but not out of parliament, where he sat for the university of Oxford. He now began to acquire a reputation as a financier and economist; and in 1819, was appointed chairman of the Bank Committee, and moved the resolutions which led to the resumption of cash-payments. He was still, however, as averse as ever to anything like religious or political reform. No member of the Liverpool-Castlereagh cabinet could have been to appearance more resolute. He even vehemently defended the infamous 'Peterloo Massacre' of 1819. In 1822, he re-entered the ministry as Home Secretary—Canning shortly after becoming Foreign Secretary, on the suicide of Lord Castlereagh. The two worked together pretty well for some time, as P. devoted himself chiefly to financial matters, and especially to the currency; but 'Roman Catholic emancipation' was a question on which Canning was considerably in advance of his brother-secretary; and when the former was called upon by the king, after the resignation of Lord Liverpool, to form a sort of Whig-Tory ministry, P., along with the Duke of Wellington and others, withdrew from office. Yet it is singularly characteristic of this most honest and *compromising* statesman, that even when he seceded (1827), his opinions were veering round to the liberal and generous view of the claims of Roman Catholics; and when the death of Canning, shortly after, led to the formation of the Wellington-Peel government, its great measure—actually introduced by 'Orange-Peel' himself—was the ever-memorable one for the 'relief' of the Roman Catholics (1829).

As Home Secretary, he also signalized himself by a re-organization of the London police force—since popularly called 'Peelers' and 'Bobbies,' their previous sobriquet being 'Charlies'—from King Charles I., who (1640) extended and improved the police system—and by the introduction of several other important measures.

Meanwhile, the university of Oxford had rejected its apostate representative, and chosen in his stead Sir Harry Inglis. But now came on the great question of parliamentary reform, which P. firmly but temperately opposed. In 1830, the Wellington-Peel ministry fell, and was succeeded by a Whig ministry under Earl Grey, which, in 1832, carried the Reform Bill. P. (now, by the death of his father, Sir Robert P.), when he saw that reform was inevitable, accepted defeat and its results with great equanimity. He shrank from anything like factious opposition to the measure, and contented himself with presenting as forcibly as he could the political *per-contra*. After it was passed, he became the leader of the 'Conservative' opposition; and, as we have said, accepting reform itself as a *fait accompli* and irreversible, he only sought by keen and vigilant criticism of Whig measures to retard the too rapid strides of liberalism.

In 1833, when the first 'reformed' parliament assembled, P. took his seat as member for Tamworth, which he represented till the close of his life. On the retirement of the Melbourne ministry in November 1834, he accepted the office of prime-minister, but could not succeed in giving stability to his administration, and was compelled again to give place to Viscount Melbourne in April 1835, and resumed his place as leader of the opposition. P.'s conduct in opposition was always eminently patriotic. The Whigs, who were being pressed on the one side by the new Radical party and the Anti-corn Law League, and on the other by O'Connell and the Irish repealers, gradually lost ground, and being narrowly defeated in 1841, on a motion of want of confidence, dissolved parliament. The general election that ensued was virtually a contest between Free-trade and Protection. Protection won; and when the new parliament met, a vote of no-confidence was carried by a majority of ninety-one. The Conservative party, headed by P., now came into office. The great feature of the new government was the attitude it adopted on the corn-law question. The Whigs, while in office, and even after their expulsion, were bent upon a fixed but moderate duty on foreign corn; the Anti-corn Law League would hear of nothing short of an entire repeal, while Sir Robert was in favor of a modification of the sliding scale of duty which had existed since 1828. He introduced and carried (1842), in spite of strong opposition, a measure based upon this principle.

The deficit in the revenue, which had become quite alarming under the Melbourne administration, next engaged his attention, and led him to bring in a bill (1842) for the imposition of an 'income-tax' of 7*d.* in the pound, to be levied for three years. To alleviate the new burden, P. commenced a revision of the general tariff, and either abolished or lowered the duties on several very important articles of commerce, such as drugs, dye-woods, cattle, sheep, pigs, salted meat, butter, eggs, cheese, and lard. He also showed himself resolute in the repression of the clamorous and anarchic malcontents of Ireland. O'Connel (q. v.) was tried for conspiracy, and though the judgment against him was set aside on appeal to the House of Lords, the influence of the 'agitator' was broken. The first half of 1845 was marked by the allowance to Maynooth being increased and changed into a permanent endowment instead of an annual grant, and by the foundation of the Irish unsectarian colleges, and other important measures. But the potato-rot in Ireland during the autumn, followed by a frightful famine, rendered 'cheap corn' a necessity, if millions were not to starve. Cobden and the League redoubled their exertions. Lord John Russell announced the views of the Whig party on the crisis, and Peel again yielded. He told his ministerial colleagues that the corn-laws were doomed, and that their repeal was inevitable. Some of them refusing to

go along with him, he resigned; but after a few days, was recalled, and resumed office.

Lord Stanley, the late Lord Derby, seceded, and with Lord George Bentinck, Mr. Disraeli, &c., formed a 'no-surrender' Tory party; but the Duke of Wellington, Graham, Aberdeen, Gladstone, and other Conservatives, stood by him, and the measure for the repeal was carried. He was, however, immediately afterwards defeated on an Irish Protection of Life Bill. Not so much upon this account, as because he felt that the course which he had pursued had produced a dissolution of the old ties of party, and that he could not expect for some time to find himself at the head of a strong government, P. retired from office in June, 1846, giving place to a Whig administration under Lord John Russel, to which he gave an independent but general support as the leader of a middle party rather Whig than Tory. In the critical times of 1847—1848, he was one of the most important props of the government, whose free-trade principles he had now completely accepted. His ecclesiastical policy had also undergone a remarkable change, and he now frankly supported the Whigs in the efforts to carry an act for the repeal of the Jewish disabilities. He was himself regarded by the working and middle classes generally with much grateful respect. An unexpected catastrophe put an end to his career. On the 28th of June 1850, he had spoken with great eloquence in the debate on Lord Palmerston's Greek policy; but on the following day was thrown from his horse in Hyde Park, and was so much injured, that he died on the evening of the 2d of July.—He left five sons, the eldest of whom, SIR ROBERT, the second, SIR FREDERICK, and the fifth, JONATHAN, lieutenant-general in the British army, have all held office as ministers.

PEEL-TOWER (W. *pill*, a stake, a fortress; Lat. *pila*, a stake, pillar, structure), the name given to the towers erected on the Scottish borders for defence. They are square, with turrets at the angles, and the door is sometimes at a height from the ground. The lower story is usually vaulted, and formed a stable for horses, cattle, &c. For an account of these old towers, now mostly in ruin, see *History of Peeblesshire*, by W. Chambers, 1864.

PEEPUL, PIPUL, or PIPPUL (*Ficus religiosa*), also known as the SACRED FIG of India, and in Ceylon called the BO TREE; a species of Fig (q. v.), somewhat resembling the Banyan, but the branches not rooting like those of that tree, and the leaves heart-shaped with long attenuated points. The tree is held sacred by the Hindus, because Vishnu is said to have been born under it. It is generally planted near temples, and religious devotees spend their lives under its shade. It is also held sacred by the Buddhists. It attains a great size and age. A wonderfully aged tree of this species is figured in the article BO TREE. The P. is often planted near houses, and by the sides of walks, for the sake of its grateful shade. The juice contains caoutchouc, and is used by women as bandoline. Lac insects feed upon this tree, and much lac is obtained from it. The fruit is not much larger than a grape, and although eatable, is not valued.

PEER (Fr. *pair;* Lat. *par*, equal), a general name applied to the titled nobility of Great Britain and Ireland, indicating their equality of rank. The peerage includes the various degrees of Baron, Viscount, Earl, Marquis, and Duke. The peers of England, of Great Britain, of the United Kingdom, and certain representative peers of Scotland and Ireland, together with certain of the bishops and archbishops, who are called lords spiritual, constitute the House of Lords. The dignity of the peeerage is hereditary, but in early times was territorial. Life peerages seem at one time to have been not unknown in England; but in 1856 Sir James Parke, having been created by Her Majesty Baron Wensleydale 'for and during the term of his natural life,' the House of Lords, on the report of a Committee of Privileges, held that he was not entitled to sit and vote in parliament. Ladies may be peeresses in their own right either by creation or by inheritance. The wives of peers are also styled peeresses. Under the articles NOBILITY, PARLIAMENT, DUKE, MARQUIS, EARL, VISCOUNT, and BARON, will be found notices of each order of peers, and of the origin, history, and privileges of the peers as a body.

A certain limited number of the French nobility were styled Peers of France.

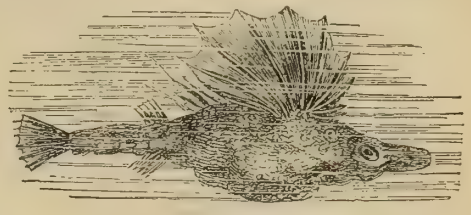
PEE'WIT. See LAPWING.

PE'GANUM, a genus of plants of the natural order *Zygophyllaceæ*, of which the only known species, *P. harmala*, a half-shrubby plant with linear, smooth, almost bipinnatifid leaves, and solitary, white, axillary flowers, a native of the Levant and the north of India, is sometimes cultivated in gardens under the name of SYRIAN RUE. The seeds are narcotic, and the Emperor Solyman is said to have kept himself intoxicated by eating them. They were formerly used in medicine in Europe, and still are in the East. The Turks use them as a spice, and also for dyeing red. The plant is believed to be the *Harmala* of the Greeks, mentioned by Dioscorides as one of the kinds of *Peganon*.

PEGASSE, or PACASSE (*Bos pegasus*), a species of ox, a native of the interior of Western Africa. The head is short and thick, the forehead wide; the horns long, extending laterally from the frontal ridge, then turning downwards, and again upwards; the ears very large and pendulous; the neck maned; the tail entirely covered with long hair; the legs long. Little is yet known of this curious species of a most important tribe.

PE'GASUS, in Greek Mythology, a winged horse which arose with Chrysaor from the blood of the Gorgon Medusa, when she was slain by Perseus. He is said to have received his name because he first made his appearence beside the springs (*pegai*) of Oceanus. He afterwards ascended to heaven, and was believed to carry the thunder and lightning of Zeus. According to later authors, however, he was the horse of Eos. The myth concerning P. is interwoven with that of the victory of Bellerophon over Chimæra. Bellerophon had in vain sought to catch P. for his combat with this monster, but was advised by the seer Polyidos of Corinth to sleep in the temple of Minerva, and the goddess appearing to him in his sleep, gave him a golden bridle and certain instructions, upon which he acted, and made use of P. in his combat with the Chimæra, the Amazons, and the Solymi. P. is also spoken of in modern times as the horse of the Muses, which, however, he was not. The ancient legend on this subject is, that the nine Muses and the nine daughters of Pieros engaged in a competition in singing by Helicon, and everything was motionless to hear their song, save Helicon, which rose ever higher and higher in its delight, when P. put a stop to this with a kick of his hoof, and from the print arose Hippocrene, the inspiring spring of the Muses. But that P. is the horse of the Muses, is entirely a modern idea, being first found in the *Orlando Innamorato* of Boiardo.

PEGASUS, a genus of fishes, constituting the family *Pegasidæ*, of the order *Lophobranchii* (q. v.) The species are few; they are small fishes, natives of the Indian seas, interesting from their peculiar form and appearance. The breast is greatly expanded, much broader than high, the gill-openings in the sides; the pectoral fins are extremely large and strong; a long snout projects before the eyes, and the mouth is situated under and at the base of it; the body is surrounded by three knobbed or spinous rings. One species (*P. draco*) is called the SEA DRAGON, another (*P. volans*) is popularly known as the PEGASUS.



Sea Dragon (*Pegasus draco*).

PEGS. Small square pointed pegs of wood have of late years been introduced by the Americans into the manufacture of boots and shoes, for the purpose of connecting the parts of the sole and upper leather together without sewing. See SHOEMAKING. This invention has been so extensively adopted, that the manufacture of wooden pegs, for this purpose, has become an important trade in America and Bohemia, from which countries a considerable importation is made to Great Britain. They are chiefly made of maple-wood, and are rarely more than an inch in length.

PEGU', in British Burmah, was till lately the central division, lying between Aracan in the north, and Tenasserim in the south; and comprised the valley of the Lower Irrawadi and the coast. In this sense it had, in 1872, an area of 26,979 sq. miles, and a pop. of 1,662,058. At the census of 1881, however, it had been severed into two divisions, P. and Irrawadi, with other minor readjustments. P., containing the districts of Rangoon town, Hanthawadi, Tharrawadi, and Prome, had, in 1881, an area of only 9159 sq. m., and a pop. of 1,162,393. The new division, Irrawadi, had an area of 16,805 sq. m., distributed into the districts of Thunkhwa, Bassein, Henzada, and Thayetmyo, and a pop. of 1,161,119. Of the joint population of the two divisions, about 800,000 are true Burmans; but in addition to these, there is a sprinkling of Karens, who live in the wild and hilly districts, Taleins or Peguers, Shans, Khyengs, Yabaings, Indians, Chinese, and a few other races.

The principal river of P. is the Irrawadi (q. v.). In March, the river begins to rise, and gradually increases in volume till its waters are forty feet above their lowest level. They rapidly subside in October, when the rains cease, and the north-east monsoon

sets in. Other rivers are the Hlaing or Rangoon, the Pegu, the Sittaung, and the Bhileng. P. was annexed to British India at the close of the Burman war of 1852, since which time slavery has ceased to exist, schools have been established, and various public works undertaken. Rice and teak timber are the principal exports. A flotilla of steamers keeps up the communication between Rangoon (q. v.), the principal port, and the chief stations on the Irrawadi, conveying troops, stores, passengers, and mails from place to place.

P. is also the name of the north-east 'township' of the Rangoon district, containing the headquarters town of P. The north-western portion is mountainous and forest clad; towards the south the hills sink towards the fertile level land, covered with rice fields. The Pegu River, 180 miles long, intersects the township, and finally joins the Rangoon River.

P. town, on the river, now but a small place of some 5000 inhabitants, seems by the accounts of European travelers in the 16th c., to have been of great size and magnificence, strongly fortified. The ancient town was founded in 573 A.D.; and its sovereigns reigned over the Irrawadi, conquered Ava, and successfully invaded Siam and Aracan.

PEHLEVI (Valor, Power; *Zabán Pehlevi* = Language of Heroes) is the name of an ancient West-Iranian (Median and Persian) idiom, in use chiefly during the period of the Sassanides (235—640 A.D.), who, wishing fully to restore the ancient Persian empire, endeavored also to reinstate the primitive national language, fallen into disuse as a court-language since the time of Alexander's conquest. Yet they did not fix upon the pure Persian as it was still spoken in the interior, but upon the dialect of the western provinces, largely mixed with Semitic words, to which Arian terminations were affixed.

The grammatical structure of the P. presents almost the same poverty of inflections and terminations as the present Persian. Although, however, less rich than Zend (q. v.) in inflection and accentuation, it yet boasts of the same copiousness of words as that dialect, to which it in reality succeeded. It is written from right to left, and the letters are mostly joined. The remnants of P. extant consist of coins, inscriptions (found at Hajiabad, Persepolis, Kirmanshah, &c.), and a number of books, all relating to the religion of Zoroaster. The most important of these are the translation of the chief part of the Zend-Avesta (Yazna, Visparad, and Vendidâd), and such original religious works as the Bundehesh, Shikandgumâni, Dinkhart, Atash Barâm, &c. The P. of the books differs from that of the inscriptions and coins to such a degree—according to the larger or smaller preponderance of the Semitic element—as to have misled investigators (Westergaard and others) to assume that two utterly distinct languages, a purely Iranic and a Semitic one, had been used somewhat indiscriminately at the time. The non-Iranian element is called Huzvaresh (Huzooresh) by the Parsee priests, who taking advantage of the ambiguity of the P. alphabet, often substitute the corresponding Persian for the foreign words. The Iranian part of the P. differs little from the Persian of our own day, and, in fact the P. changed first into Parsee, and subsequently into modern Persian, simply by getting rid first of its Chaldee, and then of those of its Iranian words which had become obsolete. The chief use of the P. dialect at present is the assistance it offers towards the education of the Zend itself. For the history of its investigation since it was first made known in Europe, we refer to PERSIAN LANGUAGE AND LITERATURE.

PEI-HO', a river of China, which, rising on the confines of Tartary, traverses the northern part of the province of Chih-le (q. v.) or Pe-chih-le, and falls into the Gulf of Pe-chih-le, in about 38° 30′ N. lat.

The attack on the escort of the British and French ambassadors, whilst ascending the Pei-ho to Pekin in June 1859, led to the war with China of 1860. See CHINA.

PEINE FORTE ET DURE, the 'strong and hard pain;' a species of torture formerly applied by the law of England to those who, on being arraigned for felony, refused to plead, and stood mute, or who peremptorily challenged more than twenty jurors, which was considered a contumacy equivalent to standing mute. In the beginning of the 13th c., this penalty seems to have consisted merely in a severe imprisonment with low diet, persisted in till the contumacy was overcome. But by the reign of Henry IV., it had become the practice to load the offender with weights, and thus press him to death; and till nearly the middle of the 18th c., pressing to death was the regular and lawful mode of punishing persons who stood mute on their arraignment for felony. The motive which induced an accused party, in any case, to submit to this penalty rather than to plead, was probably to escape the attainder which would have resulted from a conviction for felony. During the 15th, 16th, 17th, and even the 18th c., various cases are recorded of the infliction of the punishment in question, Latterly, a practice prevailed which had no sanction from the law, of first trying the effect of tying the thumbs tightly together with whipcord, that the pain might induce the offender to plead.

Among instances of the infliction of the *peine forte et dure*, are the following: Juliana Quick, in 1442, charged with high treason in speaking contemptuously of Henry VI., was pressed to death. Anthony Arrowsmith, in 1598, was pressed to death (Surtees' *History of Durham*, vol. 3, p. 271). Walter Calverly of Calverly, in Yorkshire, arraigned at the York assizes in 1605, for murdering his two children and stabbing his wife, was pressed to death in the castle by a large iron weight placed on his breast (Stow's *Chronicle*). Major Strangways suffered death in a similar way in Newgate in 1657, for refusing to plead when charged with the murder of his brother-in-law, Mr. Fussell. In 1720, a person of the name of Phillips was pressed in Newgate for a considerable time, till he was released on his submission; and the same is recorded in the following year of one Nathaniel Hawes, who lay under a weight of 250 lbs. for seven minutes. As late as 1741, a person is said to have been pressed to death at the Cambridge assizes, the tying of his thumbs having been first tried without effect.

The statute 12 Geo. III. c. 20 virtually abolished the *peine forte et dure*, by enacting that any person who shall stand mute when arraigned for felony or piracy shall be convicted, and have the same judgment and execution awarded against him as if he had been convicted by verdict of confession.

PEI'PUS, LAKE, in the north-west of Russia, is surrounded by the government of St. Petersburg, and the provinces of Esthonia and Livonia. On the south-east it is connected with Lake Pskoff by a strait 16 miles in length and from 1½ to 4½ miles broad. The length of both lakes is 87 miles, the greatest breadth about 40, and the depth from 14 to 49 feet. Lake Pskoff receives the waters of the river Velekaia, and Lake P. is supplied by Lake Pskoff, and by the Embach from the west, and other rivers. The waters of the lower lake are carried to the Gulf of Finland by the Narova. The lakes are studded with several picturesque islands, and surrounded with banks which are for the most part marshy and abound in fish, the taking of which gives employment to many.

PEI'SHWA (Minister) was the title of the personage third in rank and authority at the court of the Mahratta Maharajahs of Satara, there being only the *Priti-nidhi* (Delegate of the Rajah) between him and his sovereign. However, during the weak reigns of Sevajee's descendants, the minister increased in importance, till, at the commencement of the 18th c., BALAJEE BISWANATH, the then Peishwa, and a man of distinguished administrative ability and diplomatic talents, made himself virtually the ruler of the Mahrattas (q. v.).

PEISI'STRATOS (Lat. *Pisistratus*), a famous 'tyrant' of Athens, belonged to a family of Attica, which claimed descent from Pylian Nestor, and was born towards the close of the 7th c. B.C. —certainly not later than 612. His father's name was Hippocrates, and through his mother he was pretty closely related to the great lawgiver, Solon, between whom and P. a very intimate friendship long existed. He received an excellent education; and the charm of his manners, as well as the generosity of his spirit was so great that (according to Solon) had he not been ambitious, he would have been the best of Athenians; but his passion for the exercise of sovereign power led him to adopt a policy of artifice and dissimulation, for the purpose of attaining his ends, which prevents us from regarding him with the admiration that the beneficent character of his government might seem to demand. At first, P. co-operated with his kinsman Solon, and in the war against the Megarians, acquired considerable military distinction; but afterwards, when probably his ambitious views had become more matured, he came forward as the leader of one of the three parties into which Attica was then divided. These were, the *Pediæi* (party of the Plain), or the landed proprietors; the *Parali* (party of the Seaboard), or wealthy merchant classes; and the *Diacrii* (party of the Highlands), chiefly a laboring population, jealous of the rich, and eager for equality of political privileges. It was to the last of these that P. attached himself; but indeed he assiduously cultivated the good-will of all the poorer citizens, to whom he showed himself a most liberal benefactor. At last P. took a decided step.

Driving into the market-place of Athens one day, and exhibiting certain self-inflicted wounds, he called upon the people to protect him against his and their enemies, alleging that he had been attacked on account of his patriotism. Solon, who was present, accused him of hypocrisy; but the crowd were, according to Plutarch, ready to take up arms for their favorite; and a general assembly of the citizens being summoned, Ariston, one of P.'s partisans, proposed to allow him a body-guard of fifty men. The measure was carried in spite of the strenuous opposition of Solon. Gradually P. increased the number, and in 560 B.C., when he felt himself strong enough, seized the Akropolis. The citizens, in general, seem to have tacitly sanctioned this high-handed act. They were sick of the anarchic broils of the differ-

ent factions, and probably glad to see their champion and favorite usurp supreme authority. Megakles and the Alkmæonids—the heads of the rich aristocratic party—immediately fled from the city. Solon, who loved neither oligarchic arrogance nor military despotism, but was a thorough constitutionalist, tried, but in vain, to rouse the Athenians against Peisistratos. P., who was not at all vindictive in his disposition, did not attempt to molest Solon; he even maintained the legislation of the latter almost intact, and distinguished himself chiefly by the vigor of his administration. P. himself did not enjoy his first 'tyranny' long.

The *Pediæi* and the *Parali* rallied under Lykurgos and Megakles, united their forces, and overthrew the usurper, who was forced to go into exile. But the coalition of the two factions was soon broken up. Megakles hereupon made overtures to P., inviting him to resume his tyranny, which he did, but a family quarrel with Megakles induced the latter to again ally himself with Lykurgos, and P. was driven from Attica. He retired to Eubœa, where he remained for ten years, ever keeping an eye, however, on Athens, and making preparations for a forcible return. How he managed to acquire so much influence while only a banished man, is difficult to ascertain; but certain it is that many Greek cities, particularly Thebes and Argos, placed the greatest confidence in him, and finally supplied him abundantly with money and troops. P. at length sailed from Eubœa, landed in Attica at Marathon, and marched on the capital. His partisans hurried to swell his ranks. At Pallene, he encountered his opponents, and completely defeated them, but used his victory with admirable moderation. When he entered the city, no further resistance was made, and he resumed the sovereignty at once. The date of this event, as of most others in the life of P., is very uncertain; perhaps we shall not err far if we place it about 543 B.C. He lived for sixteen years afterwards in undisturbed possession of power, dying 527 B.C., and transmitting his supremacy to his sons, Hippias and Hipparchus, known as the *Peisistratidæ*. His rule was mild and beneficent.

Although the precautionary measures that he adopted to establish his authority involved at first a certain resolute and stringent policy (e. g., the seizure of the children of his leading opponents, and the detaining them as hostages); yet no sooner had he placed himself out of danger, than he began to display that wonderful tact, moderation, kindliness, and sympathetic appreciation of the wishes of the Athenians, that have won him the praise and esteem of all later ages, in spite of his usurpation. He firmly, but not harshly, enforced obedience to the laws of Solon; emptied the city of its poorest citizens, and made them agriculturists, supplying such as had no resources with cattle and seed; secured provision for old and disabled soldiers; bestowed great care on the celebration of the religious festivals of the Atticans, and even introduced some important changes; encouraged literature more than any Athenian had ever done before—it is to P., or to the poets, scholars, and priests about him, that we owe, for example, the first complete edition of Homer (q. v.); and, like his still more brilliant successor in the following century, Perikles, he adorned Athens with many beautiful buildings, such as the Lyceum, a temple to the Pythian Apollo, another to Olympian Zeus, &c.

PEKAN, or WOOD-SHOCK (*Martes Canadensis*), a species of Marten (q. v.), very nearly allied to the sable, a native of the northern parts of North America. It is twice the size of the pine marten, and is generally of a grayish brown color; the legs, tail, and back of the neck marked with darker brown. The fur, although not so valuable as sable, nor even as that of the pine marten, is useful, and large quantities are sent to the market. The P. lives in burrows, which it excavates in the banks of rivers; and feeds chiefly on fish and other aquatic animals.

PEKI'N, or PE-KI'NG (i. e., Northern Capital), the capital of the Chinese empire since 1421 A.D., is situated on a sandy plain about 13 miles north-west of the Peiho, in lat. 39° 54′ 13″ N., and long. 116° 28′ 54″ E., in the northern province of Chih-le, at a distance of nearly 100 miles from the sea, and about 60 miles from the great Chinese wall. The pop. of the city is estimated at about 2,000,000; and the circuit of the walls, according to the latest measurements, is 20 miles. These walls are made of earth, with an outer casing of brick, having embrasures for musketry or ordnance every 50 feet. Those of the Tartar city have an average height of 50, but in some places of 61 feet. In thickness they vary from 57 to 22 feet. The walls of the Chinese city are only 30 feet in height, and from 15 to 25 in width. The top, to which horsemen can ascend by a ramp or sloping way, is paved with stone. At intervals of 60 yards are square towers or buttresses, projecting outwards from the walls 50 or 60 feet. The gates which give access to the city from the surrounding country are 16 in number, nine of which belong to the Northern or Tartar City, and seven to the Southern or Chinese City. Over each gate is a watch-tower nine stories in height, and loop-holed for cannon.

The city of P. is divided into two parts, separated by a wall with three gates. These two sections form respectively the Northern, Interior, or Tartar City, called *Nei-tching* ('within the walls'); and the Southern, Exterior, or Chinese City, called *Wai-tching** ('without the walls'). 'Tching' or 'ching,' it may be remarked, means both city and wall.

1. *Nei-tching, or the Northern City*, has three distinct divisions or enclosures—viz., Kin-tching, or the Prohibited City; the Hwang-tching, or Imperial City; and the General City. The first of these—the innermost or central block—is surrounded by a red brick wall about two miles in circumference, which shuts in the palaces, pleasure-grounds, and temples of the sacred city. Here live the emperor and his family, the ladies of the court, and the attendant eunuchs. The palace proper consists of four large and two small buildings, called the Tching-kung, or '*the* Palace,' the Tung-kung, Sikung, and Kin-luan-teen. The smaller buildings are allotted to the dowager-empress and suite; they are called the Ning-shou-kung, and the Keen-tsing-kung, or the 'Palace of Earth's Repose.' Other notable buildings of the Prohibited City are Fung-seen-teen, the 'Temple of Imperial Ancestors;' Tching-hwang-meaou, the 'Guardian Temple of the city;' Nan-heun-teen, 'the Hall of Portraits of the Chinese emperors and sages;' and Wan-yuen Ko, the 'Hall of the Literary Abyss' i. e., the Imperial Library. It also contains the offices of the cabinet, in which the members hold their sessions, the imperial treasury, the court of controllers for the regulation of the receipts and expenses of the court, &c.—The Imperial City is built around this central block, and contains the palaces of the princes, temples, some of the government offices, and spacious pleasure-grounds, with beautiful artificial lakes.

From Woo-ying-teen, the imperial printing-office, the *Imperial*, or *Pe-king Gazette* is issued daily for all government officials throughout the empire. This is the only publication in China approaching to a newspaper, and is named *King Paou*, or 'Great Report.' It is not merely a report for official information, but forms the basis of the national annals, and is compiled from the daily records of the Supreme Council. Besides the daily edition, there is one published every two days, which is sold to the public, and from which is withheld decrees and reports of a secret character. The journal itself is a miserable production even for China, and consists of from 15 to 20 pages not so large as common note-paper.—The General City—the third division or enclosure—lies between the Imperial City and the outside walls; it is more densely populated than either of the preceding divisions, and contains the most important of the public offices, including the six supreme tribunals or boards—the Le-fan-yuen, or the Office of Foreign Affairs; Too-cha-yuen, or the Imperial Censorate, &c.; Han-lin-yuen, or the Grand National College; the Great Medical College; the Observatory; the Examination Hall, with—it is said—ten thousand cells for the candidates who assemble to compete for public offices; and the British, French, Russian, and United States legations. One may also notice the Lama temple, founded 1725–30 to conciliate the Tibetan priesthood; the temple of Confucius, in which the emperor solemnly 'worships' the great sage once a year; and the Mohammedan mosque. The British minister resides in the Leang-kung-foo, or the Palace of Leang, a gorgeous building, consisting of four or five large halls, and covering about five acres of land. The principal streets of the general city—from 140 to 200 feet wide, and unpaved—are continuous lines of shops painted red, blue, and green, decorated with staring signs, and resplendent with Chinese characters highly gilt.

By day and night, by the light of the sun, or by the illumination of torches and paper lanterns, the roar of these great thoroughfares is incessant; shopkeepers, pedlers, mountebanks, quack-doctors, passengers on foot or on horseback, each and all contributing to the general hubbub. The minor streets and lanes, where the houses of the populace are mingled with public offices, temples, stores, and manufactories, are by no means pleasant places, their general characteristics being an 'insupportable odor,' and one-storied brick houses with roofs of a gray color. There is 'Fetid Hide Street,' 'Dog's-tooth Street,' 'Dog's-tail Street,' 'Barbarian Street,' and many others with names equally uninviting.

2. *Wai-tching, or the Southern City*, the second great division of P., contains most of the mercantile population of the capital, but does not present many features of interest to the traveler. Teen-Tan, or the temple to Heaven, and Tee-Tan, or the temple to Earth, with their grounds occupy a considerable space. The latter is considered a sort of temple of agriculture, and its grounds, are the scene of the well-known ceremony in which the emperor, assisted by members of the Board of Rites, opens the plowing-season in China at the vernal equinox. The theaters and places of public amusement are likewise situated in the Southern or

* Northern City and Southern City are the most correct terms. The latter was added to the more ancient Northern City, and was originally designed to encircle it; hence it was called the Exterior City, in contradistinction to the Northern or Interior City. It was also intended to reserve the Northern City for the Tartars, and the Southern City for the Chinese, as the names still imply; but in point of fact, the Tartar City contains as many Chinese as Tartars; and it is not surrounded by the so-called Chinese City, which latter has only been added on the south side.

Chinese city; also the Golden Fish-ponds, and the execution-ground.

Outside the city, there are unwalled suburbs, as about every walled town in China. These are of considerable extent, but straggling, and consist principally of an agricultural population, the land being everywhere in a state of cultivation, producing chiefly maize and millet, as it is not so suitable for the staple products of rice and wheat. The land is badly watered but well timbered, which gives a pleasing aspect to the landscape; and when viewed towards the range of mountains extending from the west of P. to the north-east, presents a picturesque panorama. About 8 miles north-west of P., the famous *Yuen-ming-yuen* (lit. 'Round and Splendid Gardens') palaces are situated, which were sacked and destroyed by the allies in October 1860. These were 30 in number, surrounded by every variety of hill and dale, woodland and lawn, interspersed with canals, pools, rivulets, and lakes, with numerous temples and pagodas containing statues of men and gods in gold, silver, and bronze. Here had been heaped up for centuries all the movable riches and presents of the emperors of China, amongst which were found many sent by the English embassies. At the approach of the allies, Hien-fung fled in haste; and when Lord Elgin learned that it was in those grounds that the British and French prisoners, captured by treachery, had been tortured, he gave the order to sack and destroy this favorite residence of the emperor's, 'as it could not fail to be a blow to his pride as well as his feelings; and it became a solemn act of retribution.' The palaces were cleared of every valuable, and their walls destroyed by fire and sword.

P. has thus been rendered memorable by this march of the British and French forces (1860) to the walls of the city, on which the British and French flags were raised. The provisions of the treaty of Tien-tsin 1858, (see CHINA), were subsequently ratified and supplemented by the *Convention of P.*, which was signed in the English and French languages at P., October 24, 1860. The most important article of this Convention is that which allows the residence of a British envoy at P., a privilege formerly enjoyed by Russia alone. The greatest benefits have resulted to both governments by this step. The same privilege has been granted to the French and American governments. Foreigners of all nations are allowed to visit, but not to trade within the precincts of the city.

P. is a very ancient city. Centuries before the Christian era, it was the capital of the kingdom of *Yen*, but when this kingdom was overthrown by the *Tsin* dynasty in 222 B.C., the seat of government was removed elsewhere. About 938 A.D., it again became the capital of the *Kitan* dynasty. In 1215 it was captured by Genghis Khan; and in 1264, Kublai Khan (whom readers of Coleridge will remember) fixed his residence here. The native emperors, however, who succeeded the Mongol dynasty, removed the court to Nanking, which was reckoned the chief city of the empire till Yung Lo, the third emperor of the Ming dynasty, in 1421, once more made it the imperial residence, which it has ever since remained.—See *Yedo and Peking*, by Fortune (1863), Rennie's *Peking and the Pekingese* (1865), *Lord Elgin's Despatches* (1860), and the various recent books on China, noted at the end of the article CHINESE EMPIRE.

PELA'GIANISM, the doctrinal system of Pelagius (q. v.), especially on the subjects of the natural condition of man, original sin, grace, free-will, and redemption. Under the head PELAGIUS will be found what may be called the external history of the controversy to which the opinions of that remarkable man gave occasion. The movement, considered in itself, is one of the most interesting in the history of the human mind. At the close of the great controversies on the Trinity and Incarnation, the speculation, which for nearly a century had wearied itself in vain endeavors to make plain the inscrutable mysteries of the divine nature, at length turned inwards upon itself; and no one at all familiar with the controversy on P. can doubt that that prouder view of the capabilities of human nature, which lies at the root of all the theories of which P. was but the exponent, was a reaction against the crude and degrading conceptions of the nature and origin of the soul which characterized the philosophy, not alone of the Manichæan teachers, but of all the dualistic religions which sprung from the prolific soil of Gnosticism. To the Manichæan, and to all in general who adopted the Gnostic views as to the evil origin and nature of matter and material substances, man was, in his *psychical* nature, evil and incapable of good.

The Christian teacher, in combating this view, easily passed into an opposite extreme, and overlooking or explaining away the strong language of the Scripture, was led to represent man as endowed with full capacity for all good; and so long as the only adversaries to be controverted were those who urged the views of the Gnostic school, the line taken by Christian writers was but little guarded by any of those limitations and reserves which have arisen in later controversy; and thus the earlier Fathers, especially those of the Eastern Church, where Gnosticism was chiefly to be combated, are found to press earnestly the power for good which man possesses, without entering nicely into the origin or the motive principle of that power. But whatever of vagueness hung over this important subject was dispelled by the bold and precise statements of Pelagius, or at least by the discussion which at once arose thereupon, throughout the entire church. His teaching on the subject of original sin and on the primitive state of man, has been already detailed. See ORIGINAL SIN. The earliest formal embodiment of these doctrines, for the purpose of obtaining upon them the public judgment of the church, was in a number of articles presented to the council of Jerusalem, in 415, by Orosius. See PELAGIUS. Of these, the first five regarded the doctrines alread noticed under ORIGINAL SIN. The latter portion of the articles alleged that no grace or aid from God was needed for particular actions, but that free-will and the teaching of the law sufficed; that God's grace is given in proportion to our merits; that free-will would not be free, if it stood in need of aid from God; that the pardon of penitents is not granted according to God's grace and mercy, but according to their own merit and labor; and that our victory does not come from God's assistance, but from our free-will. Although the final sentence condemnatory of these doctrines (see PELAGIUS) was very generally accepted, yet the recusant party was not wanting in energy and ability.

The great champions on each side were Augustine for the orthodox, and Julianus, Bishop of Eclanium for the Pelagians. Of so much of the controversy as regards original sin, the history has been already related; that on grace and free-will was more subtle, and has led to more numerous divisions on the side of orthodoxy as well as of dissent. In order to evade the condemnation of the doctrine originally ascribed to them as to grace, Pelagius and his followers declared that they did not deny the necessity of grace; but by this name they did not understand any real and internal supernatural aid given by God in each particular action, but only either some general external assistance, such as preaching, the Scriptures, good example, &c., or an aid given which might facilitate and secure the particular work, but which was by no means necessary for its accomplishment. Whether, indeed, they at any time admitted any real internal grace, is a question much disputed. Grace is of two kinds—that which moves the will, and that which enlightens the understanding. It is necessary, too, to distinguish two periods in the history of P. —one before the appearance of the *Epistola Tractoria* of Pope Zosimus; the other, subsequent to that decree. In the first period, it would seem that the Pelagians did not admit the necessity of any internal grace whatever; in the latter, they admitted the necessity of a grace of the intellect, but not of the will; or if they seemed to speak of any internal grace of the will, it was only as facilitating man's act, not as at all necessary to his doing it.

The Pelagian theory, in a word, was that man, as coming from his Creator's hand, possessed in himself, and as constituents of his own nature, all the powers which are necessary for the attainment of salvation; that by the faithful employment of these natural powers, without any further aid whatever from God, he merits eternal life, and all other rewards, by a strict title of justice; and that, to suppose grace to be necessary, is in truth to destroy the essence of free-will. This doctrine was somewhat modified in the Semi-Pelagian System (q. v.). The Catholic schools, all without exception, maintain the necessity of grace for the performance, not only of all meritorious, but of all supernatural good works; and they are equally unanimous in maintaining that the grace so given, even that which is called 'efficacious,' does not destroy the freedom of the will. They distinguish between the 'natural' and the 'supernatural' order, and between the powers and gifts which are proper to the one and to the other. For the attainment of all the ends of the natural order, man possesses, by his very constitution, all the powers and all the gifts which are necessary; and by the proper use of these powers, he is able to merit all the rewards which belong to the natural order. He is able, therefore, without any supernatural grace, to perform morally good works (as acts of natural benevolence, the fulfilment of the ordinary duties to his neighbor, &c.), and to fulfil the purely natural obligations. But in order to works in the supernatural order (such as the love of God above all things for His own sake, faith in Him as the author of all good, &c.), and the rewards which are promised for such works, the will of man must be moved and strengthened by supernatural grace, with which the will freely co-operates, but which is a purely gratuitous gift of God—so purely gratuitous, that although God has promised eternal life as the reward of man's co-operation, yet the merit arises entirely from God's gift and promise, and not from the natural powers of the human will.

Without going into the details of the teaching of the Catholic schools, it will be enough to particularize the most remarkable among them. Of these, the chief are the Molinist, which, giving most to liberty, lies nearest to the border of P., but is clearly distinguished from it by maintaining the necessity of grace for every supernatural act; and the Thomist and Augustinian, which give

most to grace, but at the same time expressly preserve the freedom of man's will. The Thomists are often represented as denying the freedom of man's actions under grace; but although it is difficult to explain, in popular language, their method of reconciling both, yet, to those acquainted with the scholastic terminology, their distinction between the infallible efficaciousness of grace, and its imposing necessity on the will, is perfectly appreciable. In this they, as well as the Augustinian school, differ from the Jansenists (q. v.). The Jansenists, indeed, regard the Molinist school as a plain revival of P., and they profess that they alone represent fully, in their own system, the very same position which St. Augustine formerly maintained against that heresy in its first origin.

In the Reformed Church, the Arminian doctrine may be said to correspond in the main with the Molinist system in the Roman Church. The Gomarists, in most, although not in all particulars, fall in with the Jansenistic views. The Pelagian views are distinctly represented in modern controversy by the Socinians and Rationalists; and indeed very many of those who, outside of the Roman Church, have at various times engaged in the predestinarian controversy on the side of free-will, have leaned towards, if they have not fully adopted, the Pelagian view. In this controversy, however, the practice, which is not uncommon in polemics, of imputing to an antagonist the extremest views of the particular side to which he leans, has been specially noticeable. The Jesuits have been stigmatized, even by their Catholic antagonists, as Pelagians; the Thomists are called by the Jesuits indiscriminately Jansenists and Calvinists; while both unite in representing Calvin and his school as in substance Manichæan.

Hardly one among the many Christian controversies has called forth a greater amount of subtlety and power, and not one has so long and so persistently maintained its vitality. Within the twenty-five years which followed its first appearance, upwards of thirty councils (one of them, the General Council of Ephesus) were held for the purpose of this discussion. It lay at the bottom of all the intellectual activity of the conflicts in the medieval philosophic schools; and there is hardly a single subject which has come into discussion under so many different forms in modern controversy. See JANSEN, ARMINIUS, GRACE, PREDESTINATION, REPROBATION, ORIGINAL SIN, TRADUCIANISM.

PELA'GIUS, a celebrated heresiarch of the 5th c., author or systematizer of the doctrine known as PELAGIANISM (q. v.). Of his early life, little is known. He was probably born about or before the middle of the 4th c., in Britain, or according to some, in Bretagne, his name being supposed to be a Greek rendering (*Pelagios*, of or belonging to the sea) of the Celtic appellative *Morgan*, or sea-born. He was a monk, but the time and place of his entering that state are unknown; it is certain, however, that he never entered into holy orders. He settled in Rome, and at the end of the 4th c., he had already acquired a considerable reputation for sanctity and for knowledge of the Holy Scriptures and the spiritual life. P. does not appear to have himself been a very active propagandist; but he had attached to his views a follower of great energy, and a bold and ardent temper, named Celestius, who is generally supposed to have been a Scot, which, in the vocabulary of that age, means a native of Ireland. At Rome, however, they attracted but little notice, although they began to make their doctrine public about 405; and in 410, after the sack of the city by the Goths, they withdrew to Africa. After some time, P. made a pilgrimage to Jerusalem, were he met St. Jerome, and for a time enjoyed the regard and confidence of that eminent but hot-tempered scholar. His opinions, however, becoming known, Jerome withdrew from this association.

Celestius having remained at Carthage, and sought to be admitted to ordination, his doctrines became the subject of discussion, and in a synod several opinions ascribed to him were condemned. He appealed to Rome, but leaving Carthage without prosecuting the appeal, he passed to Ephesus; and the proceedings taken in Carthage regarding him are chiefly important as having first introduced St. Augustine into the controversy. Meanwhile P. remained at Jerusalem, and news of the proceedings at Carthage having been carried to Palestine, P., in 415, was accused of heresy before the synod of Jerusalem, by a Spaniard named Orosius. The impeachment failed, probably from the fact that Orosius was unable to speak Greek, the language of the synod; and in a synod subsequently held at Diospolis in the same year, P. evaded condemnation by accepting the decrees of the synod of Carthage already referred to, and even obtained from the synod an acknowledgment of his orthodoxy. The West, however, was more sharp-sighted or less indulgent. A synod of Carthage, in 416, condemned P. and Celestius, and wrote to Pope Innocent I., requesting his approval of the sentence, with which request Innocent complied by a letter which is still extant. On the death of Innocent, Celestius came to Rome in person, and P. at the same time addressed a letter to Josimus, the successor of Innocent; and in a council which Zosimus held, Celestius gave such explanations that the pope was led to believe that the doctrines of P. had been misunderstood, and wrote to call the African bishops to Rome.

A council of 214 bishops, however, was held in Carthage, in which the doctrines of P. were formally condemned in nine canons, which were sent to Rome with full explanations; and on receipt of these decrees, Zosimus re-opened the cause, cited and condemned Celestius and P., and published a decree, called *Epistola Tractoria*, adopting the canons of the African council, and requiring that all bishops should subscribe them, under pain of deposition. Nineteen Italian bishops refused to accept these canons, and were deposed. Their leader, and the person who may be regarded as the greatest theological advocate of P. in the ancient controversy, was the celebrated Julian, bishop of Eclanum, near Beneventum, who is well known to every reader of his great antagonist, St. Augustine. P. himself was banished from Rome, in 418, by the emperor Honorius. From this date P. disappears. Of his after-life, nothing is known in detail. Orosius gives an unfavorable account of his later career, but in a period of such excitement, we may not accept implicitly the judgment of an adversary. The controversy, considered as an exercise of intellectual energy, is the most remarkable in the ancient history of the church. But the most important of the writings on the Pelagian side have been lost. Julian is chiefly known through the replies of Augustine.

P.'s *Fourteen Books of a Commentary on St. Paul's Epistles*, his *Epistle to Demetrius*, and his *Memorial to Pope Innocent*, have escaped destruction probably from their being included by collectors in the works of St. Jerome. They are much mutilated, but yet almost certainly genuine. All his other works have been lost, except some further portions, chiefly fragmentary, which (with the above) have been published under the title of *Appendix Augustiniana*. After his banishment, P. is supposed to have returned to his native country, and to have died there. Others, however, represent him as having died in Palestine. Of his doctrines in detail, an account will be found under PELAGIANISM.

PELARGO'NIC ACID ($HO,C_{18}H_{17}O_3$) is one of the volatile fatty acids of the general formula $C_{2n}H_{2n}O_4$. It is an oily fluid, nearly insoluble in water, but soluble in alcohol and ether. It derives its name from its having been originally obtained from the leaves of *Pelargonium roseum* (see next article), by distilling them with water. It may also be obtained by the oxidation of oleic acid or of oil of rue by nitric acid. The pelargonate of oxide of ethyl, $C_4H_5O,C_{18}H_{17}O_3$, is an oily fluid of a very peculiar smell. According to Frankland, it is to this compound that old whisky owes its peculiar flavor; and its addition to new whisky, with a view of giving it an old flavor, is not uncommon.

PELARGO'NIUM, a genus of plants of the natural order *Geraniaceæ*, including many of the most favorite greenhouse flowers, to which the old generic name, *Geranium*, is often popularly given. The characters which distinguish P. from geranium, as now restricted by botanists, are given in the article GERANIUM. The species are numerous, and mostly South African; Australia also producing a few. Some of them are herbaceous, and some of them are stemless; most of them are half-shrubby. Some have tuberous root-stocks. The leaves exhibit great variety in form, division, &c. The flowers always adhere to a certain type in form, but with great variety in size, color, &c.; they are always in stalked umbels, which arise from the axils of the leaves or in the stemless kinds from the midst of the leaves. In no genus has the art of the gardener produced more striking results than in this; and the number of beautiful hybrids and varieties is very great, some of them excelling in beauty any of the original species. Some species, not possessing much beauty of flower, are cultivated for the grateful odor of their leaves, which in some resembles that of roses; in others, that of apples, lemons, &c.; whilst that of many species is rather unpleasant. The cultivation of Pelargoniums is similar to that of other *Geraniceæ*. See GERANIUM. A few of the species endure the open air in the south of England; many are planted out in summer even in Scotland. Water must be liberally supplied to pelargoniums during the time of flowering; but no plants more strongly require a period of rest, and water must then be very sparingly given. Many of the shrubby kinds may be taken out of the soil, hung up by the roots in a dry dark cellar, or covered with hay, and put aside in a box, in a cool dry loft or garret, care being taken however, to protect them from frost. Every leaf should be removed before they are taken up, and young watery shoots should be cut off.

Another method of treating them is to cut every leaf before frost comes, and to keep the plants all winter in their pots in a dry cool room, without giving them a drop of water. By such means, many of this beautiful genus are successfully cultivated by persons who have no greenhouse.

PELA'SGIANS, variously explained as denoting either 'Swarthy Asiatics' (*Pell-Asici*) or 'Storks' (*Pelargoi*)—significative of

wandering habits; or as being derived from the biblical *Peleg* (Gen. x. 25), from the Greek *Pelagos* (the Sea), *pelazo* (to approach), or *pelein* and *agros* (to till the field), &c.—'a name, in fact,' as Niebuhr says, 'odious to the historian, who hates the spurious philology out of which the pretences to knowledge on the subject of such extinct people arise'—designates a certain tribe or number of tribes who inhabited Italy, Thracia, Macedonia, a part of Asia Minor, and many other regions of Southern Europe, in prehistoric times. Ethnologically, they belong to the same race as the great stock of the earliest known settlers, that reached from the Po and the Arno to the Rhyndakus (near Kyzikus). Yet no Pelasgian town or village existing in Greece Proper after 776 B.C., speculation has, ever since the commencement of European historiography, been busy trying to supply the facts that were wanting to ascertain the exact origin and history of these predecessors of the Hellenes and Romans; and so futile have all efforts in this direction remained, that the very term Pelasgi has, from the days of Homer to our own, been used almost arbitrarily to designate either a single obscure division of a tribe like the Leleges and the Dolopes, or as equivalent for all the Greeks of a very early period.

In this latter sense, they are spoken of by Æschylus, Herodotus, Homer; while they are considered one of the branches of the race or races that peopled Greece, by Thucydides, Strabo, and most modern writers, the word thus not being a comprehensive term, like Arian, but a narrowly circumscribed one, like Hiudu. Recent investigation seems, as regards their previous history, to lead to the result, that soon after the first immigration of Turanians, they, like other tribes, left their Asiatic homes, and proceeded towards Europe. They are found at a very early period settled in Asia Minor; and Homer speaks of them as allies of the Trojans. They then seem to have spread themselves, by way of the Propontis and Ægæan, and again by Crete, over many of the islands between the two continents; and finally, came to occupy a great part of the Hellenic mainland—Thessaly, Epirus, the Peloponnese, Attica, Macedonia, Arcadia, provinces which, one and all, up to the latest period, bore distinct traces of the once undisputed sway of the Pelasgians. According to Herodotus, the Hellenes themselves sprang from them; and there can hardly be a doubt that they formed a most important element in the formation as well of that most gifted of nationalities, as of the Latin people. The early Etruscans (q. v.) were P. to a certain extent; and the southern tribes of the Peucetians, Œnotrians, and Iapygians are distinctly declared by ancient writers to belong to their race. The step from Greece into Italy is natural enough. What caused their wanderings originally, is difficult to conjecture; but it may not unreasonably be assumed, that they were caused to a certain extent by immigrations of eastern tribes, such as the Lydians, Phrygians, Carians, who pushed them further and further west, as they took possession of their old homes.

A special stock was formed by the Tyrrhenian Pelasgi, whose gradual advance in Greece may be traced from Acarnania to Bœotia, thence to Attica, and later still, to the Hellespont, Lemnos, &c. A strong protest, however, must be recorded here on the part of some modern writers against the assumption of others, that the P. were in reality the original population of all Italy, as they were of the greatest part of Greece (Pelasgia.) It is absurd, they argue, to suppose that a rich and populous nation, which had held a country like Italy for many centuries, should suddenly, just at the approach of historical times, die out without leaving even such single remnants as the Pelasgic settlements in Greece mentioned by Herodotus. These aboriginal Italian P. are, according to them, neither more nor less than a mere hypothesis of ignorant ancient writers, who wished to explain the ethnological and philological affinity between the two classical nations in an easy manner, and who, anticipating the questions about a contemporary colony, kill the whole nation off by pestilence and famine.

The Pelasgians, from what we can glean about them, would appear to have been a highly intellectual, receptive, active, and stirring people, of simple habits withal, chiefly intent upon agricultural pursuits. Several improvements in this province were distinctly traced back to them, such as the ploughing with oxen —for which purpose they had to invent the special goad; further, the art of surveying, and the like. Yet they were no less warlike when attacked and driven to self-defence; and the trumpet, which calls the widely scattered troops to the attack, was supposed to have been first used by them. That the art of navigation was well known to them, is shown sufficiently by their incessant migrations over sea and land. Of their architecture, in that style which, in default of a better name, has been called Cyclopean (q. v.), remnants are still existing.

The names Larissa, Argos, Ephyra, frequently met in ancient Greece, were bestowed by them upon their fortified cities, and are only generic names, expressive of either mountain fortresses or strongholds in plains. Wishing to remain in peace, they endeavored to keep off the invader by walls so enormously strong, that it really seems most surprising how they ever could have been taken. Besides these, they built canals, dams, and subterranean water-works of astonishing strength and most skilful construction. The accompanying woodcut represents the tomb or

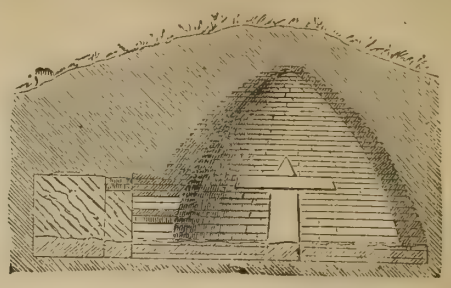


Fig. 1.—Section of Tomb of Atreus at Mycenæ.

treasury of Atreus at Mycenæ, vaulted with a fine pointed 'horizontal arch,' 48½ feet in diameter. Of their sculpture, which they no doubt likewise cultivated to a certain degree, we have but very small relics, such as a head of Medusa, and a *Xoanon* (Divine

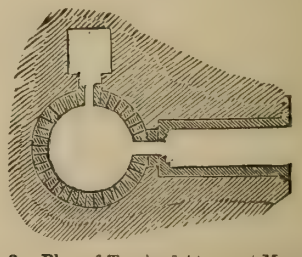


Fig. 2.—Plan of Tomb of Atreus at Mycenæ.

Image) of Orpheus; besides these, certain traces of their special mystic worship are to be found in the archaic representations, which, though not hitherto ascribed to them, bear their direct influence upon their very face. How far they were either the inventors of the so-called Cadmean or Phœnician writing-characters, from which all European characters are derived, or merely their 'improvers,' is not to be decided by the contradictory evidence to be found on the subject: but this, at all events, is certain, that they were acquainted with the art of writing, and had thus a vast element of culture in their possession before the dawn of history.

Respecting their religion and worship, there is this only to be held with certainty, that it originally consisted in a mystic service of those natural powers, whose influence is chiefly visible in the growth of the fruits of the earth. From Egypt they obtained names for their till then nameless gods, generally called by them the Theoi; and they proceeded—by permission of the Dodonic oracle, which, together with the Pythian, they first founded—to bestow them upon them individually. Their deities were, besides the Phœnician Kabiri, Demeter, Persephone Kora, Dionysos, Hermes, Zeus of Dodona, Apollo, Hephæstus, Themis, Pan, &c. Whether those P. who inhabited Lemnos and Imbros, and who were conquered by Darius, offered up human sacrifices or not, is doubtful. An ambiguous term of Herodotus respecting the language of those small Pelasgian remnants who had survived to his day, has given rise to endless and most unsatisfactory discussions. He speaks (i. 57) of their 'barbarous language;' and the question is, whether he meant that it completely differed from Greek, or that there was only so vast a divergence of dialect, that it had become unintelligible to his contemporaries. Grote inclines to the former opinion; Niebuhr, Thirlwall, T. O. Müller, followed by G. Rawlinson and others, hold, with more apparent show of reason, that the term 'barbarous language' merely indicates a corruption or alteration of idiom, such as a long lapse of time will infallibly produce, and that it bore the same relation to the Greek of the day as the Gothic does to the German, or the Latin to any of the Romance languages, not to instance the forlorn patois of out-of-the-way places in Switzerland and elsewhere, supposed to be inhabited by unmixed descendants from Roman legions.

That other phenomenon of the vast number of roots common both to Greek and Latin—the latter, it must be remembered, having been proved to be derived, not from the former, but from the Oscan—would thus easily be explained by the assumption of a common Pelasgian linguistic (as well as ethnical) stock in both nationalities.

Their political circumstances are as unknown to us as the whole process of transition between them and the real Greek period. From a few scattered allusions, we may conclude that they were not uniformly governed; that some of their multifarious tribes

were ruled by priests, while others stood under the patriarchal rule of the head of the clan or family.

How they gradually disappeared from the rank of nations, by being either 'absorbed' by superior races (Hellenes, Italici, Carians, Lydians, Phrygians), or being reduced to nameless serf-populations, does not seem so difficult to understand as some writers would have it. Hundreds of nations have disappeared in the same manner, and we may even watch the process with our own eyes. Interesting as it might be to dwell more minutely on some of the widely divergent theories and speculations upon the P. on the part of historians, phiologists, ethnologists, antiquaries, and investigators generally, to whom, at all times, this people proved exceedingly attractive, we cannot enter any further upon them here, but we shall conclude with Grote's dictum: 'If any man is inclined to call the unknown ante-Hellenic period of Greece by the name of Pelasgic, it is open to him to do so. But this is a name carrying with it no assured predicates, noway enlarging our insight into real history, nor enabling us to explain what would be the real historical problem—how, or from whom, the Hellenes acquired that stock of dispositions, aptitudes, arts, &c., with which they begin their career.'

PELA'YO, said by historians to have been the first Christian king in Spain, after the conquest of that country by the Arabs. Contemporary historians make no mention of him, but this may be accounted for on the ground of the insignificant size of his kingdom, which comprised only the mountainous district of Asturias. He is said to have been a scion of the royal Visigothic line, and to have retired before the conquering Arabs to the mountains of Asturias, where he maintained himself against the armies which were sent to attack him, defeating them in various pitched battles, and in numberless minor engagements. One of his most famous exploits was the destruction of a large army sent against him by Tarik, near Cangas-de-Onis. His men were posted on the heights bounding the valley through which the Arabs were to pass, and waiting till the enemy had become involved in the defile, at a given signal, overwhelmed them with enormous masses of rock. This great success caused P. to be recognized as sovereign by the surrounding districts, and the Christians flocked to him from all parts of Spain. He was much engaged in contests with the Arabs, but nevertheless found time to reanimate agriculture, superintend the reconstruction of churches, and the establishment of a civil administration. He died in 737. Such is the account given us by later historians, who trace from him the genealogy of the royal family of Spain.

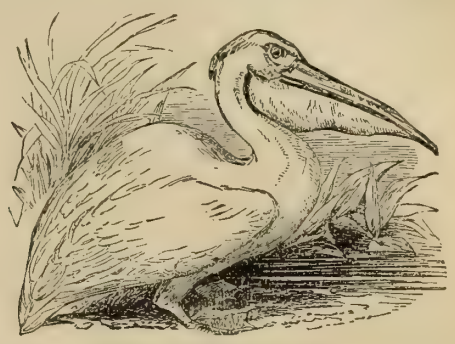
PELECA'NIDÆ, a family of palmiped birds, the *Totipalmati* of Cuvier; characterized by a long, straight, compressed bill, broad at the base, often with a pouch beneath the lower mandible; long wings, of which the first quill is the longest; short strong legs, and all the toes—including the hind toe—united by a membrane. They are generally excellent swimmers, expert divers, and birds of powerful flight. Some of them often perch on trees, which few other web-footed birds do. To this family belong pelicans, cormorants, frigate-birds, tropic-birds, and darters.

PELEW' ISLANDS, a group of islands in the North Pacific Ocean, belonging to Spain, 450 miles east of the Philippines, in lat. 7°—8° 30' N., long. 134°—136° E., at the western extremity of the Caroline Archipelago. The group includes about 20 islands, which form a chain running about 120 miles from south-south-west to north-north-east. The principal island is Babelthouap. 28 miles by 14, containing a mountain from whose summit a view of the whole group is obtained. As seen from the sea, the islands appear mountainous and rugged; but the soil is rich and fertile, and water is abundant. Bread-fruit, cocoa-nuts, bananas, sugar-cane, lemons, oranges, and other tropical trees and fruits, are grown. Cattle, fowls, and goats thrive, and fish abound on the coasts. The inhabitants, who are estimated at about 10,000 in number, are of the Malay race. They show considerable ingenuity in building their canoes, are active agriculturists, and entertain exceedingly primitive notions regarding dress, as the men go entirely naked and the women nearly so.

In 1783, the *Antelope* was wrecked upon the P. I., and the crew were treated by the natives with the greatest kindness. Further acquaintance with white men, however, seemes to have altered their disposition, and several vessels, while visiting these islands, within comparatively recent years, have narrowly escaped being cut off. The islands are said to have been discovered by the Spaniards in 1545.

PE'LICAN (*Pelecanus*), a genus of birds of the family *Pelecanidæ* (q. v.), having a very long, large, flattened bill, the upper mandible terminated by a strong hook, which curves over the tip of the lower one; beneath the lower mandible, which is composed of two flexible bony branches meeting at the tip, a great pouch of naked skin is appended; the tongue is very short, and almost rudimentary; the face and throat are naked; the wings of moderate length, the tail rounded. The species are widely distributed, frequenting the shores of the sea, lakes, and rivers, and feeding chiefly on fish. Although birds of powerful wing, they are seldom seen at a great distance from land. All of them are birds of large size. They take their prey by hovering over the water, and plunging upon it when it appears. They often fly in large flocks, and the sudden swoop of a flock of pelicans at a shoal of fish is a striking and beautiful sight. They store up their prey in their pouch, from which they bring it out at leisure, either for their own eating, or to feed their young. The pouch is capable of being wrinkled up into small size, and of being greatly distended.

The COMMON P. (*P. onocrotalus*) is as large as a swan, white, slightly tinged with flesh color, and in old birds, the breast golden yellow. The quill-feathers are black, but are scarcely seen except when the wings are expanded. It is a native of the eastern parts of Europe, and of many parts of Asia and Africa, and frequents both the sea-coast and also rivers and lakes. It makes a nest of



Pelican (*Pelecanus onocrotalus*).

grass on the ground in some retired spot near the water, often on an island, and lays two or three white eggs. The parents are said to carry water to their young, as well as food, in their pouch. During the night, the P. sits with its bill resting on its breast. The nail or hook which terminates the bill is red, and Mr. Broderip supposes that the ancient fable of the P. feeding its young with blood from its own breast has originated from its habit of pressing the bill upon the breast, in order the more easily to empty the pouch, when the red tip might be mistaken for blood. —The RUFOUS-NECKED P. (*P. fuscus*) abounds in the West Indies and in many parts of America. Other species are found in other parts of the world, and in some places the number of pelicans is prodigious, particularly in some of the most southern parts of the world.

In Heraldry, the Pelican is drawn with her wings endorsed, and wounding her breast with her beak. When represented in her nest feeding her young with her blood, she is called a pelican *in her piety*.



Pelican, in Heraldry.

PE'LION, the ancient name of a wooded mountain range in Thessaly, extending along the east coast. Its eastern side descends in steep and rugged precipices to the sea. Further to the north, near the mouth of the Peneus, is the steep conical peak of Ossa (q. v.), which, according to the classic myth, the Titans placed upon the summit of P., in order to scale Olympus, the abode of the gods. The modern name is Zagorá, and as of old, its sides and summit are clothed with venerable forests of oak, chestnut, beech, elm, and pine.

PELISSIER, AIMABLE JEAN JACQUES, Marshal of France, Duc de Malakhoff, born in 1794 at Maromme, near Rouen. His father was a small farmer, little above the degree of a peasant. P. was first sent to the Lyceum at Brussels. At twenty, he gained admission to the celebrated French Artillery college of La Flèche, and was soon transferred to the special school of St. Cyr. He entered the artillery of the Royal Guard as sub-lieutenant in 1814, and being transferred to the 57th Regiment of the line, which was not called upon to do duty after the return of Napoleon from Elba, he escaped the dilemma of declaring either for or against the Emperor. He served on the staff in Spain in 1823; made the campaign of the Morea in 1828; joined the first expedition to Algiers in 1830 as major of cavalry; and in 1839 returned to Algeria with the rank of lieutenant-colonel. He commanded the left wing of the French army at the battle of Isly. In 1845, he acquired an unenviable notoriety by suffocating more than 500 Arabs who took refuge in the caves of Ouded-Riah in the Dahra. Marshal Soult, then Minister of War, did not venture to approve this atrocity, but Marshal Bugeaud, commander-in-chief in Algeria, declared that P. only carried out his positive orders. By 1850, he had attained the rank of General of Division.

When the news of the *coup d'état* reached Algiers, he espoused

the cause of the emperor, and placed the province of Algiers under martial law until order was restored. In the war with Russia, he obtained in 1855 the command of the first corps of the Crimean army, and soon succeeded Marshal Canrobert in the chief command, when a change came over the fortunes of the campaign. The Russians were defeated on the Tchernaya, and on the 8th September the Malakhoff, the key of Sebastopol, was carried. After the fall of Sebastopol, P. received a marshal's baton, and on his return to France, was created Duc de Malakhoff and a senator, and received a dotation of 100,000 francs. He also received the order of a G.C.B. from Queen Victoria. In 1858, he came to London as the French ambassador, but resigned his post, for which he had little relish, in the following year. He was then named Governor-general of Algeria, where he died (May 1864) of congestion of the lungs.

PE'LLA, the ancient capital of Macedonia, and the birthplace of Alexander the Great, was situated on a hill, and surrounded by marshes. It was a wealthy and powerful city, but declined under the Romans until it became a place of no consequence, and in the middle ages there remained only a strong castle called *Bodena*. Its site has been identified with that of the village of *Neokhori* or *Yenikiuy*, near which is a spring called Pelle.

PE'LLAGRA, at one time, the name of a loathsome skin-disease, supposed to be endemic to the rice-producing part of the north of Italy, is now employed to designate a group of phenomena, of which the most prominent and significant are mental. Allied affections have recently been described in various continental countries; but as presented in its most intense form in Lombardy, pellagra consists in the skin being covered with tubercles and rough scales, in debility, vertigo, inability to preserve the equilibrium, epilepsy, and great depression of spirits. The melancholia which constituted the latter stage often led to suicide, and so frequently to destruction by drowning, that it was distinguished as a special form of the tendency by the appellation of Hydromania. The extent of the ravages of this affection may be estimated from the facts, that of 500 patients in the Milan Lunatic Asylum in 1827, one third were pellagrins; that when Strambio wrote (1784), one of every twenty, and when Holland (1817), one of every five or six of the population presented symptoms of the disease. The belief, so long current, that this malady was the result of the use of rice or maize as the chief article of diet, must now be greatly modified, as it has been observed in districts and under circumstances where the food is of different description; but where poverty, insufficient nourishment, filth, toil, and the ordinary agents in human degeneration are at work.

PELLESTRI'NA, a town of N. Italy, in Venetia, near the center of an island of the same name, 12 miles south of Venice. Pop. 7500.

PE'LLET, or OGRESS, in English Heraldry, a Roundle (q. v.) sable.

PE'LLICO, Silvio, an Italian poet, celebrated for his long and cruel imprisonment by the Austrians, more, perhaps, than for his verses, was born in 1788 at Saluzzo, in Piedmont, and was educated in Pignerol, where his father, Onorato Pellico, also favorably known as a lyric poet, had a silk-factory. In his 16th year, he accompanied his sister Rosina (on her marriage) to Lyon, where he remained until Foscolo's *Carme de' Sepolcri* awakened in him a strong patriotic feeling and an irresistible desire to return to Italy. Coming, about 1810, to Milan, where his family were now settled, he was warmly received by Ugo Foscolo and Vincenzo Monti, and was employed as tutor in the family of Count Porro, in whose house all the most distinguished men in Milan were accustomed to meet. His tragedies of *Laodamia* and *Francesca da Rimini* gained him an honorable name amongst Italian poets. He also translated the *Manfred* of Byron, with whom he had become acquainted. He lived in great intimacy with the most eminent patriots and authors of liberal views, and took an active part in a periodical called *Il Conciliatore*, which after a time was suppressed on account of its liberal tone. Having become connected with a secret society of the Carbonari, then the dread of the Italian government, P. was apprehended in 1820, and sent to the prison of Sta. Margherita, where his friend, the poet Maroncelli, was also confined. In the beginning of the following year, he was carried to Venice, and in January 1822, to the prison on the isle of San Michele, near Venice; and Maroncelli and he were at last condemned to death; but the emperor commuted the sentence to 20 years' imprisonment for Maroncelli, and 15 years for Pellico. In March 1822, they were both conveyed to the subterranean dungeons of the Spielberg. In August 1830, however, they were set at liberty. P. published an account of his sufferings during his ten years' imprisonment, under the title *Le mie Prigioni* (Paris, 1833), which has been translated into other languages, and has made his name familiar where it would not have been known on account of his poetry. P.'s health, never robust, was permanently injured. The Marchioness of Barolo received him into her house at Turin as her secretary. P. subsequently published numerous tragedies and other poems, and a little catechism on the duties of man. His death took place January 31, 1854.

PE'LLITORY, or PELLITORY OF THE WALL (*Parietaria*), a genus of plants of the natural order *Urticeæ*, having both unisexual and hermaphrodite flowers on the same plant, the perianth of both kinds 4-fid. The Common P. (*P. officinalis*), which grows on old walls and heaps of rubbish in Britain and many parts of Europe and Asia, is a herbaceous perennial, with prostrate branched stems, more rarely with erect stems, ovate leaves, and inconspicuous flowers. It sometimes attracts attention from the manner in which the pollen is copiously discharged in hot summer days by an elastic movement of the filaments. It was formerly much esteemed as a diuretic, refrigerant, and lithontriptic. Its properties depend on nitre, which it contains.

PE'LLITORY OF SPAIN (*Anacyclus pyrethrum*), a plant of the natural order *Compositæ*, of a genus nearly allied to Chamomile (q. v.), a native of the Levant and of Barbary, and cultivated to some extent in Germany and other countries. It has procumbent, branched, downy stems; each branch one-flowered; the root-leaves pinnate, with pinnatifid segments and linear-subulate lobes. The flowers (heads of flowers) have a white ray, purplish beneath, and a yellow disc. The root is spindle-shaped and fleshy, and when dried, is about the thickness of the little finger, inodorous, breaking with a resinous fracture.

It has a very peculiar taste, slight at first, but becoming acidulous, saline, and acrid, with a burning and tingling sensation in the mouth and throat, which continues for some time. It is valued in medicine, and is chewed or administered in the form of a tincture to relieve toothache, also in cases of paralysis of the tongue, as a sialogogue in certain kinds of headache, and of rheumaitc and neuralgic affections of the face, and is used as a gargle in relaxation of the uvula. The powder of it enters into the composition of certain cephalic snuffs, and is rubbed on the skin in certain eastern countries to promote perspiration. It is the *Radix pyrethri* of the pharmacopœias. It is a powerful local irritant. The plant cultivated in Germany has more slender roots than that of the Levant, and has sometimes been described as a distinct species (*A officinarum*), but is probably a mere variety.

PELLS, Clerk of the (Lat. *pellis*, a skin), a clerk belonging to the Court of Exchequer in England and Ireland, whose office was to enter every teller's bill into a parchment or skin, called *pellis receptorum*, and also to make another roll of payments, which was called *pellis exituum*, and which showed the warrant under which the money was paid. The office was abolished in 1834 by the statute 4 and 5 Will. IV. c. 15, which transferred the duties to the comptroller-general, who thereupon assumed the custody of the records; and the Treasury thereafter established new forms of books, accounts, and warrants.

PELO'PIDAS, a celebrated Theban general, of noble descent, noted among his fellow-citizens for his disinterested patriotism. The inviolable friendship between himself—one of the richest men in Thebes—and Epaminondas—one of the poorest—is among the most beautiful things recorded in Greek history. In 382 B.C. he was driven from Thebes by the oligarchic party, who were supported by the Spartans, and forced to seek refuge at Athens, whence he returned secretly with a few associates, 379 B.C., and recovered possession of the Kadmeia, or citadel, slaying the Spartan leader, Leontiades, with his own hand. Plutarch gives us a vivid picture of the adventurous exiles gliding quietly in disguise into the city on a winter afternoon, amid bitter wind and sleet. Having been elected Bœotarch, in conjunction with Melon and Charon, he set about training and disciplining his troops, so that they soon became as formidable as the Lacedæmonians, and were successful in several small encounters with the latter. His 'sacred band' of Theban youth largely contributed to the victory of Epaminondas at Leuctra (371 B.C.), but failed in a subsequent attack on Sparta itself. In the expedition of the Thebans against the cruel tyrant, Alexander of Pheræ (368 B.C.), he was, after several important successes, treacherously taken prisoner, when in the character of an ambassador; but was rescued by Epaminondas in the expedition of the following year. He was then sent to Susa, as ambassador from Thebes, to counteract the Spartan and Athenian intrigues going on at the court of Persia, and behaved himself very nobly while there. His diplomacy was successful. In 364 B.C., a third expedition was planned against Alexander of Pheræ, who, as usual, was threatening the Thessalian towns. The command was given to P., and in the summer he marched into Thessaly, where he won the battle of Kynoskephalæ, but was himself killed while too eagerly pursuing the foe. He was buried by the Thessalians with great pomp.

PELO'PIUM was the name given, about the beginning of the present century (1802), by Rose to a new metal which he thought

he had discovered in the mineral Columbite. It was subsequently ascertained that it was identical with Niobium.

PELOPONNE'SIAN WAR. See GREECE.

PELOPONNE'SUS (i. e., the isle of Pelops), now called the Morea (q. v.), a peninsula, which formed the southern part of ancient Greece, Hellas Proper being situated to the northward of the isthmus, on which stood the city of Corinth. See GREECE. The whole area is less than 9000 square miles. In the most flourishing periods of Grecian history, the P. had a population of more than two millions, although at present it has little over half a million. Among its most important cities were Sparta in Laconia, and Argos the capital of Argolis. Sparta acquired, after the Messenian War, a decided supremacy over the other states, and disputed the supremacy with Athens in a war of almost thirty years duration (431—404 B.C.)—the famous 'Peloponnesian War,' of which the history has been written by Thucydides. After the Roman conquest, the P. formed part of the province of Achaia, and subsequently belonged to the Byzantine empire. For its later history, see MOREA.

PE'LOPS, in Greek Mythology, the grandson of Zeus, and the son of Tantalus was slain by his father, and served up at an entertainment which he gave to the gods, in order to test their omniscience. They were not deceived, and would not touch the horrible food; but Ceres, being absorbed with grief for the loss of her daughter, ate part of a shoulder without observing. The gods then commanded the members to be thrown into a cauldron, out of which Clotho brought the boy again alive, and the want of the shoulder was supplied by an ivory one. According to the legend most general in later times, P. was a Phrygian, who being driven by Ilos from Sipylos, came with great treasures to the peninsula, which derived from him the name of Peloponnesus, married Hippodamia, obtained her father's kingdom by conquering him in a chariot-race, and became the father of Atreus, Thyestes, and other sons. But in what appear to be the oldest traditions, he is represented as a Greek, and not as a foreigner. He was said to have revived the Olympic games, and was particularly honored at Olympia.

PELTRY, a general term applied to the trade in skins of wild animals, and to the skins themselves. It is understood to mean only skins undressed, except by drying, and chiefly those which, when dressed, are called furs, and it is especially applied to the produce of the North-western Territory (Hudson's Bay Territory) of British North America, although all others are included. The following table will show the kind of skins meant, and the vast destruction of animal life which is necessitated by this valuable branch of commerce.

The number and kinds of skins sold at the Hudson Bay Company's sales in 1872 were as follows:

Beaver	903,371
Otter	13,781
Sea Otter	59
Fur Seal	10,796
" " salted	1,029
Hair seal	3,118
Musquash	124,563
Fox, Silver	540
" Cross	2,027
" Red	7,699
" White	2,804
" Blue	36
" Kitt	3,792
Fisher	7,059
Marten	59,107
Mink	39,226
Ermine	2,958
Skunk	2,621
Wolverine	1,656
Lynx	7,926
Wolf	2,790
Raccoon	3,878
Badger	1,862
Bear	8,415
American Rabbit	3,070
Musk Ox	44
American Deer	9,032
American Goat	188
Squirrel	643
Weenusk	130
Hare	126
Panther	5
Swan	317
Loon	12

Besides these there were imported in the same year the following, chiefly for the purpose of being tanned or otherwise dressed as leather, or already prepared.

Various skins, the animals' names not given,	8,643,360
Goat and Kid, dressed and undressed	5,737,320
Sheep and Lamb, do. do.	11,043,086

The total value of these was £3,629,848. The value of skins and furs imported in 1880 was £4.359,775.

The pelts of many animals in their original state do not appear well fitted for decorative or even ordinary apparel, but the art of the furrier changes them greatly. The recent discovery, that the long hairs which project over the fine under-fur of many species, are also deeper rooted in the skin, has given rise to an easy and admirable method of removing them very completely. The pelts are stretched and passed through a paring-machine, which pares the flesh-side with such nicety that it takes off a thin layer, and cuts only through the roots of the coarse, deep-seated hairs, which are consequently easily shaken or brushed out. In this way, and by dyeing the fur, beautiful imitations of the costly seal-skins, &c., are prepared from musquash, hare, and other common pelts.

PELU'SIUM, the Greek name of an ancient Egyptian city, situated at the north-eastern angle of the Delta, and important as the key of Egypt on the Asiatic side. The eastern mouth of the Nile derived from it the epithet Pelusian (*Ostium Pelusiacum*). P. is called *Sin* in the Old Testament; and both words, as well as the native Coptic or Egyptian name *Peremoun*, or *Peromi*, signify the mud-city. The *Ostium Pelusiacum* was choked up with sand as long ago as the 1st c. B.C., and its distance from the sea has ever since been increasing. P. appears to have originally borne the name of Anaris, or Abaris. It is so called by Manetho, who attributes its foundation to the Hyksos about 2000 B.C.; but it first figures in semi-authentic history as the scene of Sennacherib's defeat, when (according to the Egyptian tradition, as reported by Herodotus), the camp of the Assyrians was invaded at night by a host of field-mice, who gnawed their bowstrings and shield-straps, so that in the morning, when the Egyptians fell upon them, they were defenceless. For the Hebrew account of Sennacherib's defeat see 2 Kings, chaps. 18 and 19. In 525 B.C., Cambyses overthrew, near P., the forces of Pharaoh-Psammetichus. The city was also taken by the Persians in 309 B.C.; and in 173 B.C., it was the scene of the defeat of Ptolemy Philometor by Antiochus Epiphanes. Mark Antony captured it, 55 B.C., and it opened its gates to Octavian after his victory at Actium, 31 B.C. Its later history is unimportant, and its ruins—at *Tineh*, near Damietta—possess little interest.

PE'LVIS, THE (from the Latin *pelvis*, a basin), is a bony ring interposed between the spinal column and the lower extremities, so as to transmit the weight of the former to the latter. Before considering the pelvis as a whole, it will be expedient to consider the individual bones of which it is composed. These, in the adult, are four in number, viz., the two ossa innominata which constitute its sides and front, and the sacrum and coccyx, which complete it behind. The *os innominatum* receives its name from its bearing no resemblance to any known body, and is a large, irregular-shaped bone. In the young subject it consists of three separate bones, which meet and form the cup-shaped cavity (the *acetabulum*), situated a little below the middle of the outside of the bone, and in which the head of the thigh-bone rests. Hence it is usual to describe this bone as consisting of the ilium, the ischium, and the pubes. The *ilium* is the superior, broad, and expanded portion which forms the prominence of the hip, and articulates with the sacrum. This bone may be described as divisible into an external and an internal surface, a crest, and an anterior and posterior border. The external surface (see fig. I.) is convex in front, and concave behind; it is bounded above by the crest, below by the upper border of the acetabulum (see fig. II.), and in front and behind by the anterior and posterior borders. It presents various curved lines and rough surfaces for the attachment of the *glutæi* and other powerful muscles connecting the pelvis and the lower extremities. The internal surface, which is smooth and concave, has the same boundaries as the external, except inferiorly, where it terminates in a prominent line, termed the *linea ilio-pectinea*. The surface of the crest is convex, roughened, and sufficiently broad to admit of the attachment of three planes of muscles. The borders will be sufficiently understood by a reference to fig. I.

The *ischium* is the inferior and strongest portion of the bone. It consists of a thick and solid portion, the *body* (whose inferior border is termed the *tuberosity*), and a thin ascending portion, the *ramus*. In the ordinary sitting position, the whole weight of the body rests on the ischium; and by sitting on the hands, we can usually feel the part (the *tuborosity*, see fig. I. 15) through which the weight is transmitted. The *pubes* is that portion which runs horizontally inwards from the inner side of the acetabulum for about two inches and then descends obliquely outwards for about the same length, thus making an acute angle with its original di-

rection. The former part is called the *body*, and the latter the *ramus*, of the pubes. The ramus is continuous with the ramus of the ischium. Between the ischium and pubes is a large aperture, known as the *thyroid* or *obturator foramen*, which in the living body is closed by a membrane termed the *obturator ligament*. The object of this large foramen is probably to give lightness to the parts, without materially diminishing their strength.

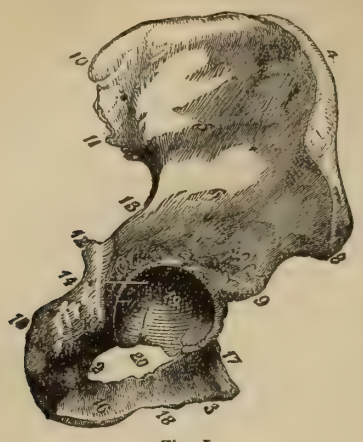


Fig. I.

The Os Innominatum of the right side.

1, the ilium, its external surface ; 2, the ischium ; 3, the os pubis; 4, the crest of the ilium; 5, 6, upper and lower curved lines for attachment of muscles; 7, the surface for attachment of the glutæus maximus; 8, 9, the anterior superior and inferior spinous processes; 10, 11, the posterior spinous processes; 12, the spine of the ischium; 13, 14, the greater and lesser sacro-ischiatic notches; 15, the tuberosity of the ischium; 16, its ramus; 17, the body of the os pubis; 18, its ramus; 19, the acetabulum; 20, the thyroid or obturator foramen.—(From Wilson.)

The development of the os innominatum affords an excellent example of the general principles laid down in the article OSSIFICATION. There are no less than *eight* centers of ossification for this bone: three primary—one for the ilium, one for the ischium, and one for the pubes—and five secondary ones for various processes, &c. The first center appears in the lower part of the ilium, at about the same period that the development of the vertebræ commences, viz., at about the close of the second month of fœtal life; the second in the body of the ischium, just below the acetabulum, at about the third month; and the third in the body of the pubes, near the acetabulum, during the fourth or fifth month. At birth, the crest of the ilium, the bottom of the acetabulum, and the rami of the ischium and pubes, are still cartilaginous. At about the sixth or seventh year, these rami become completely ossified; next, the ilium is united to the ischium; and lastly, the pubes is joined to the other two in the acetabulum. The complete ossification of the bone, from the secondary centers in the crest of the ilium, the tuberosity of the ischium, &c., is not completed till about the twenty-fifth year.

Each os innominatum articulates with its fellow of the opposite side (through the intervention of the *interosseous fibro-cartilage*, which unites the two surfaces of the pubic bones, see fig. II. *f*), with the sacrum, and with the femur (at the acetabulum). No less than thirty-five muscles are attached to this bone, some proceeding to the region of the back, others forming the walls of the abdomen, others forming the floor of the pelvis, others passing downwards to the lower extremities, &c. As the other bones entering into the formation of the pelvis, the sacrum, and the coccyx, belong essentially to the vertebral column, and will be described in the article on that subject, it is sufficient here to remark that, collectively, they form a triangular bony mass (with the base upwards, and with a concave anterior surface), which constitutes the posterior part of the pelvic ring. See fig. II., 4, 5.

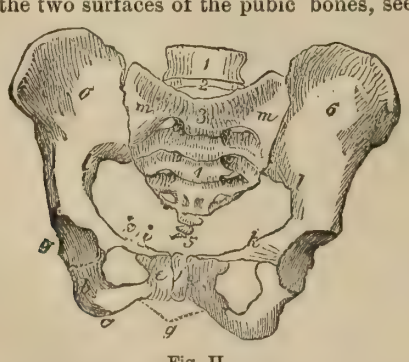


Fig. II.

Pelvis (with Fifth Lumbar Vertebra) of European Female Adult. Transverse diameter, 5·7; antero-posterior diameter, 4·5 inches.

1, the last lumbar vertebra ; 2, the inter-vertebral substance connecting it with the sacrum; 3, the promontory of the sacrum; 4, its anterior surface; 5, the coccyx; 6, 6, the iliac fossæ; 9, the acetabulum; *c*, the tuberosity, and *b*, the body of the ischium; *e*, the os pubis ; *f*, the symphysis pubis ; *g*, the arch ; *i*, the spine, and *k*, the pectineal line of the pubis; *k*, *l*, *k*, *l*, the ileo-pectineal lines.—(From Humphry.)

The pelvis, considered as a whole, is divisible into a false and true pelvis. The *false pelvis* is all that expanded portion which is bounded laterally by the iliac bones, and lies above the prominent line termed the *linea ileo-pectinea* (see fig. II. *k*, *l*); while the *true pelvis* is all that part of the general pelvic cavity which is situated below that line. The broad, shallow cavity of the false pelvis serves to support the weight of the intestines; while the rectum, bladder, and part of the generative organ, lie in the cavity of the true pelvis.

The upper aperture of the true pelvis is termed the *inlet*. It is somewhat heart-shaped in form, and has three principal diameters—an *antero-posterior* (or sacro-pubic), which extends from the angle formed by the sacrum with the last lumbar vertebra to the symphysis pubis, or point of union of the two pubic bones; the *transverse*, at right angles to the former, and extending across the greatest width of the pelvis; and the *oblique*, extending from the sacro-iliac symphysis (or union), on one side, to the margin of the brim corresponding with the acetabulum on the other. The diameters of the outlet are two—an *antero-posterior*, extending from the tip of the coccyx to the lower part of the symphysis pubis; and a *transverse*, from the posterior part of one ischiatic tuberosity, to the same point on the opposite side. As the precise knowledge of the diameter and depth of the pelvis is of the greatest importance in the practice of midwifery, we give the average numbers representing the dimensions of a well-formed adult female pelvis. *Diameters of inlet* or *brim*—antero-posterior, 4·4 inches; transverse, 5·4 inches; oblique, 4·8 inches. *Diameters of outlet*—antero-posterior, 5 inches; transverse, 4·3 inches. *Depth of the true pelvis*—posteriorly, 4·5 inches; in the middle, 3·5 inches; anteriorly, 1·5 inches.

The pelvis is placed obliquely with regard to the trunk of the body; the plane of the inlet to the true pelvis forming an angle of from 60° to 65° with the horizon. According to Naegele (*Ueber das weibliche Becken*), the extremity of the coccyx is in the female, when standing upright, about seven lines higher than the lower edge of the symphysis pubis; the upper edge of the symphysis being at the same level as the lower edge of the second segment of the coccyx. By attention to these data, a detached pelvis may readily be placed at the angle at which it normally lies in the skeleton. The shape of the human pelvis is much affected by the curving forward of the lower part of the sacrum. This bend of the sacrum forward serves to support the viscera, when the body is in an erect posture; but it is of much more importance in its relation to the act of parturition. If all the antero-posterior diameters of the true pelvis from the brim to the outlet were bisected, the points of bisection would form a curved line, similar to the curve of the sacrum, and termed the *axis* of the pelvis. As the head of the child has to follow this curve, the difficulties of parturition are much greater than if the axis of the pelvis had been straight, as in the other vertebrata. Without entering into unnecessary details, we may remark generally, that the fœtal head is of oval shape, with its greatest diameter from before backwards, and that in its passage through the pelvis it is so placed that its longest diameter at each stage of labor coincides with the longest diameter of the pelvis. The head enters the pelvis with the occiput (or back of the skull) being directed towards one ilium, and the face towards the other, while, at its final emergence, the face is turned towards the sacrum and coccyx. There can be no doubt that the screw-like or rotatory motion which is thus given to the fœtal head, renders its passage through the pelvis more easy than it would otherwise have been.



Fig III.

Pelvis, with two Lumbar Vertebræ, of a large Monkey. Transverse diameter, 2·7, and ant ro-posterior diameter, 3 inches.—(From Humphry.)

There are well-marked differences, chiefly having reference to the act of parturition, between the male and female pelvis. In the female, the bones are lighter and more delicate than in the male, and the muscular impressions and eminences are less distinctly marked. The iliac fossæ are large and expanded, and hence the great prominence of the hips. The several diameters (particularly the transverse diameter of the brim, which measures only 5·1 inches in the male) are somewhat greater; and the pubic arch is wider by about ten degrees; the sacrum also is wider and less curved.

It is worthy of notice that the pelvis of the negro is smaller in

all its dimensions than that of the European, and presents a partial approximation to that of the monkey (fig. III.), especially in the deficiency of its width. This difference is very much more obvious in the male than in the female negro; and parturition in the black races is facilitated both by the sacrum being less curved, and by the fœtal head being of smaller dimensions. In the apes and monkeys, which approach most nearly to man, the pelvis is longer and narrower, and much less curved than in the human subject. In other mammals, the differences are for the most part the same in kind, but greater in degree. In many of the Cheiroptera (bats) and Insectivora (as the mole), the pubic bones are only loosely connected by a small ligament, or there is a complete opening between the bones (as occurs normally in birds), an arrangement by which the act of parturition in these animals is much facilitated.

The pelvic bones are very simple in the Cetacea, in some cases being represented by two simple elongated bones lying near the anus, and converging from opposite sides (a transverse connecting piece being sometimes but not always present); in others, by a small V-shaped bone, while sometimes (as in Manatus) they seem to be entirely wanting. The additional pelvic bones in the non-placental mammals have been already noticed in the articles on the MARSUPIATA and MONOTREMATA. In the echidna (belonging to the latter order), the acetabulum is perforated, as occurs normally in birds. In birds, in addition to the peculiarity just noticed, we find the pelvis open in front (or, more correctly, inferiorly), there being no union of the pubic bones in any bird except the ostrich. This normal incompleteness of the pelvic ring is obviously for the purpose of facilitating the passage of the eggs. It is unnecessary to trace the further degradation of the pelvic bones in the Reptiles and Fishes.

PE'MBA, called the Green Isle by the Arabs, an island about 20 miles off the east coast of Africa, in the dominions of the Sultan of Zanzibar, lat 5° S. Length about 38 miles. It is an irregular coraline island, cut up in every direction by creeks, which were much frequented by craft engaged in the slave-trade. The vegetation is most luxuriant, but P. is unhealthy.

PE'MBROKE, a seaport of South Wales, a market-town, and municipal and parliamentary borough, in the county of the same name, occupies a rocky ridge on a navigable creek of Milford Haven, 7 miles south-east of Milford. On the extremity of the ridge on which the town is built, are the remains of its once extensive castle, said to have been the birthplace of Henry VII. Beneath the ruins is a remarkable natural cavern, which had communications both with the castle and the harbor. In 1648, the castle was beleaguered by Cromwell, and taken after a siege of six weeks. The keep, the principal building in the inner court, is 75 feet high, and 163 feet in circumference, and is surmounted by a cone-shaped roof of masonry, still perfect. *Pater*, otherwise called Pembroke Dock, which is rather a ship-building than a commercial center, is two miles from the town, and has several building-slips and a dry-dock. The naval establishment of the government embraces an area of 80 acres, and is surrounded by a high wall, flanked by fortifications. Within P. are three ancient churches, and numerous ecclesiastical and educational institutions. Pop. (1881) of parl. b., 25,309 of municipal borough 14,197. P. unites with Tenby, Milford, and Wiston in sending a member to parliament.

PEMBROKE COLLEGE, Oxford. BROADGATES HALL, a place of education, originally belonging in part to St. Frydeswyde's Priory, and in part to the monastery of Abingdon, was, on the dissolution of the religious houses, given to Christ Church by Henry VIII. In 1629, it was made a college by James I. and took its name from the Earl of Pembroke, the chancellor of the university. By the ordinances of the commissioners under 17 and 18 Vict. c. 81, the constitution of the college is now as follows: There are to be not less than 10 fellowships, open to all, not to exceed £200 a year in value, so long as the number of the fellowships is less than 16. There are not to be less than 12 incorporated scholarships. There are at present 24 which are tenable for 5 years—except the Townshend scholarships, tenable for 8 years—the holders, however, sharing in the emoluments during only 4 years. This college presents to 8 benefices, of which 6 have been purchased since 1812.

PEMBROKE COLLEGE, CAMBRIDGE, was founded in 1347 by Mary de St. Paul, the widow of Aymer de Valence, Earl of Pembroke. She was maid, wife, and widow all in one day, her husband being slain at a tilting-match held in honor of her nuptials. On this sad event, she sequestered herself from all worldly delights, and bequeathed her estate to pious uses. Henry VI. was so liberal a benefactor to this college as to obtain the name of a second founder. There are 13 fellowships and 23 scholarships of different values.

PEMBROKESHIRE, a maritime county of South Wales, and the westernmost county of the Principality, is bounded S. by the Bristol Channel, and W. and N. by St. George's Channel. Area, 393,682 statute acres. Pop. (1871) 91,936; (1881) 91,808. The river Teivy separates the county on the north-east from that of Cardigan. On the north are Newport and Fishguard Bays, the latter 3 miles in width, from 30 to 70 feet in depth, and with good anchoring-ground. St. Bride's Bay, the widest inlet on the western coast, is 10 miles in width, and has an inland sweep of 7 miles. Milford Haven (q. v.) is the most important estuary. The shores on the south are wild and inhospitable, and fronted by high precipitous cliffs. The surface is undulating; green hills alternate with fertile valleys. The principal elevations occur in the Precelly Hills, which traverse the north of the county from east to west, and rise in their highest summit to the height of 1754 feet. The rivers of the greatest importance are the Eastern and Western Cleddau, which unite and form a navigable portion of Milford Haven. None of the rivers, of which the Western Cleddau is the principal, are important. The climate is mild, but damp in the south of the county; while in the north, the temperature is considerably lower. There are excellent and productive soils in the south, and along the north-west coast the barley districts are famous; but the land on the Precelly Mountains and in the coal districts is inferior. Coal, slate, lead, and iron are the only minerals worked. Oats, barley, and potatoes are the principal crops. P. is chiefly remarkable from the fact that, although the most distant of Welsh counties from England, more than half its surface is inhabited by an English-speaking population. This arose from the settlement of a colony of Flemings here, and their adoption of the English tongue. The district has hence been called Little England beyond Wales. P. returns one member to parliament. The chief towns are Haverfordwest, St. Davids, Pembroke, and Tenby.

PE'MMICAN. This was originally a North American Indian preparation only, but it was introduced into the British navy victualling-yards, in order to supply the arctic expeditions with an easily-preserved food, containing the largest amount of nutriment in the smallest space. As made by the Indians, it consists of the lean portions of venison dried by the sun or wind, and then pounded into a paste, and tightly pressed into cakes; sometimes a few fruits of *Amelanchier ovata* are added, to improve the flavor. It will keep for a very long time uninjured. That made for the arctic voyagers was chiefly of beef. In making pemmican, it is necessary to remove the fat completely.

PE'MPHIGUS, or PO'MPHOLYX, belongs to that order of skin-diseases which is characterized by an eruption of large vesicles, filled with serous fluid, and known as *bullæ*. The disease occurs both in the acute and in the chronic form. In a mild case of acute pemphigus, bullæ, or blisters, from the size of a pea to that of a chestnut appear in succession (chiefly on the extremities), and having continued three or four days, break, form a thin scab, and soon heal, unaccompanied with febrile or inflammatory symptoms. In severe cases, there is considerable constitutional disturbance; the bullæ are larger, and the scabs heal with difficulty. The chronic form differs mainly from the acute by its prolonged continuance. The acute variety chiefly affects children, and has been ascribed to dentition, errors of diet, &c.; while the chronic form chiefly attacks aged persons, and is probably due to debility and impaired nutrition. The acute form usually requires nothing but cooling medicines and diet, and mild local dressings, such as simple cerate, to protect the raw surfaces from exposure to the air. In the chronic form, a nutritious diet, with the judicious use of tonics (iron, bark, &c.), is most commonly successful. In obstinate cases, arsenic is sometimes of use.

PEN, an instrument for writing with a fluid. In ancient times, a kind of reed (Lat. *Calamus*) was chiefly used, though sometimes the letters were painted with a fine hair-pencil, as among the Chinese at the present day. Quill-pens (see QUILLS) probably came into use after the introduction of modern paper. The English name pen is from Lat. *penna*, a feather; but the old form of *penna* was *pesna* or *petna* (= Gr. *peteron*), from the root *pet*, to fly; and just as Lat. *ped* is identical with Eng. *foot* (see letter F), so *petna* or *peteron* corresponds to *feather* (Ger. *feder*). During last century, many efforts were made to improve the quill-pen, the great defect of which was its speedy injury from use, and the consequent trouble of frequent mending; moreover, even the most skilful maker could not insure uniformity of quality, and any variation affected the writer's work. These efforts were chiefly directed to fitting small metal or even ruby points to the nib of the quill-pen; but the delicacy of fitting was so great, that but very little success attended the experiments. At the beginning of this century, pens began to be made wholly of metal; they consisted of a barrel of very thin steel, and were cut and slit so as to resemble the quill-pen as closely as possible. They were, however, very indifferent, and being dear (the retail price at first was half-a-crown, and subsequently sixpence), they made but little way; their chief fault was hardness, which produced a disagreeable scratching of the paper. In 1820, Mr. Joseph Gillott,

who dealt in the metal pens then made, hit upon an improvement, which, by removing this great defect, gave a stimulus to the manufacture, which has caused it to be developed to an extent truly marvelous. This consisted in making three slits instead of the single one formerly used, and by this means much greater softness and flexibility were acquired.

Mr. Gillott also introduced machinery for the purpose of carrying out his improvements, and thereby so reduced the cost of production, that he was enabled to sell his improved pens in 1821 at £7, 4*s.* per gross, which was then considered a remarkable success. Better pens are now sold at twopence per gross by the same manufacturer; or, in other words, 864 pens for the same price as one pen in 1821. Nor is this to be wondered at, when we are acquainted with the wonderful ingenuity of the machinery by which it is effected. The lowest-priced pens are made almost entirely by machinery, but the better ones require much hand-labor for their completion; nevertheless, in the works of Mr. Gillott alone, who is only one of several large manufacturers in Birmingham, the annual production is now nearly 150,000,000 pens, requiring a supply of five tons per week of the fine sheet-steel made for the purpose in Sheffield, a portion of which is returned as scrap or waste for re-manufacture. From Sheffield the steel is sent in sheets about eight feet long by three feet broad; it is prepared from the best iron, generally Swedish *bloom*. The manufacturer then prepares it by dipping for a short time in dilute sulphuric acid, which removes the *scale* or black surface; the acid itself is also carefully removed by immersion in clean water; the sheets are then passed backwards and forwards through a rolling-mill with smooth rollers, which reduces the steel to the exact thickness required, and gives it greater compactness; it is next slit into strips of various widths according to the kind of pen to be made; for the ordinary kind its width is seen in fig. 1. This is then passed through a cutting-machine, which rapidly punches out pieces of the shape shown in fig. 2, and in the order shown in fig. 1, which is a portion of the strip with the pieces or blanks, as they are called, cut out; that which is represented is the waste or scrap previously referred to. The blanks are now passed through a succession of operations, each conducted by a separate person: women or girls are chiefly employed.

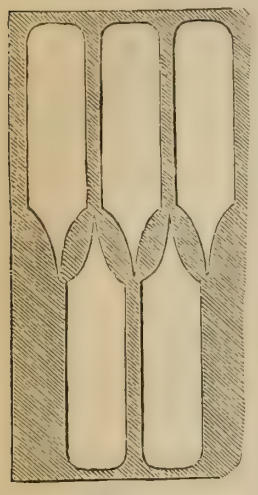
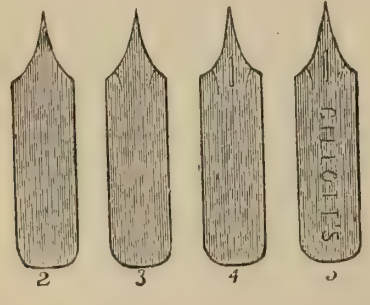


Fig. 1.

The first process is called *slitting;* they are passed one by one into a cutting-machine worked by a small hand-lever, which makes the two side-slits, as seen in fig. 3. The second process,



called *piercing*, is performed by a similar machine or hand-press, in which, however, only one punch acts, and that cuts out the small hole seen in fig. 4. The repeated rolling and stamping of the metal has by this time made it hard and brittle, and it is necessary to anneal it, for which purpose some thousands of the *slit* and *pierced* blanks are put into an iron box, and placed in the fire for a time, which softens them considerably; this is the third process. When cold, another operator receives them, and with another hand-press and a punch stamps or marks, as it called, the name of the maker, fig. 5, which constitutes the fourth process. The fifth is somewhat similar, and is sometimes omitted; it consists in placing it under another press, which has a punch and die for embossing any ornamental mark. The sixth process, called *raising*, consists in passing it into another press, which has a sinker and grooved die, as in fig. 6. The flat blank *a* is pushed under the sinker *c*, is pressed by the action of the lever into the groove *d*, and comes out with its edges curved up, as in *b*. The seventh process consists in *hardening*, which is done by placing the pens in an iron box or *muffle*, and when they are at a red heat, throwing them into oil; this renders them exceedingly brittle and hard, too much so, indeed, for they have now to pass through the eighth or *tempering* process, which brings them to the required temper or hardness and elasticity. The ninth operation is scouring; this consists in putting a large number into a tin cylinder, which is kept revolving by machinery; sand and coarse emery-powder are mixed with them; and the friction of these materials and of the pens themselves cleanses them from all impurities, and brings out the natural color of the metal. The tenth and eleventh processes consist in grind-

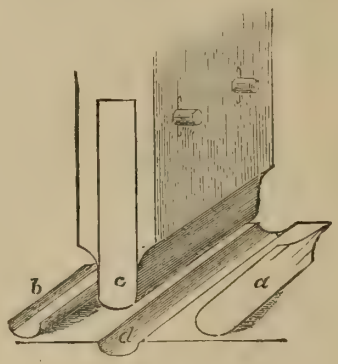


Fig. 6.



Fig. 7. Fig. 8.

ing the outside of the nib, first lengthwise (fig. 7), and then crosswise (fig. 8), which are done by different persons at separate grinding-wheels.

Next follows the most important operation, constituting the twelfth process of *slitting*—that is, making the central slit, upon the nicety of which the whole value of the pen depends. This is done in a hand-press similar to the others, but the cutting part consists of two chisels, one fixed on the table, the other coming down on the depression of the lever, and so accurately adjusted as to just clear each other. The operator then skilfully holds the pen lengthwise on the fixed chisel, and brings down the movable one, so as to effect the beautifully clean cut which constitutes so important a feature in the manufacture. Two other processes, the thirteenth and fourteenth, finish the series: the first is coloring, by heating them in a revolving cylinder over a charcoal stove, which gives them a blue or yellowish color, according to the time employed; and the last is varnishing them with a varnish composed of lac and naphtha. In the works of Messrs Gillott, from inspection of which we have gathered these facts, there are 400 women and 100 men employed, and the daily produce is enormous: a clever girl will cut out 14,000 pens per day, and a good slitter will *slit* 28,000. Besides the kind specially described above, many other forms are made, especially the large and small barrel pens; but the processes are all the same, or are modifications of those described. Gold pens are extensively made in Birmingham, and as they resist the corrosive action of the ink, they are very durable; their durability is also greatly increased by the ingenious but difficult process of soldering on to the points of the nib minute particles of iridium, which, from the extreme hardness, resist wear for many years. The manufacture of iridium-pointed pens is extensively carried on in the city of New York, where the process is said to have been first brought to perfection.

PEN HOLDERS are small turned sticks, usually of cedar, and generally with a steel cylinder to fix the pen. They are used only for metal pens, and are now made by machinery, which is so ingenious, that it turns the cedar, previously cut into square sticks, round, often in a spiral or otherwise ornamental style, cuts them to the required length, and polishes and varnishes them.

PENAL SERVITUDE is a sentence for criminal offences which has been introduced in lieu of the sentence of transportation beyond the seas. See CONVICT; TRANSPORTATION.

PE'NALTY is a sum of money declared by some statute or contract to be payable by one who commits an offence or breach of contract. It is considered as a kind of punishment, and constituting indirectly a motive to the party to avoid the commission of the act which induces such a consequence. Many contracts executed between parties contain a clause that one or other of them who fails to perform his part of the contract, will incur a penalty, i. e., will be liable to pay a fixed sum of money to the other party. In such cases, a distinction is drawn between a liquidated and unliquidated penalty; and whether it is of the one kind or the other, depends on the language used in the contract. If it is a liquidated penalty, then, when the breach of contract is committed, the party in default must pay that precise sum, neither more nor less; but if it is unliquidated, then he is not to pay the whole sum, but merely such part of it as corresponds to the amount of injury or damage done, and of which proportion a jury is the sole judge in an action of damages. In statutes, when pen-

alties are declared to follow on certain illegal acts, the sum is sometimes fixed, but in many cases only a maximum sum is stated, it being left to the court or justices who enforce the penalty what is a sufficient punishment for the offence. Sometimes penalties can only be sued for by parties immediately injured; but, as a general rule, and unless it is otherwise restricted, anybody may sue for the penalty, for in an offence against public law, where there is no public prosecutor, any person who chooses may set the law in motion.

Accordingly, not only may anybody in general sue for the penalty, but an inducement is offered by declaring the party who does so to be entitled to the whole or a half of the penalty. Without such inducement, many offences would be unpunished. The party who so sues is generally called the informer. Thus, in offences against the game laws, anybody may sue for the penalty, and he is entitled to half of it. Sometimes the penalty can only be sued for in the superior courts of law; but in the great majority of instances, the enforcing of penalties is part of the administration of justices before justices of the peace. It is for the justices to fix the amount if they have (as they generally have) a discretion to do so. If it is not paid, the justices may issue a distress-warrant, authorizing a constable to seize and sell the goods of the party to pay the fine; and if there are no goods, then the justices may commit the party to prison as a substitutionary punishment. Sometimes justices have a discretion either to impose a penalty or commit the party to prison as an alternative punishment. All these matters depend on the construction of particular statutes.

PE'NANCE (Lat. *pœnitentia*), in Roman Catholic theology, means the voluntary or accepted self-inflicted punishment by which a repentant sinner manifests his sorrow for sin, and seeks to atone for the sin, and to avert the punishment which, even after the guilt has been remitted, may still remain due to the offence. Penance is believed in the Roman Catholic Church to be one of the sacraments of the New Law. It will be necessary to explain it briefly both under its relations as a sacrament, and as a private personal exercise.

Penance must be carefully distinguished from repentance, which is simply sorrow for evil-doing, accompanied with a purpose of amendment. Penance is the fruit or the manifestation of this sorrow, and it is commonly accompanied or expressed by some of those external acts which are the natural manifestations of any deep sorrow, either negative, as the neglect of ordinary attention to dress, to the care of the person, to the use of food; or positive, as the direct acts of personal mortification and self-inflicted pain, such as fasting, wearing haircloth, strewing the head with ashes, watching of nights, sleeping hard, &c. Such manifestations of sorrow, whether from motives of religion or from merely natural causes, are common among the eastern races, and are frequently alluded to in the Scripture. In the personal practice of the early Christians, penance found a prominent place, and the chief and acknowledged objects of the stated Fasts (q. v.), and other works of mortification which prevailed, was that of penitential correction, or of the manifestation of sorrow for sin.

A still more striking use of penance, however, in the early church, was the disciplinary one; and this, in the Roman Catholic view, is connected with the sacramental character of penance. Any discussion of this purely theological question would be out of place here, and it will be enough to state briefly that Roman Catholics number penance among the Seven Sacraments (q. v.), and believe it to be of direct divine institution (Matt. xvi. 19, xviii. 18; John xx. 21). The *matter* of this sacrament consists, in their view, of the three acts of the penitent—contrition, or heartfelt sorrow for sin, as being an offence against God; confession or detailed accusation of one's-self to a priest approved for the purpose; and satisfaction, or the acceptance and accomplishment of certain penitential works, in atonement of the sin confessed; and the *form* of the sacrament is the sentence of absolution from sin pronounced by the priest who has received the confession, and has been satisfied of the penitential disposition of the self-accusing sinner.

In all these points, of course, they are at issue with Protestants. Even in the apostolic times, the practice prevailed of excluding persons of scandalous life from the spiritual fellowship of the Christian community (see EXCOMMUNICATION); and without attempting to fix the date, it may be stated as certain from the authority of Tertullian and other writers, that from a very early time the persons so excluded were subjected to certain penitential regulations. The class of offenders so treated were those who had been notoriously guilty of the grievous crimes of idolatry and apostasy, murder, adultery, and other scandalous offences. The period of penitential probation differed in different times and places, but in general was graduated according to the enormity of the sin, some going so far in their rigor (see NOVATIAN) as, contrary to the clearly-expressed sense of the church, to carry it even beyond the grave. In the earlier ages, much depended upon the spirit of each particular church or country; but about the 4th c., the public penitential discipline assumed a settled form, which especially as established in the Greek Church, is so curious that it deserves to be briefly described. Sinners of the classes already referred to had their names enrolled, and were (in some churches, after having made a preliminary confession to a priest appointed for the purpose) admitted, with a blessing and other ceremonial, by the pishop to the rank of penitents. This enrollment appears to have commonly taken place on the first day of Lent. The penitents so enrolled were arranged in four grades, called—1. (Gr. *prosklaiontes*, Lat. *flentes*) 'Weepers;' 2. (Gr. *akroomenoi*, Lat. *audientes*) 'Hearers;' 3. (Gr. *hypopipontes*, Lat. *prosternentes*) 'Prostraters;' 4. (Gr. *systantes*, Lat. *consistentes*) 'Standers.' Of these classes, the first were obliged to remain outside of the church at the time of public worship, and to ask the prayers of the faithful as they entered. The second were permitted to enter and to remain in the place and during the time appointed for the Catechumens (q. v.); but, like them, were required to depart before the commencement of the solemn part of the Liturgy (q. v.)

The third were permitted to pray with the rest, but kneeling or prostrate, and for them were prescribed many other acts of mortification. The fourth were permitted to pray with the rest in a standing posture, although apparently in a distinct part of the church; but they were excluded from making offerings with the rest, and still more from receiving the communion. The time to be spent in each of these grades at first differed very much according to times and circumstances, but was afterwards regulated by elaborate laws, called penitential canons. Still it was in the power of the bishop to abridge or to prolong it; a power, the exercise of which is connected with the historical origin of the practice of Indulgence (q. v.). Of these four grades, the first two hardly appear in the Western Church. It is a subject of controversy whether, and how far, this discipline was extended to other than *public* sinners; but it seems certain that individuals, not publicly known as sinners, *voluntarily* enrolled themselves among the penitents. All four grades wore a distinguishing penitential dress, in which they appeared on all occasions of public worship, and were obliged to observe certain rules of life, to renounce certain indulgencies and luxuries, and to practice certain austerities. In some churches, they were employed in the care of the sick, the burial of the dead, and other of the more laborious works of charity. The penitent, in ordinary cases, could only be restored to communion by the bishop who had excluded him, and this only at the expiration of the appointed time, unless the bishop himself had shortened it; but, in case of dangerous illness, he might be restored, with the condition, however, that, if he recovered from the illness, the whole course of penance should be completed.

The reconciliation of penitents took place commonly in Holy Week, and was publicly performed by the bishop in the church, with prayer and imposition of hands. It was followed by the administration of communion. If any of the clergy were guilty of a crime to which public penance was annexed, they were first deposed from the rank of the clergy, and then subjected to the ordeal like the laity themselves. This public discipline continued in force with greater or less exactness in the 5th, 6th, and 7th, centuries, gradually, however, being replaced by semi-public, and ultimately by private penance. In the 11th and 12th centuries, the public penance had entirely disappeared. The nature and origin of *private penance* is a subject of controversy between Catholics and Protestants; the former contending that it had existed from the first, and that it held the same place even in the ages of public penance for *secret sins* which the public penance did for public offences. At all events, from the date of the cessation of the public discipline, it has existed universally in the Roman Church. The priest, in absolving the penitent, imposes upon him the obligation of reciting certain prayers, undergoing certain works of mortification, or performing certain devotional exercises. These acts of the penitent are held to form an integral part of the sacrament of penance.

According to Protestants, penance has no countenance whatever from Scripture, and is contrary to some of the most essential principles of the Christian religion; particularly to the doctrine of justification by faith in Jesus Christ alone, on the ground of his complete or 'finished' work; penance being, in fact, founded on a doctrine of—at least—supplementary atonement by the works or sufferings of man—the sinner—himself. The outward expressions of humiliation, sorrow, and repentance common under the Jewish dispensation, are regarded as very consistent with the character of that dispensation, in which so many symbols were employed.

It is also held, that the self-inflicted austerities, as fasting, sackcloth and ashes, &c., of Jewish and earliest Christian times, had for their sole purpose the *mortification* of unholy lusts and sinful passions in the people of God; or the expression of sorrow for sin, so that others beholding might be warned of its evil and restrained from it; all which is perfectly consistent with the principles of Christianity, if kept within the bounds of moderation and discretion. But penance in any other view, as a *personal exercise*,

is utterly rejected. Arguments founded on the meaning of the two Greek words *metanœo* and *metameleomai*, both translated in our English version, *repent*, are much urged by many Roman Catholic controversialists—the former being represented as equivalent to the English *Do Penance;* but this is condemned by Protestants as inconsistent with the very use of the words in the New Testament itself. That penance began, as a practice, very early in the Christian church, is not only admitted by Protestants, but alleged in proof of the very early growth of those corruptions which finally developed themselves in the doctrines and practices of the Roman Catholic Church, and of which Protestants also hold that there are plain intimations in the New Testament, not only prophetical, but showing the development of their germs to have already begun during the age of the apostles.

In the discipline of the Protestant churches, penance is now unknown. The nearest approach to the Roman Catholic polity on the subject was that in use among the English Puritans of the 17th c., and more particularly in the Church of Scotland during that and the succeeding century, when it was common 'to make satisfaction publicly on the Stool of Repentance' (q. v.). It does not seem to have occurred to the Reformers or their more immediate successors in the Protestant churches, that their system of discipline, with its public rebukes and enforced humiliations of various kinds—as the wearing of a sackcloth robe, and sitting on a particular seat in church—was liable to be interpreted in a sense very different from that of a mere expression of sorrow for sin; but the belief is now very general among the most zealous adherents of their doctrinal opinions, that in all this they adopted practices incongruous with their creed, and in harmony rather with that of the Church of Rome. Nor do they seem to have perceived that Church-Discipline (q. v.), in its proper sense, as relating to ecclesiastical rights and privileges, is wholly distinct from the imposition of penalties by churches or church courts. Penitential humiliations, imposed by ecclesiastical authority, are now no more in favor where church discipline is most strict, than where the utmost laxity prevails. The commutation of penalties deemed shameful, for a fine to the poor of the parish, was an abuse once prevalent in Scotland, but never sanctioned by the higher ecclesiastical authorities.

PENANG. See PRINCE OF WALES ISLAND.

PENA'NG LAW'YERS, the commercial name for the stems of a species of palm imported from Penang for walking-sticks. They are small and hard, and have a portion of the root-stock attached, which is left to form the handle.

PENATES. See LARES, MANES, and PENATES.

PE'NCILS are instruments for writing, drawing, and painting, and they differ as much in their construction as in the uses to which they are applied. Probably the pencil was the first instrument used by artists, and consisted then of lumps of colored earth or chalk simply cut into a form convenient for holding in the hand. With such pencils were executed the line-drawings of Aridices the Corinthian, and Telephanes the Sicyonian, and also the early one-colored pictures, or *monochromata*, of the Greeks and Egyptians; but as wet colors began to be used, small fine-pointed brushes would be required, and we find it recorded that as early as the 4th c. B.C., several Greek artists had rendered the art of painting with hair-pencils so famous, that some of their pictures sold for vast sums of money. There are now in use the following kinds of pencils: hair-pencils, black-lead pencils, chalk-pencils, and slate-pencils. The first are used for painting or writing with fluid colors, either oil or water, and in China and Japan are employed almost entirely instead of pens for writing; the color used being the black or brown pigment obtained from various species of sepia or cuttle-fish. The manufacture of hair-pencils is of great importance, and requires much care and skill. The hairs employed are chiefly those of the camel, badger, sable, mink, kolinski, fitch, goat, and the bristles of hogs; and the art of pencil-making requires that these hairs shall be tied up in cylindrical bundles, so nicely arranged that all their naturally fine points shall be in one direction, and that the central one shall project the furthest, and the others in succession shall recede, so that, collectively, the whole shall form a beautifully smooth cone, the apex of which is a sharp point. Black-lead pencils are made of graphite or plumbago, which contains no lead whatever in its composition, but is in reality almost pure carbon. See BLACK-LEAD. The misnomer is probably owing to the fact, that, previous to the employment of graphite for making pencils, common lead was used, and this was the case even within the present century. Consequently, as the plumbago, with its black streak, offered a contrast to the pale one of the lead, it was called in contradistinction *black-lead*.

The best graphite for drawing-pencils is found in the Cumberland mines, which have long been celebrated. Within the last twenty years, however, vast deposits of this mineral, of a very fine quality, have been discovered in Siberia and other parts of the Russian empire. Inferior qualities are found in Austria and Prussia, in Ceylon, and various parts of North America; but they are rarely used in pencil-making, except for very inferior kinds. Black-lead is rarely sufficiently free from sand and other foreign ingredients to be used without preparation; it is therefore generally ground fine, and levigated or washed until it is pure, and again formed into solid blocks by means of enormous pressure, generally in hydraulic presses; these blocks are then sawn into thin plates about the sixteenth of an inch in thickness, which are again cut across, so as to form them into small square sticks.

It may appear a very simple process to press the powdered graphite into blocks, but it was found so difficult in practice as almost to prevent the employment of this method, which has led to immense improvement in pencil-making. It was found at first that the difficulty of pressing out the contained air was so great that the presses were broken under the weight required; pressure in a vacuum was then tried, but the diffiulty of applying it was found almost insurmountable, and it was certainly unprofitable. Mr. Brokedon of London, who has long been famous for his pencils, at last surmounted the difficulty by an ingenious and very simple process. This consists in compressing the black-lead into blocks two or three inches square, with only moderate pressure; these are then coated over with paper, well glued, so that, when dry, the covering is air-tight. A small hole is now made through this coating on one side, and several of these cubes of black-lead are put under the receiver of an air-pump, and the air being exhausted completely from them, the orifice in each is closed by an adhesive wafer, which prevents the return of the air when they are taken out of the receiver. They are next placed under the hydraulic press, and a well-sustained and regular pressure is brought to bear upon them for twenty-four hours, after which they are found to be so completely consolidated, that in cutting them the substance is equal in density to the best specimens of unprepared graphite.

There is so large a variation in the color of various qualities of blacklead, that, by a judicious mixture of them, when in the powdered state, almost any shade of darkness can be procured; but instead of thus carefully combining different qualities of graphite, it is a common practice to add sulphur or sulphuret of antimony, and by heating to procure the desired degree of blackness. For very inferior pencils, the worst quality of black-lead is mixed with black chalk and size, or gum-water, and formed into a paste, of which the pencil is made.

It is usual to enclose the material constituting the essential part of the pencil in a case of wood, for its protection from breakage, and to prevent its soiling the hands. The wood (generally cedar) is first sawn into thin boards, about half the thickness of the intended pencils; these are then cut into small pieces about ten inches long, by six in width, which are placed in the cutting and grooving machine. This machine consists principally of two circular saws—one very thin, and so set that it will cut through the board; the other revolving within the eighth of an inch of it, so set as only to cut a fine square groove in the wood. By means of this machine, the little boards are cut into straight square sticks, each having a groove on one surface. Into these grooves, the little prepared sticks of black-lead are laid and covered with a similar piece of wood, but not grooved. A workman, who is called the 'fastener-up,' having glued the inner faces of the two pieces of wood, presses them together, and sets them to dry; after which they are passed through the rounding-machine, dressed with a semi-circular smoothing-plane, cut at the ends, and then polished by rubbing them with a piece of shark-skin. The last process is stamping them with the maker's name and the letter which designates their peculiar quality. These letters are H, HH, HHH, B, BB, BBB, HB, FS. H signifies *hard;* repeated twice and thrice, it means *harder* and *very hard*. B means *black*, HB hard and black, and so on. FS signifies *fine stroke*.

Chalk-pencils are made in a similar manner, only that finely-powdered colored chalks, such as are used for crayons, are substituted for the black-lead. Previous to pressing and cutting the chalk, it is mixed with a little hot melted wax, which gives it softness and adhesiveness.

Slate-pencils for writing on slate are made either by cutting slate into sticks, and rounding them, or by cutting it into fine square slips, and encasing them in wood, as in the case of black-lead, &c.

PE'NDANT, or PENNANT, is a narrow flag of great length, tapering to a point, and carried at the head of the principal mast in a royal ship, to show that she is in commission. In the British navy, the pendants are borne of three colors—red, white, or blue—according to the color to which the admiral commanding the fleet pertains. See FLAG-OFFICER. A *broad-pennant* is a blue pennant, shorter and broader than the above, carried at the masthead of a commodore's ship, to denote that her captain is the commodore on the station. A first-class commodore hoists his broad-pennant at the fore; if of the second-class, his flag flies at the mizzen.

The *rudder-pendants* are strong ropes spliced in the rings of the rudder-chain, to prevent the loss of the rudder, should it by any accident become unshipped.

PENDANT, a hanging ornament, used in ceilings, vaults, staircases, timber-roofs, &c. It is sometimes a simple ball, and sometimes elaborately ornamented, and is chiefly used in the later Gothic and Elizabethan styles.

PENDE'NTIVE, the portion of a vault resting on one pier, and extending from the springing to the apex.—The word pendentive is also applied to the portions of vaults introduced in the angles of rectangular compartments, in order to reduce them to a circular or other suitable form to receive a dome.

PE'NDLETON, a township of Lancashire, with a station on the Lancashire and Yorkshire Railway, is a suburb of Manchester, and is 2¼ miles west-north-west of the town of that name. In 1871, it contained 30,652 inhabitants; and in 1881, the population had increased to 48,409. P. is part of the parliamentary borough of Salford, and since 1852 it has been incorporated with the municipality of the same borough. The rapid increase of its population is due to the immense industry of the locality. The inhabitants are employed in the numerous cotton and flax mills, print and dye-works, iron foundries, soap, and chemical works, in operation here. Hundreds of the population are also employed in the well-known P. collieries, which are conducted with much enterprise by the lessees. P. is also the residence of a portion of the mercantile community from Manchester, whose large mansions, with their parks and gardens, are dotted at intervals along the two roads leading from the township westward to Eccles.

PENE'DO, a flourishing town of Brazil, in the province of Alagoas, near the mouth of the San Francisco. Pop. 9000.

PE'NDULUM, in its widest scientific sense, denotes a body of any form or material which, under the action of some force, vibrates about a position of stable equilibrium. In its more usual application, however, this term is restricted, in conformity with its etymology (Lat. *pendeo*, to hang), to bodies suspended from a point, or oscillating about an axis, under the action of gravity, so that, although the laws of their motion are the same, Rocking Stones (q. v.), Magnetic Needles, Tuning-forks, Balance wheel of a watch, &c., are not included in the definition.

The *simple* pendulum consists (in theory) of a heavy point or particle, suspended by a flexible string without weight, and therefore constrained to move as if it were always on the inner surface of a smooth spherical bowl. If such a pendulum be drawn aside into a slightly inclined position, and allowed to fall back, it evidently will oscillate from side to side of its position of equilibrium, the motion being confined to a vertical plane. If, instead of being allowed to fall back, it be projected horizontally in a direction perpendicular to that in which gravity tends to move it, the bob will revolve about its lowest position; and there is a particular velocity with which, if it be projected, it describes a circle about that point, and is then called a *conical* pendulum. As the theory of the simple pendulum can be very easily explained, by reference to that of the conical pendulum, we commence with the latter, which is extremely simple. To find the requisite velocity, we have only to notice that the (so-called) Centrifugal Force (q. v.) must balance the tendency towards the vertical. This tendency is not directly due to gravity, but to the tension of the suspending cord. In the fig. let O be the point of suspension, OA the pendulum in its lowest position, P the bob in any position in the (dotted) circle which it describes when revolving as a conical pendulum; PB, a radius of the dotted circle, is evidently perpendicular to OA. Now, the centrifugal force is directly as the radius PB of the circle, and inversely as the square of the time of revolution.

Also the radius PB is PO sin. BOP, the length of the string multiplied by the sine of the angle it makes with the vertical; and the force towards the vertical is proportional to the earth's attraction, and to the tangent of the above angle—as may be at once seen from the consideration that the three forces acting on the bob at P are parallel, and therefore proportional, to the sides of the triangle OBP. Hence the square of the time of revolution is directly as the length of the string and the sine of the angle BOP, and inversely as the earth's attraction and the tangent of the same angle; or (what is easily seen to be equivalent) to the length of the string and the cosine of its inclination to the vertical directly, and to the earth's attraction inversely. Hence, in any given locality, all conical pendulums revolve in equal times, whatever be the lengths of their strings, so long as their *heights* are equal; the height being the product of the length of the string by the cosine of its inclination to the vertical. Also the squares of the times of revolution of conical pendulums are as their heights directly, and as the earth's attraction inversely.

Now, *so long as a conical pendulum is deflected only through a very small angle from the vertical*, the motion of its bob may be considered as compounded of two equal simple pendulum oscillations in directions perpendicular to each other, such as it appears to make to an eye on a level with it and viewing it at some distance, first from one point, say on the north, and then from another 90° round, say on the east. And these motions take place, by Newton's second law (see MOTION, LAWS OF), independently. Also the time of a (double) oscillation in either of these directions is evidently the same as that of the rotation of the conical pendulum. Hence, for *small arcs of vibration*, the square of the time of oscillation of a simple pendulum is directly as its length, and inversely as the earth's attraction. Thus, the length of the second's pendulum at London being 39·1393 inches, that of the half-second's pendulum is 9·7848 inches, or one fourth; that of the two seconds' pendulum 156·5572 inches, or four times that length.

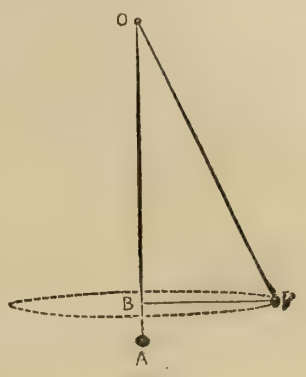


Fig. 1.

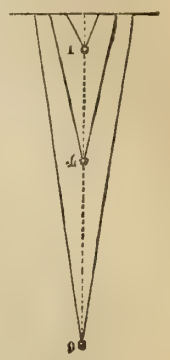


Fig. 2.

It follows from the principle now demonstrated, that so long as the arcs of vibration of a pendulum are all small relatively to the length of the string, they may differ considerably in length among themselves without differing appreciably in time. It is to this property of pendulum oscillations, known as Isochronism (q. v.), that they owe their value in measuring time. See HOROLOGY.

That the times of vibration of different pendulums are as the square roots of their lengths, may be demonstrated to the eye by a very simple experiment. Suspend three musket balls on double threads as in the figure, so that the heights in the dotted line may be as 1, 4, and 9. When they are made to vibrate simultaneously, while the lowest ball makes one oscillation the highest will be found to make three, and the middle ball one and a half.

A pendulum of *given* length is a most delicate instrument for the measurement of the relative amounts of the earth's attraction at different places. Practically, it gives the kinetic measurement of gravity, which is not only by far the most convenient, but also the true measure. By this application of the pendulum, the oblateness of the earth has been determined, in terms of the law of decrease of gravity from the poles to the equator. The instrument has also been employed to determine the mean density of the earth (from which its mass is directly derivable), by the observation of its times of vibration at the mouth and at the bottom of a coal-pit. It was shown by Newton, that the force of attraction at the bottom of a pit depends only upon the internal nucleus which remains when a shell, everywhere of thickness equal to the depth of the pit, has been supposed to be removed from the whole surface of the earth. The latest observations by this method were made by Airy, the present astronomer-royal, in the Harton coal-pit, and gave for the mean density of the earth a result nearly equivalent to that deduced by Cavendish and Maskelyne from experiments of a totally different nature. See EARTH.

If the bob of the simple pendulum be slightly displaced in any manner, it describes an ellipse about its lowest position as center. This ellipse may, of course, become a straight line or a circle, as in the cases already considered. The bob does not accurately describe the same curve in successive revolutions; in fact, the elliptic orbit just mentioned rotates in its own plane about its center, in the same direction as the bob moves, with an angular velocity nearly proportional to the area of the ellipse. This is an interesting case of *progression of the apse* (Apsides, q. v.), which can be watched by any one who will attach a small bullet to a fine thread; or, still better, attach to the lower end of a long string fixed to the ceiling a funnel full of fine sand or ink which is allowed to escape from a small orifice. By this process, a more or less permanent trace of the motion of the pendulum is recorded, by which the elliptic form of the path and the phenomena of progression are well shown.

According to what is stated above, there ought to be no progression if the pendulum could be made to vibrate simply in a straight line, as then the area of its elliptic orbit vanishes. It is, however, found to be almost impossible in practice to render the path absolutely straight; so that there always is from this cause

a slight rate of change in the position of the line of oscillation. But as the direction of this change depends on the direction of rotation in the ellipse, it is as likely to affect the motion in one way as in the opposite, and is thus easily separable from the very curious result obtained by Foucault, that on account of the earth's rotation, the plane of vibration of the pendulum *appears to turn* in the same direction as the sun, that is, in the opposite direction to the earth's rotation about its axis.

To illustrate this now well-known case, consider for a moment a simple pendulum vibrating at the *pole* of the earth. Here, if the pendulum vibrates in a straight line, the direction of that line remains absolutely fixed in space, while the earth turns round below it once in 24 hours. To a spectator on the earth, it appears, of course, as if the plane of motion of the pendulum were turning once round in 24 hours, but in the opposite direction. To find the amount of the corresponding phenomenon in any other latitude, all that is required is to know the rate of the earth's rotation about the vertical in that latitude. This is easy, for velocities of rotation are resolved and compounded by the same process as forces, hence the rate at which the earth rotates about the vertical in latitude λ is less than that of rotation about the polar axis in the ratio of sin. λ to 1. Hence the time of the apparent rotation of the plane of the pendulum's motion is $\frac{24 \text{ hours.}}{\text{sin. } \lambda}$. At the pole, this is simply 24 hours; at the equator, it is infinitely great, or there is no effect of this kind; in the latitude of Edinburgh (56° 57′ 23·2″) it is 28·63 h., or 28 h. 37 m. 48 s.

We have not yet alluded to the obvious fact, that a *simple* pendulum, such as we have described above, exists in theory only, since we cannot procure either a single heavy particle, or a perfectly light and flexible string. But it is easily shown, although the process cannot be given here, that a rigid body of any form whatever vibrates about an axis under the action of gravity, according to the same law as the hypothetical simple pendulum. The length of the equivalent simple pendulum depends upon what is called the Radius of Gyration (q. v.) of the pendulous body. Its property is simply this, that if the whole mass of the body were collected at a point whose distance from the axis is the radius of gyration, the moment (q. v.) of inertia of this heavy point (about the axis) would be the same as that of the complex body. The square of the radius of gyration of a body about any axis, is greater than the square of the radius of gyration about a parallel axis through the center of gravity, by the square of the distance between those lines. Now, the length of the simple pendulum equivalent to a body oscillating about any axis is directly as the square of the radius of gyration, and inversely as the distance of the center of gravity from the axis. Hence, if k be the radius of gyration of a body about an axis through the centre of gravity, $\sqrt{k^2+h^2}$ is that about a parallel axis whose distance from the first is h; and the length, l, of the equivalent simple pendulum is $l = \frac{k^2+h^2}{h}$.

This expression becomes infinitely great if h be very large, and also if h be very small (that is, a body vibrates very slowly about an axis either far from, or near to, its center of gravity). It must therefore have a minimum value. By solving the equation above as a quadratic in h, we find that l cannot be less than $2k$, which is, therefore, the length of the simple pendulum corresponding to the quickest vibrations which the body can execute about any axis parallel to the given one. In this case, the value of h is equal to k. Hence, if a circular cylinder be described in a body, its axis passing through the center of gravity, and its radius being the radius of gyration about the axis, the times of oscillation about all generating lines of this cylinder are equal, and less than the times of oscillation about any other axes parallel to the given one. Also, since the formula for l, above given, may be thus written, $h(l-h) = k^2$, it is obvious that it is satisfied if $l-h$ be put for h. Hence, if any value l (of course not less than $2k$) be assigned as the length of the equivalent simple pendulum, there are *two* values of h which will satisfy the conditions; that is, there are two concentric cylinders, about a generating line of either of which the time of oscillation is that of the assigned simple pendulum. When $l = 2k$, these cylinders coincide, and form that above described. And since the sum of the radii of these cylinders is l, it is obvious that if we can find experimentally two parallel axes, about which a body oscillates in equal times, and if the center of gravity of the body lie *between* these axes, and in their plane, *the distance between these axes is the length of the equivalent simple pendulum*. This result is of very great importance, because it enabled Kater (who was the first to employ it) to use the complex pendulum for the determination of the length of the simple second's pendulum in any locality. The simple pendulum is perfect in theory, but cannot be constructed; and thus the method which enables us to obtain its results by the help of such a pendulum as we can construct, is especially valuable.

Compensation Pendulum.—As the length of a rod or bar of any material depends on its temperature (see HEAT), a clock with an ordinary pendulum goes faster in cold, and slower in hot, weather. Various contrivances have been devised for the purposes of diminishing, if not destroying, these effects. The most perfect in theory, though perhaps not the most available in practice, is that of Sir D. Brewster (q. v.), founded upon the experimental discovery of Mitscherlich, that some crystals *expand* by heat in one direction, while *contracting* in the perpendicular one; and therefore that a rod may be cut out of the crystal in such a direction as not to alter in length by any change of temperature. In the method of correction usually employed, and called *compensation*, advantage is taken of the fact that different substances have different coefficients of linear dilatation; so that if the bob of the pendulum be so suspended as to be raised by the expansion of one substance, and depressed by the expansion of another, the lengths of the effective portions of these substances may be so adjusted that the raising and depression, taking place simultaneously, may leave the position of the bob unaffected. There are two common methods of effecting this, differing a little in construction, but ultimately depending on the same principle. Of these, the *mercurial* pendulum is the more easily described. The rod AC, and the framework CB, are of steel. Inside the framework is placed a cylindrical glass jar, nearly full of mercury, which can be raised or depressed by turning a nut at B. By increase of temperature, the steel portion AB is lengthened by an amount proportional to its length, its coefficient of linear dilatation, and the change of temperature, conjointly—and thus the jar of mercury is removed from the axis of suspension. But neglecting the expansion of the glass, which is very small, the mercury rises in the jar by an amount proportional to its bulk, its coefficient of cubical dilatation, and the change of temperature conjointly. Now, by increasing or diminishing the quantity of mercury, it is obvious that we may so adjust the instrument that the length $\left(\frac{k^2}{h}\right)$ of the equivalent simple pendulum shall be unaltered by the change of temperature, whatever be its amount, so long as it is not great enough to sensibly change the coefficients of dilatation of the two metals. The screw at B has nothing to do with the *compensation*, its use is to adjust the length of the pendulum so that it shall vibrate in one second.



Fig. 3.

The construction of the *gridiron* pendulum will be easily understood from the cut. The black bars are steel, the shaded ones are brass, copper, or some substance whose coefficient of linear dilatation is more than double that of steel. It is obvious from the figure that the horizontal bars are merely connectors, and that their expansion has nothing to do with the vibration of the pendulum, so they may be made of any substance. It is easily seen that an increase of temperature lowers the bob by expanding the steel rods, whose effective length consists of the sum of the lengths of A*a*, BC, and the steel bar to which the bob is attached; while it raises the bob by expanding the brass bars, whose effective length is that of one of them only; the other, as well as the steel rod *bc*, being added to the instrument for the sake of symmetry, strength, and stiffness only. If the effective lengths of steel and brass be inversely as their respective dilatation coefficients, the position of the bob is unaltered by temperature; and therefore the pendulum will vibrate in the same period as before heating. This is on the supposition that the weight of the framework may be neglected in comparison with that of the bob; if this weight must be taken into account, the requisite adjustments, though possible, are greatly more complex, and can only be alluded to here. Practically, it is found that a strip of dry fir-wood, carefully varnished, to prevent the absorption of moisture, and consequent hygrometric alterations of its length, is very little affected by change of temperature; and in many excellent clocks, this is used as a very effective substitute for the more elaborate forms just described. To give an idea of the nicety which modern astronomy requires in the construction of an observing clock, we may mention that the Russian astronomers find the gridiron superior to the mercurial pendulum; because differences of temperature at different parts of the clock case (though almost imperceptible in a properly protected instrument), may heat the steel or the mercury unduly in the latter; while, in the former, the steel and brass bars run side by side through the greater part of the length of the pendulum, and are thus simultaneously affected by any such alterations of temperature.



Fig. 4.

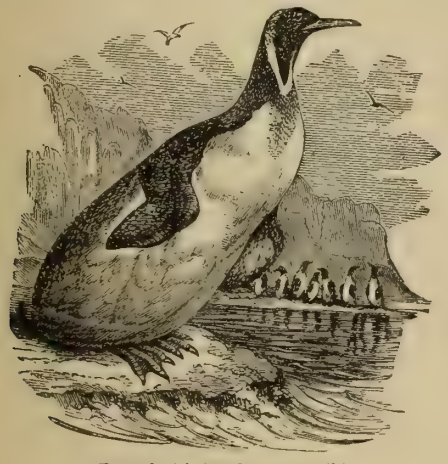
It would lead us into details of a character far too abstruse for the present work to treat of the effects of the hydrostatic pressure and viscosity of the air upon the motion of a pendulum.

PENE'LOPÉ, in Homeric legend, the wife of Ulysses (Odysseus), and mother of Telemachus, who was still an infant when

Ulysses went to the Trojan war. During his long wanderings after the fall of Troy, he was generally regarded as dead, and P. was vexed by the urgent suits of many lovers, whom she put off on the pretext that she must first weave a shroud for Laertes, her aged father-in-law. To protract the time, she undid by night the portion of the web which she had woven by day. When the suitors had discovered this device, her position became more difficult than before; but fortunately Ulysses returned in time to rescue his chaste spouse from their distasteful importunities. Later tradition represents P. in a very different light, asserting that by Hermes (Mercury), or by all her suitors together, she became the mother of Pan (q. v.), and that Ulysses, on his return, divorced her in consequence. But the older Homeric legion is the simpler and more genuine version of the story.

PE'NGUIN (*Aptenodytes*), a genus of birds of the family *Alcidæ* (see AUK), or constituting the family *Aptenodidæ*, regarded by many as a sub-family of *Alcidæ*, and divided into several genera or sub-genera. They have short wings, quite unfit for flight, but covered with short rigid scale-like feathers, admirably adapted for swimming, and much like the flippers of turtles. The legs are very short, and are placed very far back, so that on land penguins rest on the tarsus, which is widened like the sole of the foot of a quadruped, and maintain a perfectly erect posture. Their bones, unlike those of birds in general, are hard, compact, and heavy, and have no air-cavities; those of the extremities contain an oily marrow.

The body is of an elliptical form; the neck of moderate length; the head small; the bill moderately long, straight, more or less compressed; the tail very short. Some of them have a long, slender, and pointed bill, the upper mandible a little curved at



Penguin (*Aptenodytes pennatis*).

the tip, and feathered for about a third of its length; some, sometimes called Gorfews or Gorfous (*Chrysocoma*) have a stout and pointed bill, a little curved at the tip; some, Sphenisques or Spheniscans (*Spheniscu*), have a straight and compressed bill, irregularly furrowed at the base. The Penguins are all among the most aquatic birds, although they are seldom seen very far out at sea; but it is only in the breeding season that they spend much time on shore. They are found only in the southern hemisphere, and chiefly in high southern latitudes, although some of the species extend into warm regions, as *Spheniscus Humboldtii* to the coast of Peru. Of this species, which is called *Paxaro nino*, or Child Bird, by the Peruvians, Tschudi states that it is easily tamed, becomes very sociable, and follows its master like a dog, waddling along in a very amusing manner with its plump body and short legs, keeping its balance by motions of its little wings. It displays considerable intelligence, and learns to answer to its name. In some of the furthest antarctic regions, penguins are prodigiously numerous, appearing on the shore like regiments of soldiers, or, according to another similitude which has been used by a voyager, like bands of little children in white aprons.

They often occupy for their breeding ground a space of several acres, which is laid out and levelled and divided into squares, as nicely as if it had been done by a surveyor; whilst between the compartments they march as accurately as soldiers on parade. The KING P. (*A. Patachonica*), a large species, of the size of the great auk, dark grayish-blue above, white beneath, with a black head and a yellow curved band on the throat, is found in such numbers on some of the sandy antarctic coasts, that Mr. Bennett describes one breeding ground on Macquarie Island as covering thirty or forty acres, and to give some notion of the multitudes, speaks of 30,000 or 40,000 birds as continually landing and as many putting to sea. On many of the antarctic shores, the penguins do not flee from nor seem to dread the presence of man, remaining as if stupidly indifferent, even when their companions are knocked on the head; their very indifference, it is said, suggesting the idea of loneliness and desolation more powerfully than if there were a total absence of life. When attacked, however, they often show courage in self-defence, and are ready to run with open bill at an invader. The young are reckoned good eating; the old are said to be black and tough. The name P. is said to be derived from the Latin *pinguis*, fat.—Penguins make no nest, but lay a single egg in a chosen place on the shore; and the egg is carefully tended both by male and female. The female P. keeps charge of her young for nearly twelve months.—Many of the penguins are birds of bright plumage.—Cuttlefish, and other *Cephalopoda*, form a great part of their food. Their voice is loud and harsh, between a quack and a bray, but there are many diversities in the different species.

PENICILLA'RIA. See GUINEA CORN and MILLET.

PENITE'NTIAL PSALMS, seven of the Psalms, of David, so called as being specially expressive of sorrow for sin, and accepted by Christian devotion as forms of prayer suitable for the repentant sinner. They are Psalms vi., xxxii., xxxviii., li., cii., cxxx., and cxliii., according to the Authorized Version, which correspond with vi., xxxi., xxxvii., l., ci., cxxix., and cxlii. of the Vulgate. These Psalms have been set apart from a very early period, and are referred to as such by Origen (Hom. ii. in Leviticum). Pope Innocent III. ordered that they should be recited in Lent. They have a special place in the Roman Breviary, and more than one of the popes attached an indulgence to the recital of them. The most deeply penitential, and the most frequent in use, both public and private, is the 51st Psalm, or the *Miserere* (50th in the Vulgate).

PENITE'NTIARIES, strictly so called, are institutions for the reception of penitent women, in which confinement is purely voluntary. The name has also been applied to prisons under the separate system, having been adopted by the Quakers of Pennsylvania in 1786, when they caused the legislature of that state to abolish the punishments of death, mutilation, and the whip, and to substitute solitary confinement as a reformatory process. (See CONVICT, PRISON DISCIPLINE.) The P. of the first mentioned kind are often known as Magdalen Asylums or Female Refuges. Most of the institutions of this kind in the United Kingdom are associated under the auspices of the Reformatory and Refuge Union, an association which embraces also reformatories, industrial schools, and other like institutes. In 1877 the union had on its list 65 P. or homes for fallen women in England (15 in London), and 12 in Ireland and Scotland. In the Magdalen asylums, the inmates remain in the strictest seclusion for periods varying from a few months to two years, the average time being about a year; they then return to their friends, or to situations provided for them. It is an invariable rule not to dismiss any save the entirely incorrigible, without seeing that they are provided with the means of honest subsistence. During their seclusion, they are employed in needlework, washing, and housework. Most of the provincial and metropolitan establishments have been created in the last twenty years.

The oldest institution is the London Magdalen Hospital (with room for 140 penitents), opened in 1758; the next that of Dublin (for 20 persons), in 1766; the Edinburgh Magdalen Asylum (with room for 70 persons), in 1797. All the rest (including a large one at Glasgow, with accommodation for 146 penitents) have been founded in the present century. The results of these P., as far as they can be ascertained, are excellent. During the last hundred years, the London Magdalen committee state that they have found from their extensive experience that 70 per cent. are permanently reformed. All the institutions can show a very large percentage restored to their friends and to society.

PENITENTIARY (Lat. and Ital. *penitentiaria*), the name given to one of the offices of the Roman court, and also to the dignitary (a cardinal, called *Penitentiarius*) who presides over it. The cardinal penitentiary must be a priest and a doctor of theology or canon law. He is named by the pope himself, and should the penitentiary die while the Roman see is vacant, the cardinals must be specially assembled to elect by secret scrutiny a propenitentiary to act for the time. The officials of the penitentiary under the cardinal penitentiary, are a regent, three secretaries, three clerks, a corrector, a consulter in theology, and another in canon law, and one or two minor officers. The subjects which come under the notice of the penitentiary are all matters relating to the confessional, especially the absolution from sins and from canonical censures, reserved to the pope, and in certain cases dispensations from the impediments of marriage.

PENN, WILLIAM, a celebrated English Quaker and philanthropist, the founder of the colony of Pennsylvania, was the son of Sir William Penn, an eminent English admiral, and was born at London, 14th October 1644. His early years were spent

partly in Essex and partly in Ireland, where his father had several estates. P. studied at Christ Church, Oxford, and while here was converted to Quakerism by the preaching of a disciple of George Fox, named Thomas Loe. His enthusiasm for his new faith assumed a pugnacious form. Not only did he object personally to attend the services of the Church of England, and to wear the surplice of a student—both of which he considered eminently papistical—but, along with some companions who had also become Quakers, he attacked several of his fellow-students, and tore the obnoxious robes from their backs. For this unseemly proceedure P. was expelled from the university. His father was so excessively annoyed at his conduct, that he gave P. a beating, and turned him out of doors; but he soon afterwards mollified, and sent his son to travel on the continent, in the hope that change of scene and the gaiety of French life would change the bent of his mind. They failed, however, to effect this, but the youth certainly acquired a grace and suavity of address that he did not before possess. In 1666 the admiral sent him to Ireland to look after his estates in the county of Cork, which P. did to his father's complete satisfaction; for in matters of business he was as practical an Englishman as in religion he was an out-and-out mystic. In the city of Cork, however, he again fell in with Thomas Loe, and for attending a Quaker meeting was, along with some others, imprisoned by the mayor, but was immediately afterwards released on appealing to the lord president of the Council of Munster, who was personally acquainted with him.

On his return to England, P. and his father again quarrelled, because the 'conscience' of the former would not allow him to take off his hat to anybody—not even to the king, the Duke of York, or the admiral himself. P. was again turned out of doors by his perhaps testy, but assuredly provoked parent. The mother, however, stepped in, and smoothed matters so far that P. was allowed to return home, and the admiral even exerted his influence with the government to wink at his son's attendance at the illegal conventicles of the Quakers, which nothing would induce him to give up. In 1668, however, he was thrown into the Tower, on account of a publication entitled *The Sandy Foundation Shaken*, in which he attacked the ordinary doctrines of the Trinity, God's 'satisfaction' in the death of Christ, and justification by the imputation of Christ's righteousness. While in prison he wrote the most famous and popular of his books, *No Cross, no Crown*, and *Innocency with her Open Face*, a vindication of himself, which contributed to his liberation, which was obtained through the interference of the Duke of York. In September 1670, Admiral Penn died, leaving his son an estate of £1500 a year, together with claims upon government for £16,000. In 1671, the upright but incorrigible sectary was again committed to the Tower for preaching, and as he would not take an oath at his trial, he was sent to Newgate for six months. Here he wrote four treatises; one of them, entitled *The Great Cause of Liberty of Conscience*, is an admirable defence of the doctrine of toleration. After regaining his liberty he visited Holland and Germany, along with Fox and Barclay, for the advancement of Quakerism. The Countess Palatine Elizabeth, the granddaughter of James I., showed him particular favor. On his return, he married, in the beginning of 1672, Gulielma Maria Springett, daughter of Sir William Springett, and for some years thereafter continued to propagate, by preaching and writing, the doctrines of his sect.

Circumstances having turned his attention to the New World, he, in 1681, obtained from the crown, in lieu of his monetary claim upon it, a grant of the territory now forming the state of Pennsylvania. P. wanted to call it Sylvania, on account of its forests; but the king (Charles II.) good-humoredly insisted on the prefix Penn. His great desire was to establish a home for his co-religionists in the distant West, where they might preach and practise their convictions in unmolested peace. P., with several friends sailed for the Delaware in August 1682, was well received by the settlers, and on the 30th November held his famous interview with the Indian tribes, under a large elm-tree at Shackamaxon, now Kensington. He next planned and named the city of Philadelphia, and for two years governed the colony in the wisest, most benevolent, and liberal manner. Not only Quakers, but persecuted members of other religious sects, sought refuge in his new colony, where, from the first, the principle of toleration was established by law. Having called the colonists together, he gave the infant state a constitution in twenty-four articles. Towards the end of the reign of Charles II., Penn returned to England to exert himself in favor of his persecuted brethren at home, His influence with James II.—an old friend of his father's—was so great that many people then, and some even yet, do not feel quite satisfied about the nature of their relations; but the suspicion that he allowed himself to be used as a tool by the court is really not justified by any known facts. It is possible, for his position was equivocal, but it is not proven, and Lord Macaulay —who has urged the view of his complicity in some of the disgraceful incidents that followed Monmouth's rebellion with an ungracious animosity—has been convicted of haste and inaccuracy in several important particulars. At any rate, his exertions in favor of the Quakers were so far successful, that in 1686 a proclamation was issued to release all persons imprisoned on account of their religious opinions, and more than 1200 Quakers were set free. In the April following, James issued an edict for the repeal of all religious tests and penalties, but the mass of Nonconformists mistrusted his sincerity, and refused to avail themselves of it.

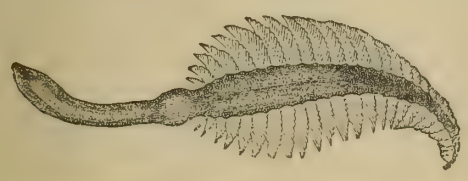
After the accession of the Prince of Orange as William III., P. was twice accused of treason, and of corresponding with the exiled monarch, but was acquitted. In 1690 he was arrested on a charge of conspiracy, but was again acquitted. Nevertheless, in the following year, the charge was renewed. Nothing appears to have been done for some time, but P. at last, through the kindly offices of his friends, Locke, Tillotson, and others, had the matter thoroughly investigated, and he was finally and honorably acquitted, November 1693. Shortly after, his wife died, but in less than two years he married again. His second wife, Hannah Callowhill, was a Bristol lady. In 1699 he paid a second visit to the New World, and found Pennsylvania in a prosperous condition. His stay, which lasted two years, was marked by many useful measures, and by efforts to ameliorate the condition both of the Indians and Negroes. P. departed for England towards the end of 1701, leaving the management of his affairs to a Quaker agent named Ford, whose villany virtually ruined Penn. When the rogue died, he left to his widow and son false claims against his master, and these were so ruthlessly pressed, that P. allowed himself to be thrown into the Fleet in 1708, to avoid extortion. His friends afterwards procured his release, but not till his constitution was fatally impaired. P. died at Ruscombe, in Berkshire, July 30, 1718. He left issue by both marriages. Upon the P. controversy it is unnecessary further to enter. We refer our readers to Macaulay's *History of England* (1849—1855); Hepworth Dixon's *Life of Penn* (new edit. 1856); J. Paget's *Inquiry Into the Evidence of the Charges brought by Lord Macaulay against William Penn* (1858); and Stoughton's *William Penn* (new ed. 1883).

PE'NNALISM, the name given to a practice once prevalent in the Protestant universities of Germany, which seems to have been essentially the same as the Fagging (q. v.) of the English public schools. The freshmen or students of the first year (called *pennals*—i. e., *pen-cases;* fags) were considered by the elder students ('schorists') as virtually their servants. Whatever property the pennals had they must give up to the schorists, who now employed them in the meanest offices, made laughing-stocks of them, and beat and ill-used them—all which had to be endured without complaint. After a year of this discipline followed the ceremony of 'deposition'—a practice older than pennalism itself, and borrowed probably from knightly consecration—in which the pennal underwent a number of symbolical trials, indicative generally of purgation from impurity and consecration to an intellectual life. Pennalism is said to have been introduced in the beginning of the 17th c., and to have been mostly confined to the Protestant universities of Germany. But although the full development of the system may have been thus restricted, germs and modifications of it were much earlier and more general, as is manifest from the prevalence of names of contempt for first year's students (see BEJAN), and from statutes passed by French universities as early as the middle of the 14th c., against levying payments for first footing from them. See also FAGGING. The servitude imposed on the pennals was probably an aping of the usage of chivalry, by which a candidate for knighthood had to serve for a time as a page to one already a knight. All attempts to check the evils of pennalism were long unavailing, as the pennals took part with the schorists in resisting all regulations of the authorities, which would have deprived them of the hope of exercising in their turn a like tyranny upon others. Edicts against the practice were issued in Jena and other universities about the beginning of the 17th c., but it was not till the last half of the century that the universities, by uniting in severe measures, were able to check the evil; and traces of it survived for a long time afterwards. In imitation of the students, a kind of pennalism was adopted by other bodies, more particularly by the printers, who retained the ceremony of 'deposition' after it had disappeared from the universities—Schöttgen, *Historie des Pennalwesens* (Dresd. 1747).

PENNANT, THOMAS, LL.D., tourist, naturalist, and antiquary, was born June 14, 1726, at Downing, in Flintshire, and educated at Queen's and Oriel Colleges, Oxford. His first important publication was the *British Zoology* (1761—1769), which contained in all 132 plates on imperial paper, engraved by Mazel, and established his reputation. While the work was in course of publication, P. made a trip to the continent, and saw some of the scientific and literary celebrities of the time, as Buffon, who has favorably mentioned him in his great work on *Natural History*, Voltaire, Haller, the two Gesners, and Pallas. In 1769, he made the first of his famous tours in Scotland, penetrating to the remotest part of the country, which, he says, was then 'almost as

little known as Kamtschatka.' He returned with a very good opinion of it, and published his report in 1771, in consequence of which (according to him) Scotland has 'ever since been *inondée* with Southern visitants,' The year before, he added 103 plates to his *British Zoology*, with descriptive notices; and in 1771, printed at Chester his *Synopsis of Quadrupeds*, subsequently enlarged and improved under the title of *History of Quadrupeds*. Of this work Cuvier says: 'It is still indispensable to those who wish to to study the history of quadrupeds.' In the same year the university of Oxford conferred on him the degree of LL.D. Next year he undertook his second and most important tour in Scotland, which included a voyage to the Hebrides (an account of which appeared in 3 vols. 1775). P. was warmly welcomed by the inhabitants. Almost every corporated town paid him some formal compliment, and he returned 'rich in civic honor.' In 1773, he published his *Genera of Birds*, and made an antiquarian tour through the north of England. His subsequent tours through Wales do not require special notice. In 1777 appeared a fourth volume of his *British Zoology*, containing the Vermes, the Crustaceous and the Testaceous Animals of the Country. Among a great variety of later miscellaneous publications, we may mention in particular an amusing life of himself (*The Literary Life of the late Thomas Pennant, Esq., by himself*, 1793). He died December 16, 1798.

PENNA'TULA, a genus of zoophytes (*Anthozoa*), allied to Gorgonia (q. v.) and *Alcyonium* (q. v.), and having very similar polypes; but the polype mass is not fixed by its base, has a fleshy stem strengthened by a bone, and a skin containing calcareous spiculæ the upper part of the stem winged on two sides with numerous pinnæ, along the upper margins of which the polype-cells are ranged. The whole form somewhat resembles a quill, so that the popular name SEA PEN is very often given to these zoophytes, One species, *P. phosphorea*, is common on the northern parts of the British coast. It is from two to four inches in



Pennatula (*Virgularia mirabilis*).

length, of a purplish-red color, and like many—perhaps all—of the other species, is sometimes brilliantly phosphorescent, emitting flashes of light when disturbed, but ceasing to be luminous on relapsing into quiescence. The stalk is hollow in the center, and the bone which it contains—and which is composed of phosphate and carbonate of lime, like the bones of the vertebrate animals—is a very remarkable part of its structure, not extending the whole length of the stalk, slender, straight, and perfectly simple, but bent backwards at each end into a hook. Other species are found in the Mediterranean and other seas, some of them more pen-like than even the British one. It has been alleged that they swim by contractions and dilatations of their common fleshy substance, or by movememts of the pinnæ; but there is no good evidence of their possessing any such power of locomotion, which is very contrary to the analogy of all similar zoophytes, and more probably the opinion prevalent among the fishermen of the Scottish coasts is the correct one, that their natural place is at the bottom of the sea, with the somewhat flexible lower end of the stalk immersed in mud.

Nearly allied to the pennatulæ is another genus of extremely beautiful zoophytes, *Virgularia*, ranked with them in the family *Pennatulidæ*, and sometimes receiving the popular name SEA RUSH. One species, *V. mirabilis*, is found on the British coasts. It resembles a slender rod, bearing throughout the greater part of its length two rows of lobes, along the margin of which the polypes are arranged. The whole length is from six to ten inches.

PE'NNON, a small, pointed, or swallow-tailed flag, carried by the medieval knight on his lance, bearing his personal device or badge, and sometimes richly fringed with gold. The device was so placed as to appear in its proper position when the weapon was laid for the charge.

PE'NNONCELLE, a long streamer-like flag, the diminutive of the Pennon (q. v.).

PENNSYLVA'NIA, one of the thirteen original United States of America, now the second in population, and called from its position and importance 'the Keystone State,' is in lat. 39° 43'—42° 15' N., long. 74° 75'—80° 37' W. It is bounded N. by Lake Erie and New York; E. by by New York and New Jersey, from which it is separated by the Delaware River; S. by Maryland and Virginia; and W. by Virginia and Ohio. The small state of Delaware borders for a few miles on its south-eastern angle. The form is very regular, the boundaries of three sides being lines of latitude and longitude. It is 310 miles long, 160 wide, containing an area of 42,215 square miles, or 28,937,600 acres, divided into 66 counties. The state is divided near the middle by the Alleghanies into an eastern region, whose waters fall into the Delaware and Chesapeake Bays, and a western, in which the principal rivers are the Alleghany, the Monongahela, and other important affluents of the Ohio.

These, with the Delaware and Susquehanna, Lehigh, Schuylkill, and Juniatta, are the principal rivers. The chief towns are Philadelphia, on its south-eastern border; Pittsburgh, at the head of the Ohio; and Harrisburgh, the capital, on the Susquehanna. The Blue Ridge, which enters the south-eastern portion of the state, rises to the height of 1500 feet; the passes of the Alleghanies are 2000 feet high, and single peaks 3000 feet. Lake Erie is 565 feet above the ocean. The geological formations range from the Potsdam sandstones to the coal-measures. There is middle secondary red sandstone and drift in the north-east; gneiss and red sandstone in the south-east; the center of the state is a rich and fertile limestone valley. Near Philadelphia are fine quarries of white marble. The great anthracite and semi-anthracite deposits of coal are east of the Alleghanies; west are the great beds of bituminous coal; three counties of P. in 1880 produced about 25 per cent. of the whole coal product of the States. Salt is found beneath the coal, and in the bituminous districts great deposits of petroleum. Adjacent to the coal-measures are rich beds of iron ore, also lead, copper, nickel, and zinc ores. The climate is mild, and the soil fertile, producing abundance of wheat, Indian corn, oats, rye, buckwheat, potatoes, flax, hemp, tobacco, hay and pasturage, apples, pears, peaches, grapes, &c. P. has also a large industry engaged in mines and manufactures, coal, iron, woollen, and cotton. At Pittsburgh, about 57,000 hands are employed in the coal and iron industries. In 1880, the state possessed near 7000 miles of railway; above 30 colleges; several theological, medical, and normal schools, and above 17,000 public schools; nearly 6000 churches, and 1400 public libraries. There are two state penitentiaries (one on the solitary system), 6 asylums for the insane, 2 institutions for deaf-mutes, 2 for the blind orphans' schools, &c. In 1627 a colony of Swedes and Finns settled on the river Delaware. In 1681 the territory was granted by Charles II. to William Penn, who, by the industry of his co-religionists, the Society of Friends, by cultivating peace with the Indians and encouraging emigration, founded a rich and flourishing state. It was the scene of Braddock's defeat in the French war; and in the revolution of 1776, Philadelphia was the chief city and capital of the Federation, near which were the actions of Germantown, Brandywine, &c. The population, largely Scottish and German in its origin, was in 1800, 602,361; in 1820, it was 1,049,458; in 1870; 3,521,951; and in 1880, 4,282,891.

PENNY, a British coin and money of account. After the Sceattæ (q. v.) it is the most ancient of the English coins, and was the only one generally current among the Anglo-Saxons. The name is evidently the same as the German *pfennig*, and both words seem to be intimately connected with the old German *pfant*, a pledge, and the Latin *pendo*, to weigh or to pay. Both in Britain and on the continent the word was anciently used for money in general, hence we have such phrases as, 'he has got his *penny-worth*,' i.e., he has got value for his money, &c. The penny is first mentioned in the laws of Ina, king of the West Saxons, about the close of the 7th century. It was at this time a silver coin, and weighed about 22½ troy grains, being thus about $\frac{1}{240}$th of the Saxon pound-weight. This relation to the pound-weight is evidently derived from the usage of the early Franks, who retained the Roman division of the *libra* into 20 *solidi*, and the *solidus* into 12 *denarii* (the denarius being thus the 240th part of the libra or pound. See MARK. Halfpence and farthings were not coined in England till the time of Edward I., but the practice previously prevailed of so deeply indenting the penny with a cross mark, that the coin could be easily broken into two or four parts as required. Silver farthings ceased to be coined under Edward VI., and silver halfpennies under the Commonwealth. By this time the penny had steadily decreased in weight; it was 18 grains under Edward III., 15 and 12 under Edward IV., 8 under Edward VI., and under Elizabeth it was finally fixed at $7\frac{23}{31}$ grains, or $\frac{1}{12}$ of an ounce of silver, a value to which the subsequent copper pennies, which till 1860 were the circulating medium, closely approximated. In 1672 an authorized copper coinage was established, and halfpence and farthings were struck in copper. The penny was not introduced till 1797, and at the same period the coinage of twopenny pieces was begun; but these latter, being found unsuitable, were withdrawn. The penny of the present bronze coinage is of only about half the value of the old copper penny. The German *pfennig* was also originally a silver coin, bearing the same relation to the German pound of silver as the English penny to its pound.

The old Scottish penny was only $\frac{1}{12}$th of the English one, as the pound Scots and the Scots shilling were also $\frac{1}{12}$th of the English coins of the same name. In the 12th c. it was made very broad and thin.

In the beginning of the 14th c. the mark of silver was anew divided into 60 parts or coins, which, to distinguish them from the old coins, were called *grossi denarii*, whence the term *groschen*. In the currency of the German Empire, the pfennig is a nickel coin, the hundreth of the mark, the latter being equal to a shilling.

PENNYROY'AL, a species of Mint (q. v.). The name P. is given in North America to a small plant, *Hedeosma pulegioides*, allied to the mints, and having, like them, a pleasant aromatic



Pennyroyal.

smell, and a warm pungent taste; which is much in use in domestic medicine, in the form of a warm infusion, to promote perspiration and as an emmenagogue.

PENNY WEDDINGS, or PENNY BRIDALS, was the name given to festive marriage ceremonials in Scotland, at which the invited guests made contributions in money (seldom more than 1*s.* each), to pay the general expenses, and leave over a small sum, which would assist the newly-married pair in furnishing their dwelling. This practice, now disused, was prevalent in the 17th c.; and, as leading to 'profane minstrelsing and promiscuous dancing,' was denounced by an Act of the General Assembly of the Kirk, 1645, as well as by numerous acts of presbyteries and kirk-sessions about the same period.

PENO'BSCOT, a river of Maine, U. S., rises near the center of the state by two branches, from a chain of lakes extending northwesterly; and after a south by west course of 135 miles from the junction, or 275 in all, empties into Penobscot Bay, a broad and sheltered opening into the Atlantic Ocean, 20 miles wide, with several large islands. Its chief towns are Belfast, at its mouth; Bangor, 50 miles above, where falls supply power to saw-mills and factories; Castine, and Bucksport. It is navigable to Bangor, where there is a tide of 20 feet. The chief trade is pine-timber.

PE'NRITH, a market town of Cumberland, in a picturesque and fertile valley, with rich and striking scenery in the vicinity, stands on the Carlisle and Lancaster Railway, 17 miles south-south-east of Carlisle. In the parish churchyard is a monument of great antiquity, formed of two pyramidal stones about 12 feet high, and known as the 'Giant's Grave.' The town contains an ancient free grammar-school, and other educational institutions. A new and beautiful church, built in the style of the 13th c., was consecrated here in 1850. There are iron-foundries, saw-mills, and breweries. Pop. (1871) 8317; (1881) 9268.

PENRY'N, a municipal and parliamentary borough and market town of England, in the county or Cornwall, in a warm, sheltered, and richly productive valley, on the Plymouth and Falmouth Railway, two miles west-north-west of Falmouth. It stands on a low hill projecting eastward into Falmouth Harbor. Trade is carried on to some extent with the mining district of Redruth, and there are several quarries in the vicinity, from which the famous P. granite —the material of which Waterloo Bridge, the Chatham Docks, and a great number of other important public works are constructed—is obtained; 20,000 tons of granite have been exported in the year, but the quantity varies much. Pop. (1881) of municipal borough, 3463. Together with Falmouth, it forms a parliamentary borough, which returns two members to parliament.

PENSACO'LA, a city and port of entry, on a deep bay opening into the Gulf of Mexico, at the south-western extremity of West Florida, U.S. The town is on the north shore of the bay, and is connected by railway with Montgomery, Alabama. Population (1880) 6846. Nine-tenths of the business part of P. were burned down in a great fire, November 1880. Near the entrance are the navy yard, hospital, and Fort Barrancas. The entrance is further defended by Fort Pickens, at the west end of Santa Rosa Island, and Fort M'Rae on the opposite point. The bay branches into two divisions, receiving the Escambia and Yellow Rivers. As one of the best harbors on the gulf, P. was settled by the Spaniards, occupied by the British in 1814, and acquired by the United States in 1821.

PENSION (Lat. *pensio*, from *pendo*, to weigh out, to pay), an allowance paid annually by government to an individual in consideration of past services, civil or military. See CIVIL LIST.

PENSIONS AND PENSIONERS, MILITARY AND NAVAL. There are pensions for good service, for mere faithful ordinary service, for wounds, and to representatives of deceased officers.

Good-Service Pensions are rewards to selected officers in the British navy for distinguished service. In 1873 they were as follow: 12 admirals had £300 each, 25 captains £150, 1 general of marines £300, 5 do. £200, 2 colonels £150, and 5 medical officers £100; total, £9150. In 1875—1876, the total was £7500. The corresponding pension in the army is called a REWARD FOR DISTINGUISHED SERVICE (q. v.).

The *Pensions for Long Service* are awarded in the army to non-commissioned officers and soldiers who have served 21 years in the infantry, or 24 years in the cavalry, or earlier if disabled from further service, according to the wounds, loss of health, and conduct of the pensioner. The amount is fixed by the commissioners of Chelsea Hospital, and varies from 1½ *d.* to 3*s.* 6*d.* a day, the lower rates being mainly confined to negro pensioners from the West India regiments. Pensioners are either *in-pensioners* of Chelsea (q. v.) or Kilmainham Hospitals, in which case they forego their proper pension, and receive board, lodging, and a small sum for tobacco-money, or out-pensioners residing where they please, and drawing their pensions from the staff officers of pensioners, of whom there is one in every considerable town. These men can follow other pursuits, often do so with great success, as their military habits of regularity stand them in good stead in civil life. In particular, railways give employment to great numbers of pensioners, as signalmen, guards, &c. Pensioners who are in good health, and are willing for such service, are enrolled in a force called the 'Enrolled Pensioners,' which forms a defensive corps of veterans, and belongs to the Army of Reserve. This gives the men, as an adjunct to the pension, an annual retaining fee of £1 each, besides pay during the yearly training of 8 days, at the rate of 2*s.* a day for privates, 2*s.* 6*d.* for corporals, and 3*s.* for sergeants. The veterans are officered by their respective staff officers, and, in case of emergency, would be embodied for service. As garrison troops, these old soldiers would doubtless prove most valuable. A pension is forfeited if the holder be convicted of felony. The number of pensioners for 1875—1876 was 63,234, and their pensions amounted to £1,193,600, besides £7500 to Malta Fencible Artillery, &c. These were exclusive of 538 in-pensioners of Chelsea, and about 130 of Kilmainham; the cost of those establishments together being £34,334.

The *Naval Pensions for Long Service* are given to petty officers, seamen, and marines under principles essentially similar to those for the army, except that there are now no in-pensioners. The commissioners of the Admiralty award the allowances, and the pensioners draw their pensions through the staff officers of military pensioners. Under the old arrangement there were in-pensioners, whose home was Greenwich Hospital. In 1875—1876, 20,234 engineers, warrant-officers, seamen, marines, &c., received pensions, producing a total of £471,758.

Under this section should be mentioned pensions for especial bravery in action, granted with the Victoria Cross (q. v.).

Pensions for *wounds* are common to both services, and are limited to officers. They are awarded respectively by the Secretary for War and Lords of the Admiralty, for serious bodily injury, as the loss of a limb or eye, and vary according to the rank of the recipient and other circumstances. In cases of less serious injury, temporary pensions are sometimes granted, or gratuitous. The charge for pensions for wounds for 1875—1876 was—army, 172 recipients, £16,443; navy, 85 recipients, £9036; total, £25,479. In the case of common soldiers and sailors, wounds may serve to hasten or augment the pension for service (see above); but they have no distinctive pension for wounds.

Widows of commissioned and warrant officers in the army and navy receive pensions so long as they remain unmarried, provided they have been married severally twelve months when their husbands die, and that the latter were under 60 years of age (50 for warrant officers) when they married the claimants. Such pension

is not granted if the widow be left in wealthy circumstances, and lies dormant during a second marriage, though it may be revived should she again become a widow. The amount of pension varies according to rank, and there are three distinct classes for each rank: 1st, When the husband was killed in battle, or died within six months of wounds received therein; 2d, When he died from some cause distinctly falling within the sphere of his duty, but not from wounds in action; 3d, When he died in the course of nature. The following table shows the amount of pension to widows of combatant ranks, civil ranks receiving similar rates according to relative standing. See RELATIVE RANK.

Widow of	PER ANNUM.		
	1st Class.	2d Class.	3d Class.
Flag Officer, or General Officer	According to circumstances.		£120
Captains in Navy; Colonels in Army	£200	105 Cptns. 150 Cols.	80 & 90
Lieutenant-Colonels in Army	200	140	80
Commanders in Navy; Majors in Army,	120	100	70
Lieutenants, Navy Captains, Army	80	65	50
Sub-Lieutenants, Navy	60	50	..
Lieutenants, Army	60	50	40
Sub-Lieutenants, Army	50	40	36
Gunners, Boatswains, Carpenters, Navy,	35	30	25

Compassionate allowances are small additional pensions granted to the children of deceased officers, left in indifferent or bad circumstances. They vary from £5 to £40 each, and can be held by boys till 18 (unless earlier provided for), and by girls until 21, or an earlier marriage. If an officer fall in action, without leaving a widow or orphans, but leaving a parent who had been more or less dependent on him, such parent may be granted the pension or a portion of it, and is sometimes allowed to commute the pension into a single payment. In very special cases, the sisters of an officer, who had been more or less dependent on him, are granted compassionate allowances. The pensions to soldiers' wives and allowances to their orphans, &c., amounted in 1875–1876 to a total of £146,933. The corresponding figure for widows and orphans of sailors was £173,086.

The following are the principal relevant items from the estimates for 1881-82: *Army*.—For distinguished services, £33,960; to widows and orphans, £124,250; for wounds, £16,990; hospitals, £33,887; out-pensions, £1,386,500. *Navy*.—For meritorious services, £6500; for wounds, £7724; pensions to engineers, warrant officers, &c., £77,192; to widows and relatives of officers, £136,742; to seamen and marines for wounds, &c., £565,247.

PENSIONARY, GRAND, OF HOLLAND. See GRAND PENSIONARY.

PENTA'CRINUS, a genus of *Echinodermata* of the order or family *Crinoideæ* (q. v.), remarkable as containing the only permanently stalked Crinoideæ, or Crinoideæ believed to be permanently stalked, known now to exist, and thus the only true living representative of the fossil Encrinites (q. v.). The genus P. has a long pentangular column of numerous joints, from which there arise at intervals many whorls of unbranched arms, and which bears at its summit a disc at first divided into five radiating members, and afterwards branching into ten arms, each further subdivided. The whole of this skeleton is calcareous, but it is united by cartilages, and covered with a fleshy integument. *P. Caput Medusæ*, the MEDUSA'S HEAD, is found in the West Indian seas, and is very rare in collections, being only dredged up from waters of considerable depth; from which cause also the nature of the base of the column is not certainly known. The stem is more than a foot long.—The fossil species of P. are numerous in the Lias and Oolite formations. They gradually become fewer in the newer rocks.—The stalked young of *Comatula rosacea* was at one time regarded as a *P.*, and described under the name of *P. Europæus*. See CRINOIDEÆ.

PENTADE'SMA, a genus of trees of the natural order *Guttiferæ*, to which belong the BUTTER-AND-TALLOW TREE of Sierra Leone, *P. butyracea*. It is a tree sixty feet high, and produces a conical fruit of the size of a very large pear, the pulp of which abounds in a yellow oily substance, with a strong flavor, somewhat resembling that of turpentine, yet much used by the natives as an article of food.

PE'NTAGON is a plane geometrical figure of five sides. When the sides are equal, the figure is called a regular pentagon.

PE'NTASTYLE, a building with a portico of five columns.

PE'NTATEUCH (Gr. fivefold book), a name given by Greek translators to the five books ascribed to Moses, which are in Hebrew called collectively *Torah* (Law), by way of eminence, or *Chamisha Chumshe Torah* (five-fifths of the Torah). *Law* is also the general name by which the work or portions of it are referred to and quoted (the words 'of Moses' or 'of the Lord' being added occasionally) both in the Old and New Testament.

The division into five portions (further divided into 50, 40, 27, 36, 34 chapters, or 12, 11, 10, 10, 11 Parshioth or Sidras respectively, by the Masoretes) is, if not original, at all events of a very remote date, and certainly anterior to the Septuagint. Genesis, Leviticus, and Deuteronomy, the first, third, and fifth books, form clearly defined and internally complete parts of the work as a whole, and thus, also, fix the limits of the intermediate second (Exodus) and the commencement of the concluding fifth (Deuteronomy). The chief aim of the Pentateuch being to give a description of the origin and history of the Hebrew people up to the conquest of Canaan, together with the theocracy founded among them, the center is formed by the person of Moses himself, the regenerator and lawgiver of the nation. Genesis, beginning with the history of the creation and antediluvian genealogy from Adam to Noah, in rapid outlines sketches the propagation of the various tribes that descended from the one man who was saved in the Deluge, but dwells with special emphasis upon Shem, from whom sprang, in the tenth generation, Abraham, the progenitor of the 'people of the covenant.'

The salient events in the lives of his descendants, the Patriarchs, are minutely described; and a fitting close is found in the benediction of Jacob, who, as it were, reinaugurates and confirms all his twelve sons in the covenant made between Abraham and God. Exodus, treating of the liberation of the people from Egypt; their wanderings in the desert; the promulgation of the Law, by which they became emphatically the 'holy nation' and the 'people of the Lord;' and the erection of a visible sanctuary; may be regarded as the nucleus of the work; while Leviticus, the following book, fittingly enters into the details of the legislation and the mode of worship; especially the prescriptions concerning sacrifices, festivals, ceremonial purity, and the duties of the priests, with but little of history. The historical thread is taken up again in Numbers, the fourth book, which, also, side by side with the relation of the events between the Sinaitic period and the beginning of the fortieth year after the Exodus, contains many laws explanatory of, or complementary to, those of the former books, together with such as new circumstances had called into existence. A brief recapitulation of the preceding portions; Moses's most impressive and reiterated exhortations to keep that Law, which was now completed, and solemnly transmitted to the Levites; and the death of the legislator himself; form the chief contents of the fifth book, or Deuteronomy. Thus, the theocratic plan of the work is carried through from beginning to end, coming out more prominently in the three intermediate books, but never lost sight of entirely. Nothing is dwelt or even touched upon save that which in some way illustrates either the relation of God to the people, or of the people to God; the political, civil, and domestic laws themselves, being enumerated only as bearing upon the main aim and object of the work.

The special books being treated separately under their respective heads, we have here only to consider some questions relating to the work as a whole, and principally that of its authorship and history, as far as these points have not been touched upon already under GENESIS. Tradition, as embodied in the earliest historical records, mentions Moses as the writer of the complete Pentateuch, such as it is before us: with the exception of a few verses, describing the last moments of the lawgiver, &c., which were ascribed to Joshua. This tradition has for many a long century been almost universally adhered to. Not that there have not at different periods suspicions been raised respecting this 'authenticity.' The Pseudo-Clementines, for instance, assumed that the Law, orally delivered by Moses to the Elders, had, before and after its being committed to writing, undergone innumerable changes, nay, corruptions; among these the too personal and human conceptions of God, and the unworthy traits recorded of the Patriarchs. Jerome expresses himself in a somewhat doubtful manner on the relation of Ezra as the 'redactor,' or rather 'restorer,' of the Pentateuch. Aben Ezra boldly calls several passages later interpolations, and speaks of others still more poignantly as a *Ssod*, or a 'Mystery,' i. e., as containing difficulties not to be cleared away in consonance with the common belief, which he, however, was too pious wantonly to disturb. Other voices, vaguely lifted up by more or less competent scholars, remained unheard. It was not until long after the Reformation, at the dawn of the exegetical and critical modern age, that the question whether this codex was the work of one man, or even of one age, and what share, if any, Moses had in its composition, began to be discussed seriously and on scientific grounds. Hobbes held that the Pentateuch was rather a work on, than by Moses, Spinoza came to the conclusion, that it was to Ezra that we were indebted for the

book in its present shape, and that it embodies certain genuine portions, collected at a late period, together with a vast amount of later material, added at various periods subsequent to the time of the supposed author.

Vitringa, Le Clerc (Clericus), Rich. Simon, and others, followed, resuming and enlarging the discussion chiefly respecting the difficulties which presented themselves in the accounts of the creation, and the like, contained in Genesis. The next, and indeed the most important step—because the one which at once removed the question from the field of hazy and timid speculations to that scientific basis upon which it still rests, was taken by Astruc, who, from the marked difference of the Divine names used in Genesis and the beginning of Exodus—noticed in the TALMUD and the FATHERS OF THE CHURCH—came to the conclusion, that these books had been worked up from different original documents, which he called Jehovistic and Elohistic respectively. See article GENESIS, where the development of this speculation is described. At the present stage of the investigation, the view very generally adopted is the 'complementary theory,' which assumes, with certainty, two or more authors—Jehovists and Elohists—for the whole of the first four books, at least; the fifth being by some (Delitzsch, Schulz, Kurz, &c.) still ascribed chiefly to Moses's own hand. Only a small apologetic school, of which Hengstenberg long was spokesman, still upholds the entire integrity and authenticity of the work, pronouncing Moses its sole author. The contemporary discussions on these points, which, up to within a very recent period, were chiefly confined to Germany, have now also found their way into England. The impulse to the controversy in this country was principally given by Dr. Davidson, the 'Essayists and Reviewers,' and Bishop Colenso, all of whom, on the basis of these German investigations, raised some new points. Innumerable replies, by more or less competent champions, have been issued; but as yet, so far from either of the combatants having declared themselves convinced by the arguments from the other side, the controversy elicits new publications uninterruptedly.

While endeavoring to trace, in the briefest of outlines, some of the chief objections raised against the Mosaic authorship, and the replies given thereunto, we must remind the reader that ours is only the task of epitomizers, as it were, and that the very nature of our task precludes us from giving any opinion whatsoever about the superior force of the arguments on either side.

A work, alleged to be the production of one man, it is urged, first of all, ought to contain neither unnecessary repetitions of considerable length, nor contradictions, nor anachronisms. There ought to be a plan and a unity. Yet, there can be no doubt, they say, about the fragmentary character of the Pentateuch. Many portions, evidently complete in themselves, are strung together without the slightest logical sequence, nay, in an unchronological order. As to repetitions and contradictions, there is, to begin with, the very history of the creation, which occurs twice in the first chapters of Genesis, is each time given differently, and in each account the Divine name is consistently mentioned in a different way. The same is to be said with regard to the account of the Deluge, and several incidents in the lives of the Patriarchs; the important conversation between God and Moses respecting Aaron (Exod. iv. 10—16, and vi. 9); the descriptions of the tabernacle; the priestly vestments; the story of the manna as given in Exodus and Numbers; the account of the appointment of the council of the 70 elders in the same books; &c. Again, the work itself sometimes seems to indicate an author who is not the legislator himself, such as the phrase of Moses being the humblest of men; the account of his own death; the passage in Genesis 'before there reigned any king over the children of Israel' (xxxvi. 31); the occurrence of the name of the city of Dan (Gen. xiv. 14, Deut. xxxiv. 1), so called only after the conquest by that tribe. In Numb. xxxii. 34, again, we have an enumeration of a certain number of towns and villages built by the tribes of Gad and Reuben—an event which could not have happened during Moses's lifetime; further, the frequent occurrence of the formula 'unto this day' (e. g., Deut. x. 8, where the author speaks of the institution of the Levites as being still in force 'up to this day'), &c. It is contended, also, that the language of the Petateuch varies very little from that of the last prophets, and that it can hardly be assumed that a thousand years should have made no perceptible difference in the idiom; more particularly has Deuteronomy been supposed to bear a striking resemblance, in style and language, to Jeremiah. The Pentateuch is further said to contain many facts palpably contradictory to natural laws, as they are established in the experience of the whole historical human race, and systematized by science.

Of the many ways to get rid of these and similar—old and new—exceptions, the most generally adopted is that which we mentioned as the method of 'interpolation,' by which the Apologetic School strikes out some fifty or more passages, as not belonging to the original work, but having crept in, by way of commentary note, or explanation, in post-Mosaic times—the body of the work being thus saved, so to say, by a most extensive amputation. As to the argument from the language, it is said that the Pentateuch, being *the* divine book, by way of eminence, and embodying the very phrases (to the letter) made use of by the Almighty, must needs have served as a model for the next thousand years, and priests and Levites, the teachers of the people, were enjoined constantly to study and read it: hence the small difference in the later writers. Arabic and Syriac, it is argued, did likewise not change essentially for many centuries—an assertion, however, which only holds good if 'many' is taken in a very vague sense indeed. That Deuteronomy differs in style and manner, is verbose, &c., is explained by Moses's advanced age. On the other hand, events which are not in harmony with the 'natural laws,' are accepted by the orthodox simply and literally as 'miracles,' while 'conservative' rationalists of the school of Eichhorn, Rosenmüller, and others who stand by the authenticity of the Pentateuch, have been at great pains to find some kind of poetical interpretation for them.

Some of the recent attacks on the authenticity are chiefly founded upon arithmetical grounds. The numbers of the people, their cattle, and the like, at various periods, do not seem to conform to the laws of natural increase, or even to the geometrical limits within which they were at times stated to have been confined. Among the direct proofs, however, proffered by the defenders of the authenticity, the following chiefly deserve attention. Deuteronomy, it is averred, can only be the work of Moses. He speaks in it to the men whom he has led for many years, as one who has lived through all the events himself.

There is no possibility of any one imitating the local coloring in such a manner. If, then, Deuteronomy must be allowed to be the work of Moses, the three preceding books, to the contents of which frequent allusion is made, must equally be supposed to be finally redacted, if not written, by the same hand; and it further follows naturally, that the introduction to these books, which is Genesis, must have emanated from it. Again, any one writing after Moses, could not possibly have possessed the extraordinarily correct knowledge of contemporary Egypt and Arabia, which appears throughout the Pentateuch. A writer who might be supposed to have acquired it by dint of study of antiquities, must, it is said, have betrayed himself on every page by inaccuracies and anachronisms. Nineveh is in Genesis a city of as yet little importance; while Resen, of which no trace is to be found in any other part of the Bible, is the great metropolis of Assyria of the time. Tyre, great in the days of David, and mentioned already in Joshua, is not to be met with in the Pentateuch, where a later writer would certainly have spoken of it in connection with Sidon. The Canaanite gods and altars are often spoken of; never their temples, of which yet we read in Joshua. Why, then, should that very ancient author, to whom must needs be traced the Pentateuch, not be Moses himself, rather than some contemporary of his? The fragmentary, abrupt, and, as it were, confused character of the work, the apologists further urge, so far from testifying against Moses, confirm the tradition of his authorship. Would not a later historian have worked the mixed mass of historical, geographical, legal, and personal material into a methodical and systematical whole? Who else could have imparted to the book the impress of a diary, so to say, but the man who was in the midst of the events, jotting down all the items important either in his own individual or the national career? And who but one standing in its very center could depict with such glowing colors the life that moved around him?—But a further direct argument for the authenticity is found by them in the very item of the language of the Pentateuch.

True, they say, it resembles as much as can be that of later books, because, as we said before, it remained the classical language for all later generations; but, on the other hand, it offers certain peculiarities—such as the use of a common pronoun of the third person singular for both the masculine and feminine genders; the same term for boy and girl; and the like archaisms—all of which distinctly prove it to be a work of a very much older date. The existence of an ancient Mosaic code of laws would further appear proved beyond any doubt by the constant recurrence of quotations from 'the Law of Jehovah' or 'the Law of Moses' throughout the other books of the Old Testament from Joshua to Hosea. Had there in reality been no such code in existence, the authors of the different biblical works could not possibly have so unanimously spoken of it without betraying a conscious forgery somewhere. That Ezra should have been the author, or, at all events, the refounder of the Pentateuch, is equally improbable, on account of the spirit, tone, language, and all those smaller peculiarities of which mention has been made; and he would, on the other hand, never have been able so skilfully to avoid his own individual manner and style, as it appears in his own book. The Samaritan P., it is further said, which, with a very few characteristic alterations, is an accurate transcript of our Pentateuch, would have been an utter impossibility, considering the hostile relations between the Samaritans and the

Jews, if it had not been well known as a genuine document before the division of the empire. That Hilkiah, who is said to have *found* the Book of the Law in the temple in the days of Josiah (2 Kings, xxii.; 2 Chron. xxxiv.) should have been its real author—an opinion first advanced by De Wette—would imply a complicity in the forgery not only on the part of Jeremiah, Huldah, and the elders, but almost of the whole people, among whom, on the contrary, there certainly seems to have been living a very vivid tradition of the former existence of the book or some of its portions at least. Moreover, had it been first written in those days, there surely would have been introduced some kind of prophetical allusion to the royal house of David, or, at all events, a pedigree and origin differing from the incestuous one given in Gen. xxxviii.

Deuteronomy would altogether have changed its language about Royalty (xvii. 15—20) very considerably; and Joseph's would not have stood out so prominently as a favored tribe. The alleged difficulties respecting the numbers are explained away more or less convincingly—in the most difficult cases, by miraculous interferance. Corruptions, interpolations, and the many fates that befall ancient documents, are allowed to have crept in, in some places; although this argument is given up by those who hold that a special providence watched over the divine work. In all other respects, they hold these books are exactly as they were written by Moses under direct 'Inspiration'—thus far, in swiftest outlines, the pros and contras most commonly adduced, and worthy of some consideration.

A few rationalistic critics, however, have gone so far as to deny the very possibility of Moses having given the laws contained in the Pentateuch, chiefly founding their objections upon the ground that he was not likely to have been versed in the art of writing to an extent which the composition of these laws would presuppose. Egyptian characters, with which he might have been familiar, could not have been used for Hebrew composition; and the Hebrews themselves, uncultivated as they were, did not possess any characters of their own. There has only, in reply to these objections, that fact to be stated, that a soberer criticism of more recent date has found itself obliged, in deference to certain paleographical and other scientific truths, to give up most of these points, or, at all events, to found no such sweeping condemnation upon those which still remain. On the contrary, whichever of the hypotheses enumerated at the beginning is assumed, the groundwork of the legislation is traced back, by almost unanimous consent, to the historical person of Moses, who is no longer the mythical demigod of barbarous hordes, but a man. The final redaction of these laws—of which many of later date are found to be wholly inconsistent with the earlier corresponding laws—as of the whole of the Pentateuch, is almost as unanimously placed in ages long after him.

In the contemporary 'moderate' school in England, so far as we have been able to glean from their writings, the following seems to be the prevalent opinion on the point of the Mosaic authorship: It is allowed, that Moses did not write the whole of the Pentateuch, but portions of Exodus, Leviticus, and Numbers, and the whole of Deuteronomy, with the exception of the account of his death, and such portions as palpably show an author who points to the imminent dissolution of the empire. That even the fundamental Law (Decalogue) should be found in two varying versions, they hold, strengthens rather the assumption of their genuine Mosaic authorship in some original shape. The later editor, finding two different recensions made by contemporaries, or in subsequent ages, embodied them both, on account of their paramount importance, literally. Genesis was worked up from ancient documents, composed by various writers, living at various 'prehistoric' periods, either by Moses himself, or under his supervision, by some of the elders. The first redaction of the five books as a whole took place after the conquest of Canaan, through Joshua and the elders; the second and final redaction, however, in which it received its present shape, is to be dated from the time of Ezra, after the return from the exile.

The majority of continental modern critics of the more moderate stamp—who repudiate the notion of their belonging to the advanced rationalistic party—hold opinions of a very different kind; and since they have found professed partisans in England, the foremost of whom is Dr. Davidson, we will make use of his own words (*Introduction to the Old Testament*): 'There is little external evidence for the Mosaic authorship; and what little there is, does not stand the test of criticism. The succeeding writers of the Old Testament do not confirm it. The venerable authority of Christ himself has no proper bearing on the question. The objections derived from internal structure are conclusive against the Mosaic authorship. Various contradictions are irreconcilable. The traces of a later date are convincing. The narratives of the Pentateuch are usually trustworthy, though partly mythical and legendary. The miracles recorded were the exaggerations of a later age. The voice of God cannot, without profanity, be said to have externally uttered all the precepts attributed to him. Moses's hand laid the foundation of the edifice of God's word, which has grown into the proportions in which we now possess it; but he was not the first writer who penned parts of the national legends and history. He was emphatically a *lawgiver*, not a historian, a grand spiritual *actor* in the life-drama of the Israelites, who founded their theocratic constitution under the direct guidance of the Supreme.'

A few words must be added respecting the use of the Pentateuch. According to Deut. xxxi. 24seqq., it was preserved in the Ark of the Covenant. Every seventh year it had to be read to the people in public; and probably the Schools of Prophets, instituted at the time of Samuel, propagated its use by copies. Moreover, certain priestly, sanitary, and other laws required constant reference to it, so that certain portions of it seem to have been widely in use at an early period. Every synagogue is, according to the traditional Law, to possess a roll of the Torah, written on parchment, and under certain strictly-insisted-upon regulations, out of which roll certain portions are read on Sabbath and feast-days; and, according to the ancient custom in Palestine, when Monday and Thursday were the market-days—when the country-people came to town and the judges sat—also on those days. A smaller portion (Parasha) is read on these and on the afternoon service of the Sabbath than on the Sabbath morning service, when a whole Sidra is read, or rather chanted, according to the *Neginah*, which is note and accent at the same time. The Samaritans have, of all biblical books, only adopted the Pentateuch, with slight variations (see SAMARITANS), their Book of Joshua being a very different work from ours; and certain very recent accounts of their possessing also other adaptations of our biblical books, require confirmation. For the different translations of the Pentateuch, ancient and modern, see BIBLE. The first printed edition of the Pentateuch dates Bologna, 1482, fol. The name of commentators and writers on the whole of the Pentateuch, both in and out of the Church, is legion. We mention among the foremost, besides the Church Fathers (Augustine, Jerome, Ephraim, Syrus, &c.) and the medieval Jewish commentators (Raspi, D. Kimchi, Aben, Ezra), Calvin, Luther, Grotius, Père Simon, Le Clerc, Michaelis, Eichhorn, Jahn, De Wette, Keil, Hävernick, Bleek, Hengstenberg, Ranke, Kurtz, Sähelin, Ewald, Bertheau, Colenso, Graves, Stuart, Bush, &c.

PE'NTECOST (Gr. *pentecosté*, fiftieth) was the name given to the feast among the Jews, held on the fiftieth day after the passover, in celebration of the 'ingathering,' and in thanksgiving for the harvest. See FESTIVALS. From the Jewish use it was introduced into the Christian, and with special solemnity, as being the day of the descent of the Holy Ghost on the apostles, and of the first solemn preaching of the Christian religion. From very early times, pentecost has been regarded as one of the great festivals of the Christian year, and it was chosen as one of the times for the solemn administration of baptism; and the English name of the festival, *Whit-Sunday*, is derived from the *white* robes in which the newly-baptized were clad. It is regarded as specially sacred to the Third Person of the Blessed Trinity, to whose honor the services of the day are directly addressed. Many curious usages were anciently connected with the celebration. The dove, being held as an emblem of the Holy Ghost in some churches, a figure of a dove, suspended by a cord from the ceiling, was lowered so as to alight on the high altar during the service. In others, figures of cloven tongues, or red rose-leaves, were similarly introduced. The latter practice is said to be still retained at Messina, but in general these scenical representations have been discontinued. In some places however, in the East as well as in the West, the practice prevails of decorating the churches with evergreens and flowers, as is done in England at Christmas. The whole time intervening between Easter and Pentecost is celebrated in the Roman Catholic church with special solemnity, and with some peculiar usages, and of this something is retained in the Church of England.

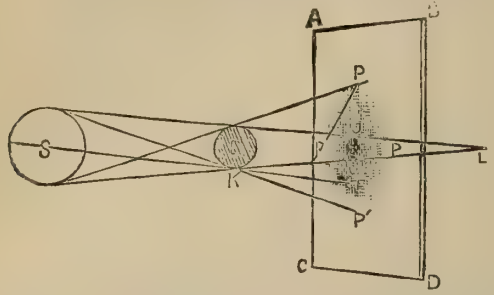
PE'NTHOUSE, a projection forming an open roof or shed, protecting a doorway, gate, window, &c.

PE'NTLAND FIRTH, a channel or strait between the Atlantic and German Oceans, separating the mainland of Scotland from the Orkney Islands. It is 17 miles long, and from 6 to 8 miles wide. About a mile west of Duncansby Head is a ferry station, whence boats cross to Burwick, in the island of South Ronaldshay, a distance of 7 miles. The Pentland Skerries, 5 miles north-east of Duncansby Head, consist of two islets, and of several contiguous rocks. On the larger of the islets is a light-house with two lights, one of which is 170, and the other 140 feet above sea-level. The lat. of the light-house is 58° 41′ N., long. 2° 55′ W. Off the coast of Caithness, and separated from it by a channel called the Inner Sound (about two miles in width), is the island of Stroma; and 3 miles north-north-east of Stroma is the islet of Swona, one of the Orkneys. On the north side of Stroma is the small vortex or whirlpool of Swalchie, and west of it are the breakers called the 'Men of Mey,' which are supposed to be

produced by a current setting strongly on a concealed reef. The navigation of the P. F. is more dangerous than that of any other portion of the Scottish seas. A current setting from west to east flows through the Firth with a velocity of from 3 to 9 miles an hour, and causes numerous eddies and whirlpools. It is estimated that about 4000 vessels with cargoes pass through the Firth annually.

PENTLAND HILLS, in the Lowlands of Scotland, extend north-east from the border of Lanarkshire to the center of the county of Edinburgh, and to within 4 miles of the city of that name. The mean height is upwards of 1000 feet; the highest summit, Carnethy Cairn, in Edinburghshire, has an elevation of 1884 feet.

PENU'MBRA. When the shadow of an opaque object is thrown upon a surface at some little distance by a light of considerable apparent size, it is observed that the shadow is divided into two portions, a dark portion in the center, and a lighter portion surrounding it. The former is known as the *umbra*, or complete shadow; the latter as the *penumbra*, or partial shadow. A



reference to the figure will at once make plain their origin and relation; for if S be the illuminating body, E the object whose shadow is cast on the surface, ABCD, it is seen that the small portion, *uu*, receives (omitting all consideration of refraction, dispersion, &c., of light) *no* light from S, while the whole surface outside of PPPP′ is completely illuminated. The point P′ receives light from the whole of S; the point F is only half illumined, and that by the lower part of S, the illumination of the points becoming less and less as they approach *u′*, which is unillumined. The portion within *uu′* is the umbra and that between the boundaries PPPP′ and *uu′* is the penumbra, which, as we have seen, gradually shades from perfect light at the outer boundary to perfect darkness at the inner, so that it is almost impossible exactly to note its limits on either side. This phenomenon, it is evident, can only occur when the illuminating body is of such a size, real or apparent, as to make the angle, P′K*u′*, of sensible magnitude; and it is equally evident that the nearer the body E approaches the plane on which its shadow is cast, the larger is the umbra and the smaller the penumbra; while by increasing the distance between E and the plane, so that the point L shall fall between them, the umbra is made to vanish, and the penumbra is increased. This is well illustrated by natural phenomena: the shadow of a man cast by the sun on the ground presents almost no penumbra; the shadow of the earth thrown by the sun upon space at the distance of the moon gives a penumbra many times as large as the umbra; and sometimes, when the moon is new at her apogee, for instance, her shadow cast upon the earth exhibits no umbra. Spectators on the earth who see a partial eclipse of the sun, are situated within the penumbra, but within the umbra when they observe a total eclipse; while if the eclipse be annular, the umbra does not exist in the shadow cast by the moon on the earth's surface. See ECLIPSES.

PE'NZA, a central government of European Russia, between the government of Nijni-Novgorod on the north, and that of Tambov on the west. Area, 15,000 sq. m.; pop. (1879) 1,332,598. The surface is in extensive and elevated plains, marked occasionally with ridges of low hills. The rivers are tributaries of the Don and Volga, and three of them, the Khoper, the Soura, and the Moksha, are navigable. The climate, though rather cold in winter, is temperate, agreeable, and healthy. The soil, consisting for the most part, of black earth, is extremely fertile, and agriculture is the principal employment of the inhabitants. Grain of different kinds, leguminous plants, beet-root, flax, hemp, tobacco, and hops are the principal products. Much of the grain is used in the numerous distilleries, and considerable quantities of it are exported to the neighboring governments. About one-third of the entire area is covered with forests, some of which consist entirely of oak-trees. The manufactories are centered chiefly in the towns; cloth and leather are the principal articles made. The commercial improvement of the government is hindered by the want of direct means of communication with the consuming districts. The principal towns are Penza, Mokshansk, and Saransk.

PENZA, a town of European Russia, capital of the government of the same name, on the Soura, 220 miles south-south-east of Nijni-Novgorod. It was founded in the middle of the 17th c., as a defence against Tartar invasion, is a handsome town, occupying an elevation, and containing 19 churches, 2 convents, many gardens, a large park, with a beautiful fruit-garden and a horticultural school. It possesses cloth-factories, iron-works, tanneries, soap-boiling and candle-making establishments. The principal articles of commerce are corn and timber, which is floated down the Soura during Spring. Pop. (1880) 35,000.

PENZA'NCE, a market and sea-port town, and a municipal borough of England, in the county of Cornwall, stands on the north-west shore of Mount's Bay, 22 miles west-south-west of Falmouth. It is the most westerly town in England—the lighthouse on its pier being in lat. 50° 7′ N., and in long. 5° 28′ W. The town, standing on a finely-curved shore, surrounded by rocky eminences, and in a fertile district, is exceedingly picturesque in situation, and is famous for its mild, though somewhat moist climate. Its esplanade, one of the finest in the west of England, commands charming land and sea views. The chief buildings, most of which are constructed of granite, are the town-hall and corn-market, surmounted by a dome, and the chapels of St. Paul and St. Mary. There are numerous boarding-houses for the accommodation of the visitors, attracted hither by the temperate and equable climate, by the beauty of the neighboring scenery, and the curiosities of the district of Land's End. Woollen yarns and cloths are manufactured; the fishery employs upwards of 2000 persons; agricultural produce, pilchards, and tin and copper ores produced from the mines of the vicinity are exported; and timber, iron, hemp, and hides are the chief imports. The harbor is accessible for vessels of considerable burden, and is furnished with a pier 800 feet in length. In 1880, 789 vessels, of 65,671 tons, entered the port, and 738, of 59,261 tons, cleared it. Pop. (1871) 10,414; (1881) 11,684. P. was laid in ashes by a party of marauding Spaniards in 1595, and was sacked by Fairfax in 1646. At P. is a statue to Sir Humphry Davy.

PE'ON. See CALOPHYLLUM.

PEO'RIA, a city and port of entry in Illinois, U.S., on the west bank of the Illinois River, which is crossed by two bridges of 2500 feet, at the outlet of Peoria Lake, 70 miles north of Springfield, and 160 miles south-west of Chicago. It is connected by steamboat navigation with the Ohio and Mississippi, by canal with Lake Michigan, and is an important station on the great network of western railways. Bluffs of bituminous coal, opening upon the river banks, supply numerous manufactories. There are 28 churches, and numerous schools and public institutions. Pop. (1870) 22,849; (1880) 55,419.

PEPÉ. Three Neapolitans of this name have played an important part in history. The first of these was GABRIELE PEPE, who was born in 1781 at Bojano, in the present province of Molise, Italy, and was a student of law in 1799, when, on the proclamation of the Parthenopæan Republic, he took service in the Franco-Neapolitan army, and was consequently exiled on the fall of the new government. Subsequently he served in the Italian legion in the French army under King Joseph in Spain with great distinction, and with Murat. In 1815, he was raised by the latter to the rank of colonel, a grade confirmed by Ferdinand I., who gave him the command of a province, and afterwards of the garrison of Syracuse. He espoused with great zeal the cause of the revolutionary party in 1820, and was deputed to the national parliament. On the downfall of the constitutional government, he was seized by the Austrians, and imprisoned at Olmutz, in Moravia; but was released at the end of two years, and retired to Tuscany; where, feeling hurt at some remarks of M. de Lamartine, then charge-d'-affaires in that country, on Italian patriotism, he in turn wielded the pen in defence of his countrymen with such severity that a duel resulted between him and the poet, followed by an apology from the latter. From this time he took no part in political affairs, but devoted himself to science and literature, and died at Bojano, August 1849.—His cousin, GUGLIELMO PEPE, born in 1782 at Squillace, was a man of equal note. After serving in the French army of Catalonia, and attaining to high rank and honor, he returned to Naples to support Murat; and after the flight of that chief, was one of the leaders of the 'Muratist' party, yet, after the restoration, the Bourbon Ferdinand allowed him to retain his honors. P. rendered valuable services in rooting out (1818) the nests of brigands who infested the provinces of Avellino and Foggia, and after the insurrection of 1820, was for some months the most influential man in Naples; but, after his defeat by the Austrians at Rieti, 7th March 1821, he was forced to flee the country, and took refuge in Spain, whence he retired to England, where he lived many years, afterwards removing to Paris.

In 1848, on the proclamation of an armistice, he returned to Naples, welcomed with enthusiasm by the people and the court; and the king, constrained by the public voice, gave him the com-

mand of the Neapolitan contingent which was sent to aid the Lombards against Austria; but after the suppression of revolution in Naples (15th May), P., was ordered to return and put down the insurgents of Calabria. Disregarding these orders, P., with as many of the Neapolitans as would adhere to him (2000 men), devoted his energies to the defence of Venice, of whose army he had been elected commander-in-chief. His prudence and courage, joined to an untiring energy, enabled him greatly to retard the operations of the Austrians; but the force under his command was ill suited for effecting anything of importance. His most remarkable exploit was the sortie he effected in person (October 1849) from the citadel of Marghera. After the fall of Venice, P. fled to Corfu on board a French ship, and subsequently returned to Paris. He had, however, an antipathy to France, and speedily removed to Turin, where he died 9th August 1855. He has left several works, the chief of which are, *Relation des Evenements Politiques et Militaires de Naples en* 1820 *et* 1821 (Paris 1822, in Italian and French), and *Histoire des Revolutions et des Guerres d' Italie en* 1847, 1848, *et* 1849 (Paris, 1850). A statue of him has been erected in Turin.—His elder brother, FLORESTANO P. (born 1780, died 1851), was also a Muratist, but submitted to Ferdinand. He was a mild and conciliatory, but feeble liberal.

PEPERI'NO, an Italian term, applied by some geologists to the brown volcanic tuffs derived from augitic rocks, to distinguish them from the ordinary tufas, which name they confine to the lighter-colored pumiceous rocks that have more trachyte in their composition.

PEPIN, the name of several distinguished members of the Carlovingian family; the first of whom in order was PEPIN LE VIEUX or PEPIN DE LANDEN, the founder of the family. He was of a Brabant family, and took his designation from Landen (now in Liege, Belgium). Rebelling with others of the great lords of Austrasia against the rule of Brunehaut, who was regent for the youthful king, he offered the crown to Clotaire II., king of Neustria, who, in reward of his services, created P. *maire du palais* of Austrasia, an office which he continued to hold during the two following reigns, and died in 639. His administration was directed to the preservation of the power and integrity of the Austrasian kingdom, and though, by opposing the various schemes of centralization proposed by the king, he fell under the royal displeasure, his conduct gained for him favor and influence with the Austrasian chiefs; his power and wealth were greatly increased, and a broad and firm path to political supremacy laid for his descendants. His son, Grimoald, who succeeded him as *maire du palais*, incautiously attempted to gather the fruits of his father's schemes before they were quite ripe, and accordingly suffered for his folly. Both he and his son Childebert were strangled in prison (656) by order of Clovis II. Pepin 'the Old' left by his daughter a grandson, PEPIN LE GROS or PEPIN D'HERISTAL, who was elected by the Austrasian nobility as their chief, to protect Austrasia against the machinations of Elroin, the able *maire* of Neustria. His first step was to rid himself of the Merovingian king, who nominally ruled over Austrasia; which was effected by obtaining the condemnation of the unfortunate monarch, Dagobert II., by a council of bishops, and then putting him to death. From this time the Merovingian rule in Austrasia ceased. P. was now sole ruler, but his ambition did not stop here; he had resolved on the ruin of the Merovingian monarchs, and accordingly levied a large army for the invasion of Neustria. Elroin, on his side, was equally resolved to humble the territorial aristocracy, and support the throne; and advancing into Austrasia, his army came in sight of P.'s at Loixi. In the battle (680) which ensued, P.'s army was totally defeated, his brother and co-ruler, Martin, was taken prisoner and put to death, and he himself narrowly escaped.

Luckily for him, however, Elroin was soon afterwards assassinated, and his successor, Warato, signed a treaty of peace. The incapacity and tyranny of Warato and his successor, Berthaire, discontented the Neustrian nobles, who went over to P., and by this accession of power enabled him to resume the offensive. Neustria was immediately invaded, and a bloody but decisive battle at Testry (687) freed P. of his opponent Berthaire, who was left dead on the field, and placed Neustria at his feet. Full of moderation in the midst of triumph, and satisfied that he could not place on the throne a more obedient slave than Thierry III., the then king of Neustria, P. caused him to be also proclaimed king of Austrasia, but reserved for himself the sovereign power, wielding the sceptre though declining the crown. From this time he ruled the whole of France (Austrasia in his own right by his election as Duke, and Neustria as *maire du palais*) with energy, and undisturbed by any internal commotion, during the lives of three other 'faineant' kings, till his death in 714. He had made several campaigns (689—708) against the Frisians, but that valiant and independent race was not thoroughly subdued for some time afterwards. P. had two legitimate sons who died before him, and an illegitimate son, Charles, subsequently known as Charles Martel (q. v.), who succeeded to his power.—The third who bore this name was PEPIN LE BREF, the younger son of Charles Martel, who, on the death of his father in 741, received Neustria and Burgundy; Austrasia, Thuringia, and Suabia being the heritage of his elder brother Carloman. Aquitaine was nominally a part of P.'s dominions, though, as it was really independent under its own duke, he made several attempts to subdue it; but the duke was quite able to hold his own against both P. on the one hand and the Arabs (from Spain) on the other. The farce of governing the country in the name and as the chief minister of the Merovingian sovereign was still kept up, though P. was eagerly longing for an opportunity to assume the crown; but the present time was inopportune, as no sooner was the restraint of Charles Martel's iron hand removed by death, than revolts broke out in all quarters among the Franks, Germans, Bavarians, and Gascons.

The country, by the united exertions of P. and Carloman, was restored to tranquillity about 745. Those princes who had excited the insurrection were mostly deposed, and otherwise punished, and the Duke of Aquitaine was compelled to acknowledge at least the nominal sovereignity of Pepin. In 747, Carloman bade adieu to power, and retired into a convent, leaving his government to his sons, who were immediately dispossessed by Pepin. After crushing a rebellion of Saxons and Bavarians, P. began to carry out his favorite project of dispossessing the Merovingian dynasty of even the semblance of authority, and of originating in person a new royal dynasty. To gain his point he flattered the clergy, then the most influential body in France; and as they had been despoiled by Charles Martel for the behoof of his warriors, a moderate degree of kindness and generosity on the part of P. contrasted him so favorably with his father, that the clergy at once became his partisans. So did the pope, who felt the importance of securing the aid of the powerful Frankish chief against the Lombards, who were then masters of Italy, and released the Franks from their oath of fidelity to Childeric, the Merovingian monarch. On learning this, P. at once caused himself to be elected king by the assembly of estates at Soissons, and was consecrated by the Bishop of Mayence (March 752). Childeric retired to a convent, where he died in 755. P. was the first Frankish monarch whose election received the sanction of the pope, and who was consecrated to his high dignity; and these solemn ceremonies put the crown to a great extent at the mercy of the clergy, who from this time took a political rank in the state. The practice, too, followed by P. and his predecessors in office, of gaining partisans, by granting particular fiefs to various chiefs, greatly strengthened the feudal system, and proportionally weakened the royal power. This effect, however, did not show itself till after the subsequent reign of Charlemagne, on account of the personal genius of these two rulers. P. was soon called upon to aid the pope against the Lombards, and marching into Italy at the head of a large army, he compelled Astulf, the Lombard king, to retire from the siege of Rome, and restore several cities which had previously belonged to the Greeks; these were now handed over to the pope. He had hardly returned to France, when he was anew summoned (755) to Italy, the Lombards having broken their engagments.

This time he took Ravenna, Emilia, the Pentapolis, and the duchy of Rome from the Lombards, reuniting them to the Holy See. After the settlement of affairs in Italy, the turbulent nations on his eastern frontier demanded his attention. The Saxons and other German tribes were defeated (757), their country cruelly ravaged, a heavy tribute exacted, and numbers of captives and hostages taken. Resolved to unite the whole of Gaul under his authority, he eagerly accepted the invitation of the Visigoths of Septimania to aid them against the Arabs, who had taken possession of the country; and after a war of many years' duration, Narbonne, the last of the Arab strongholds, was taken, and the country freed of these invaders, at once acknowledged P.'s authority. The remaining years of his reign were occupied in reducing the independent monarchy of Aquitaine, which was not accomplished till, after nine years (760—768) of desolating warfare. P. obtained the assassination of his opponent, Duke Waifre, whose partisans then laid down their arms, surrendering to the Frankish monarch the vast provinces which stretch from the Loire to the ocean and the Pyrenees. Shortly after this conquest, P. died of dropsy, September 768. He was a most active, enterprising, and in general fortunate prince; he established the unity of the Gallic nation, and protected it as far as could be done by invading and ravaging the territories of the neighboring nations, though he also introduced those elements of weakness into its constitution, which reduced the authority of his successors to such a deplorable state. The others of this name, though important personages at the time, make little figure in history.

PEPPER (*Piper*), a genus of plants of the natural order *Piperaceæ* (q. v.), which once included the whole of that order; but, as now limited, consists of plants with woody stems, solitary spikes opposite to the leaves, and covered with flowers on all sides, the flowers mostly hermaphrodite

The most important species is COMMON P. or BLACK P. (*P. nigrum*), a native of the East Indies, now cultivated also in many tropical countries, and extensively in some parts of the New World; its fruit being the most common and largely used of all spices. It is a rambling and climbing shrub, with smooth and spongy stems, sometimes twelve feet in length; and broadly ovate, acuminate, leathery leaves. The fruit is about the size of a pea, of a bright-red color when ripe, not crowded on the spike. In cultivation, the P. plant is supported by poles, or by small trees planted for the purpose, as it loves a certain degree of shade, and different kinds of trees are often planted for this purpose in India. It is propagated by cuttings, comes into bearing in three or four years after it is planted, and yields two crops annually for about twelve years. When any of the 'berries' of a spike begin to change from green to red, all are gathered, as when more fully ripe they are less pungent, besides being apt to drop off. They are spread on mats and separated from the spikes by rubbing with the hands or by treading with the feet, after which they are cleaned by winnowing. The *Black P.* of commerce consists of the berries thus dried, and become wrinkled and black; *White P.* is the seed freed from the skin and fleshy part of the fruit, to effect which the dried fruit is soaked in water and then rubbed. White P. thus prepared is of a whitish-gray color, but not unfrequently undergoes a bleaching by chlorine, which improves its appearance at the expense of its quality. Black P. is much more pungent than White P., the essential constituents of the spice being more abundant in the outer parts of the fruit than in the seed. P. depends for its properties chiefly on an acrid resin and an acrid volatile oil; it contains also a crystalline substance called *Piperin*.

The fruit of *Piper trioicum*, a species very similar to the Common P., is more pungent; and it is cultivated in some parts of India.—The fruit of other species of *Piperaceæ* is used as pepper in their native countries; that of *Cocobryon Capense* at the Cape of Good Hope; that of *Peltobryon longifolium*, of *Artanthe crocata*, of *A. trichostachya*, and of *Serronia jaborandi* in South America.—*Chavica Roxburghii* and *C. officinarum* yield the LONG PEPPER of druggists. They have woody climbing stems, solitary spikes opposite to the leaves, dicœcious flowers, and the fruits so close together on the spikes as in ripening to become a compact mass. The spikes are gathered when unripe, and dried in the sun. They are used in pickling and for culinary purposes, also in medicine for the same purposes as Common Pepper. They are generally reputed to be more pungent than Common Pepper. *C. Roxburghii* is cultivated in Bengal and the Circars, where it is called *Pippul; C. officinarum* in the Dutch East Indian colonies. The root and thickest part of the stem of *C. Roxburghii* are extensively used in India as a stimulant medicine; and are cut into small pieces, dried, and brought to the market under the name of *pippula moola*.

P. acts on the skin as a rubefacient and vesicant, and is often used for this purpose in a powdered state, moistened with some kind of alcoholic spirit. It is also employed as a local stimulant in relaxation of the uvula, and is applied in the form of an ointment to ringworm. Taken into the stomach in small quantities it is a pleasant stimulant, but in large doses it produces great pain and irritation. The quantity used, however, by the natives of hot climates much exceeds anything known among Europeans, and the effects are evidently beneficial rather than injurious. The chief use of P. is as a spice and condiment.

P. was known to the ancients; Hippocrates employed it as a medicine; and Pliny expresses his surprise that it should have come into general use, considering its want of flavor. In the middle ages P. was one of the most costly spices, and in the 13th c. a few pounds of it were reckoned a princely present. The quantity now imported into Europe is immense; but there are no means of exactly ascertaining how much of the P. of commerce is the produce of *Piper nigrum*, or indeed of the *Piperaceæ*, and how much—although certainly it is not a large proportion of the whole—is the produce of species of *Capsicum*.

The name P. is popularly given to substances possessing a pungency resembling that of P., although produced by very different plants. Thus, CAYENNE P. is the produce of species of *Capsicum*, of the natural order *Solanaceæ;* JAMAICA P. (or PIMENTO) of species of *Eugenia*, of the natural order *Myrtaceæ;* and GUINEA P., or MELEGUETTA P., of species of the natural orders *Scitamineæ* and *Anonaceæ*. See CAPSICUM, PIMENTO, GRAINS OF PARADISE, and GUINEA PEPPER.

PE'PPERMINT. See MINT.

PEPPER-POT, a celebrated West Indian dish, of which Casareep (q. v.) is a principal ingredient; and along with it flesh or dried fish, vegetables, chiefly the unripe pods of the ochro (see HIBISCUS), and chillies (see CAPSICUM).

PEPPER-ROOT (*Dentaria diphylla*), a perennial herbaceous plant, of the natural order *Cruciferæ*, a native of North America, with pairs of ternate leaves, and racemes of white flowers; the root of which has a pungent mustard-like taste, and is used as a condiment.

PE'PSINE has been already described (in the article DIGESTION) as one of the essential constituents of the gastric juice. Various modes of extracting it from the walls of the stomach of the calf, sheep, and pig have been proposed by different chemists (Wasmann, Frerichs, Schmidt, Boudault, and others), into which it is unnecessary to enter. According to Schmidt's analysis, it contains 53·0 per cent. of carbon, 6·7 of hydrogen, 17·8 of nitrogen, and 22·5 of oxygen, and hence in its ultimate composition it is closely allied to albumen. This substance, either as a powder or in solution, has been employed of late years to a considerable extent in medical practice, in cases of disorded digestion from deficient or imperfect secretion of gastric juice, and of convalescence from typhoid and other debilitating fevers. Pepsine wine is perhaps the best form in which to prescribe this substance; a teaspoonful being the ordinary dose.

PEPYS, SAMUEL, a distinguished officer of the Admiralty during the reign of Charles II and James II., was born February 23, 1632—1633. He was the son of a London citizen, a tailor, but was well educated, first at St. Paul's School, and afterwards at Magdalen College, Cambridge. His cousin, Sir Edward Montagu (the first Earl of Sandwich), introduced him to public employment. In 1660 he was appointed Clerk of the Acts of the Navy, and in 1673 Secretary for the affairs of the Navy. He was an excellent public servant, acute, diligent, and laborious; but during the fanatical excitement of the Popish Plot he was committed to the Tower, on an unfounded and absurd charge of aiding in the design to dethrone the king and extirpate the Protestant religion. Having been discharged without a trial, P. was replaced at his post in the Admiralty, which he retained till the abdication of James II. For two years he held the honorable station of President of the Royal Society. He died May 26, 1703. P. wrote *Memoirs of the Royal Navy*, 1690, He left to the Magdalen College his large collection of books, MSS., and prints, including about 2000 ancient English ballads, forming five folio volumes. This curious collection was begun, he says, by Selden, and continued down to the year 1700, when the form peculiar to the old ballads, namely, the black letter with pictures, was laid aside for the simpler modern fashion. P. is now best remembered for his *Diary*, deciphered by the Rev. J. Smith from the original shorthand MS. in the Pepysian Library, Cambridge, and first published, under the editorial care of Lord Braybrooke, in 1825. It commences on the 1st of January 1659—1660, and is continued for above nine years, when the diarist was obliged from defective eyesight to abandon his daily task. As a picture of the court and times of Charles II. this *Diary* is invaluable; the events, characters, follies, vices, and peculiarities of the age are presented in true and lively colors, and the work altogether is one of the most racy, unique, and amusing books in the language. Bright's edition (1875–80) is in 6 vols. See Wheatley's *P. and the World he lived in* (1880).

PE'RA, a suburb of CONSTANTINOPLE (q. v.).

PERAK, one of the largest Malay states in the peninsula of Malacca, extends about 90 miles along the Strait of Malacca, and some 45 miles inland. The soil is fertile, and for the most part covered with luxuriant vegetation. The mineral wealth is very great, and comprises abundance of tin, some gold and plumbago, and poor coal. Elephants, tigers, leopards, bears, and boars, and occasionally a rhinoceros, are found. P. is thinly inhabited by various races, of whom the Malays are the most numerous. Some of the others are of the same stock as the inhabitants of Sumatra; there are wild hill-tribes in the interior. Cannibalism is still practised by some of these races. P. is governed by a sultan and petty chiefs, who have of late come under British influence, represented by a Resident and his assistants. The murder of the British Resident in 1875 has made the name of P. more familiar to Englishmen. See Major M'Nair's *P. and the Malays* (1877).

PERAMBULA'TION OF PARISHES. The ancient custom in England of perambulating parishes in Rogation week had a twofold object. It was designed to supplicate the Divine blessing on the fruits of the earth; and to preserve in all classes of the community a correct knowledge of, and due respect for, the bounds of parochial and individual property. It appears to have been derived from a still older custom among the ancient Romans, called Terminalia, and Ambarvalia, which were festivals in honor of the god Terminus and the goddess Ceres. On its becoming a Christian custom the heathen rites and ceremonies were of course discarded, and those of Christianity substituted. It was appointed to be observed on one of the Rogation (q. v.) days, which were the three days next before Ascension Day. Before the Reformation parochial perambulations were conducted with great ceremony. The lord of the manor, with a large banner, priests in surplices and with crosses, and other persons with handbells, banners and staves, followed by most of the parishioners,

walked in procession round the parish, stopping at crosses, forming crosses on the ground, 'saying or singing gospels to the corn,' and allowing 'drinkings and good cheer' (Grindal's *Remains*, pp. 141, 241, and *Note;* Whitgift's Works, iii. 266—267; Tindal's Works, iii. 62, 234, Parker Society's Edition), which was remarkable, as the Rogation days were appointed fasts. From the different practices observed on the occasion the custom received the various names of *processioning*, *rogationing*, *perambulating*, and *ganging the boundaries;* and the week in which it was observed was called *Rogation week; Cross week*, because crosses were borne in the processions; and *Grass week*, because the Rogation days being fasts, vegetables formed the chief portion of diet.

At the Reformation, the ceremonies and practices deemed objectionable were abolished, and only 'the useful and harmless part of the custom retained.' Yet its observance was considered so desirable, that a homily was prepared for the occasion; and injunctions were issued requiring that for 'the perambulation of the circuits of parishes, the people should once in the year, at the time accustomed, with the rector, vicar, or curate, and the substantial men of the parish, walk about the parishes, as they were accustomed, and at their return to the church make their common prayer. And the curate, in their said common perambulations, was at certain convenient places to admonish the people to give thanks to God (while beholding of his benefits), and for the increase and abundance of his fruits upon the face of the earth, with the saying of the 103d Psalm. At which time also the said minister was required to inculcate these, or such like sentences, Cursed be he which translateth the bounds and doles of his neighbor; or such other order of prayers as should be lawfully appointed.' (Burn's *Ecclesiastical Law*, vol. iii. 61.)

To this day, questions of disputed boundary between parishes are invariably settled by the evidence afforded by these perambulations; for in such questions, immemorial custom is conclusive. And so far are they recognized in law, that the parishioners on such occasions are entitled to trespass on lands, and even to enter private houses if these stand on the boundary line. In Scotland, where the parochial principle has never been developed as in England, there seem to be few traces of a similar practice. But, as between neighboring landowners, a brieve of perambulation is the technical remedy for setting right a dispute as to boundaries or marches; and perambulating or 'riding' the bounds of boroughs is a common practice.

The necessity or determination to perambulate along the old track often occasioned curious incidents. If a canal had been cut through the boundary of a parish, it was deemed necessary that some of the parishioners should pass through the water. Where a river formed part of the boundary line, the procession either passed along it in boats, or some of the party stripped and swam along it, or boys were thrown into it at customary places. If a house had been erected on the boundary line, the procession claimed the right to pass through it. A house in Buckinghamshire, still existing, has an oven passing over the boundary line. It was customary in the perambulations to put a boy into this recess to preserve the integrity of the boundary line.

At various parts of the parish boundaries, two or three of the village boys were 'bumped'—that is, a certain part of the person was swung against a stone wall, a tree, a post, or any other hard object which happened to be near the parish boundary. This, it will scarcely be doubted, was an effectual method of recording the boundaries in the memory of these *battering-rams*, and of those who witnessed this curious mode of registration.

The custom of perambulating parishes continued in some parts of the kingdom to a late period, but the religious portion of it was generally, if not universally omitted. The custom has, however, of late years been revived in its integrity in many parishes.

PERCE'PTION. This word refers to our reception of knowledge through the senses, an operation that to the common understanding seems simple enough, but, viewed philosophically, is attended with much difficulty. Perception, considered as a source of knowledge, refers exclusively to the outer, or the object world —the world of extended matter and its properties. The names for the act of knowing one's own mind—the feelings and thoughts of the individual—are Self-consciousness and Self-introspection. The word 'consciousness,' is sometimes improperly limited to this signification. Locke used the term 'Reflection' for the same meaning, but this is ambiguous, and is now disused. All our knowledge is thus said (by those that deny innate ideas) to spring from two sources—Perception and Self-consciousness.

Two great disputes connect themselves with Perception, both raised into their full prominence in the philosophical world by Bishop Berkeley. The first is the origin of our judgments of the Distances and real Magnitudes of visible bodies. In opposition to the common opinion on this subject, Berkeley maintained that these were learned by experience, and not known by the mere act of vision. See VISION.

The second question relates to the grounds we have for asserting the existence of an external and material world, which, in the view of Berkeley was bound up with the other. Inasmuch as perception is a mental act, and knowledge is something contained in a mind, what reason have we for believing in the existence of objects apart from our minds? or what is the mode of existence of the so-called external world?

The following sentences show in what manner Berkeley opened up the question: 'That neither our thoughts, nor passions, nor ideas, formed by the imagination, exist without the mind, is what everybody will allow; and it seems no less evident that the various sensations or ideas imprinted on the sense, however blended or combined together (i. e., whatever objects they compose), cannot exist otherwise than in a mind perceiving them. I think an intuitive knowledge may be obtained of this by any one that shall attend to what is meant by the term *exist* when applied to sensible things. The table I write on, I say, exists—i. e., I see and feel it; and if I were out of my study, I should say it existed, meaning thereby that if I was in my study I might perceive it, or that some other spirit actually does perceive it. There was an odor—i. e., it was smelled; there was a sound—that is to say, it was heard; a color or figure, and it was perceived by sight or touch. This is all I can understand by these and the like expressions. For as to what is said of the absolute existence of unthinking things, without any relation to their being perceived, that seems perfectly unintelligible. Their *esse* is *percipi*, nor is it possible they should have any existence out of the minds or thinking things which perceive them.'

This doctrine of Berkeley, amounting, it was said, to a denial of the existence of a material world (which is far from a correct view of it), was followed up by Hume, who, on similar reasoning, denied the existence of mind, and resolved the universe into a mere flow of ideas and impressions without any subject to be impressed, acknowledging, nevertheless, that he felt himself unable, practically, to acquiesce in his own unanswerable arguments. There was obviously some great mistake in a mode of reasoning that brought about a dead-lock of this description; and hence it has been the work of *metaphysical* philosophy since that time to endeavor to put the perception of the world on an admissible footing.

Dr. Reid reclaimed against Berkeley and Hume, by appealing to Common Sense, or Unreasoning Instinct, as a sufficient foundation for our belief in the existence of a world apart from our own minds. Sir W. Hamilton has expounded the same view with greater clearness and precision. He considers that our consciousness tells us at once that in the act of perceiving there is both a *perceiving subject*—self, or the mind—and an *external reality*, in relation with sense, as the *object perceived*. 'Of the existence of both these things,' he says, 'I am convinced; because I am conscious of knowing each of them, not mediately in something else, *as represented*, but immediately in itself, *as existing*. Of their mutual dependence I am no less convinced; because each is apprehended equally and at once, in the same indivisible energy, the one not preceding or determining the other, not following or determined; and because each is apprehended out of, and in direct contrast to the other.'—*Reid*, p. 747.

Much as Hamilton has labored to elucidate this doctrine in all its bearings, it has not been universally accepted as satisfactory. Many believe that he has regarded as an ultimate fact of our constitution what admits of being still further resolved, and has mistaken an acquisition of the mature mind for a primitive or instinctive revelation.

Professor Ferrier, in his *Institutes of Metaphysic*, has gone through the question with extraordinary minuteness and elaboration. His main position is the inseparability of the subject and the object in perception (a position also maintained by Hamilton in the above extract), which is not reconcilable with the common assumption as to the independent existence of matter. Indeed, he reduces the received dogma of the existence of matter *per se* to a self-contradiction, and builds up a system in strict conformity with the correlation, or necessary connection, of the mind perceiving with the object perceived. He thus approaches nearer to Berkeley than to Hamilton or to Reid.

Those who would endeavor to show that our notion of the outer world is a complex fact, and an acquisition, and not a simple apprehension of the uneducated mind, explain themselves to the following effect. It is in the exercise of *force* that we have to look for the peculiar feeling of the externality of sensible things, or the distinction that we make between what impresses from without, and impressions not recognized as outward. Any impression that rouses a stroke of energy within us, and that varies exactly and constantly as that energy varies, we call an outward impression. Dr. Johnson refuted Berkeley, as he thought, by kicking a stone. But in fact it was his own action with its consequences, and not the optical impression of a stone in the eye, that satisfied him as to the existence of something outward. The sum-total of all the occasions for putting forth

active energy, or for conceiving this as possible to be put forth, is our external world.

We experience certain uniformly recurring sensations, and certain uniform changes in these, when we exert particular energies. Thus the visible picture of our dwelling in a permanent and habitual experience, and the variations of appearance that it is subject to correspond principally to our own conscious movements. As we move from one end of a room to another, we experience a change of the visible aspect at every step, and this regularly happens as often as we repeat the movement. But at times the appearance exists in another shape, to which we give the name of memory or *idea*. We draw a marked distinction between these two modes of presentation, the actual and the ideal, and we assign a superiority to the one over the other. The superiority we find connects itself with the relation to our own movements; a mere idea or mental picture remains the same whatever be our bodily position or bodily exertions; the sensation that we call the *actual* is entirely at the mercy of our movements, shifting in every possible way (but uniformly) according to the varieties of action that we go through.

With a forward movement the visible impression enlarges, with a backward movement it diminishes. A certain movement of the eye shuts it out, another restores it. The raising of the head and the bending of the body are followed by an altered spectacle. We cannot but draw a broad distinction between the mental scenery that is thus shifted by all our movements, and the ideas and dreams that vary of themselves while we are still. To express the one fact, we use the terms externality, the material world, independent existence; to express the other we employ the opposite language, internality, the world of mind, &c. Even if sensation were only in ourselves, we should still have to distinguish between present sensation and remembered or revived sensation, the reference of the one to our voluntary movements, and of the other to no such modifying causes, would oblige us to note a vital difference in the two classes of facts. Such is the uniformity of connection between certain appearances and certain movements, that we come to anticipate the one through the other. We know that in some one position, as when lying in bed, certain movements of the limbs and back will bring us to the sensation of a solid contact in the feet; that another series of movements will bring on a particular view to the sight; that a third movement will give the sound of a bell in the ear, and so forth. We cannot avoid regarding those various sensible effects, brought uniformly into play by a regular series of waking voluntary actions, as totally different from our ideas, recollections, and dreams.

As our belief in the externality of the causes of our sensations means that certain actions of ours will bring the sensations into play, or modify them in a known manner, this belief is readily furnished by experience, and is no more than our experience entitles us to entertain. When we have been repeatedly conscious that a tree becomes larger and larger to the eye in connection with a definite locomotion on our part, called the forward advance; that this movement brings on at last a sensation of touch; that this sensation of touch varies with definite movements of the arms, and so on; the repetition of all this train of experience fixes it on the mind, so that from one thing alone, as from the distant vision of the tree, we can anticipate, or as it is otherwise called, *perceive* all the other consequences. We then know, without going through the steps, that the specified movements will bring about all the sensations above described, and we know nothing else; this knowledge, however, is to us the recognition of external existence, the actual fact that is meant when a material world is spoken of. Belief in external reality is the sure anticipation of certain sensations on the performance of certain movements; everything else said to be implied in it is but a convenient hypothesis for aiding the mind in holding together those multifarious connections that our experience has established in the mind. In order to account for the fact that the conscious movement of elevating the upper eyelid is followed with the sensation of light, to us and to other minds, we suppose a luminous agency always existing even when not affecting us or any other person; we cannot know or verify this supposition—it is a generalization founded upon particular experiences, and serving to sum up those experiences in a convenient form, but no such perennial independent substance can be absolutely proved.

PERCEVAL, Spencer, Right Hon., English minister, was the second son of John, Earl of Egmont; born November 1, 1762; educated at Harrow, and at Trinity College, Cambridge. He was called to the bar, and soon obtained a reputation as a diligent lawyer. A clever pamphlet on the abatement of the impeachment of Warren Hastings, made him known to Pitt. Obtaining a seat in parliament for Northampton, he was soon conspicuous for his extreme horror of popery, and his violent advocacy of what was called by his party the 'Protestant interest.' In the Addington administration, he was made Solicitor-general in 1801, and Attorney-general in 1802. He was afterwards induced to abandon his profession, and adopt a political career. In the Portland administration of 1807, he was made Chancellor of the Exchequer, and was even then the real head of the government, his influence with George III. being obtained by the depth of his bigotry and his pertinacious opposition to the Catholic claims. On the death of the Duke of Portland in 1809, P. became Premier, uniting to his office of Chancellor of the Exchequer that of First Lord of the Treasury. He was retained in power by the Prince of Wales on his accession to the regency. On the 11th May 1812, about 5 P.M., as P. was entering the lobby of the House of Commons, a man named Bellingham fired a pistol at him, the ball pierced his heart, and he instantly expired. The assassin made no attempt to escape. He was a Liverpool broker, trading with Russia, who, having sustained some losses and injuries, which he had vainly applied to the government to redress, determined to avenge himself by taking the life of the prime minister. P.'s assassination shocked the public mind, and parliament hastened to make an ample provision for his widow and numerous family. His death was, however, rather a private than a public calamity. 'With all my respect for the virtues and excellences of the late minister,' said the Marquis of Wellesley, who had held the office of Foreign Secretary in his administration, 'I still feel it my duty to say that I did not consider him a fit man to lead the councils of this great empire.' He was ready in debate, a placid and not ungraceful speaker, and led the House of Commons with much tact; but he was superficial and intolerant. Sydney Smith, in his *Letters of Peter Plymley*, has conferred a species of immortality upon him by his wit and sarcasm. It was the fashion, when P.'s public policy was attacked, to laud his domestic virtues. 'Peter' said, if he had to choose between public and private virtues, he should prefer that Mr. P. 'owed for the veal of the preceding year, whipped his boys, and saved his country.'

PERCH (*Perca*), a genus of acanthopterous fishes, of the family *Percidæ*, to which it gives its name, and which includes many genera and a very great number of species, both of marine and fresh-water fishes. The *Percidæ*, or P. family, have the body somewhat oblong and more or less compressed; the scales rather large; the bones of the gill-covers toothed or otherwise armed; the mouth without barbels; the *vomer* toothed, and generally also the palate; there are sometimes two dorsals, sometimes only one. To this family belong not only the true perches, all of which are fresh-water fishes, but the Lates (q. v.) of the Nile, the Basse (q. v.) or Sea P., and their congeners the Pike Perches (q. v.), the



Perch (*Perca fluviatilis*).

Serrani, and many other fishes. The true perches (*Perca*) have two dorsal fins, distinct and separate, the rays of the first spinous and those of the second flexible; the tongue is smooth; and the gill-covers are bony, notched, and sharply serrated. The Common P. (*P. fluviatilis*) is an inhabitant of the lakes, ponds, and still rivers of almost all parts of Europe. It is very common in England and Ireland, and is found in many of the waters of the south of Scotland, although in the north it is rare, and is said to exist only where it has been introduced. But it is found in Scandinavia, and even in Lapland. It is of a greenish-brown color, passing into golden-yellow on the under parts, and marked on the back with six or seven indistinct blackish crossbands. Its height is about one-third of its length. It often attains a length of 16 or 18 inches, and a weight of 2 or 3 pounds, but perches have been taken of 8 pounds weight or more. The P. loves still waters, and is easily reared in ponds, but it is not a desirable inmate of ponds intended for other fish, because it is very voracious, and devours their fry.

It is readily caught by almost any kind of bait, and sometimes takes a small artificial fly. It is much esteemed for the table. It lives a long time out of the water if kept moist, and in some countries is thus brought to market, and carried back to the pond if not sold. The female P. deposits her eggs in long strings, united by a viscid matter.—A species of P. (*P. Italica*), found in the south of Europe, differs from the Common P. in its shorter and deeper form, and want of black bands. Several species are natives of the rivers and lakes of North America, and are among the most esteemed of its fresh-water fishes.

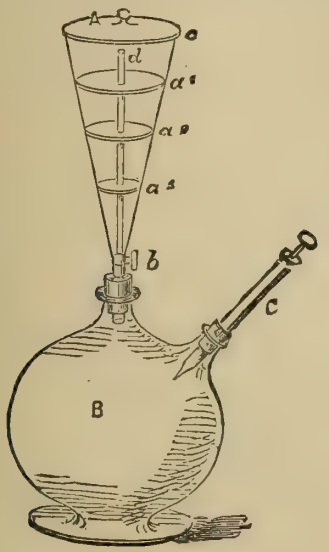
PERCH. See Rod.

PERCLO'SE, a railing or other enclosure separating a tomb or chapel from the rest of a church.

PERCLOSE, or DEMI-GARTER, in Heraldry, the lower half of a garter with the buckle.

PERCOLA'TION, a process much used in Pharmacy, and in some other arts, for extracting certain soluble properties of various bodies by filtering a liquid through them. In the new British pharmacopœia, 39 tinctures and 9 extracts are ordered to be prepared by percolation. As the fluid soaks in and passes through the material acted upon, it displaces and carries with it the soluble parts, hence percolation is sometimes called the *Method of Displacement*. The forms of apparatus for percolation are very numerous, but the principle is the same in all—viz., a vessel with a porous bottom, and in the form of a truncated cone inverted, receives the material first, and over it is poured the water or other fluid which is to extract its virtues. One made by an eminent French pharmacien, M. Bejot, is very effective and complete.

A is a long funnel-shaped glass, a glass stop-cock (*b*) in the bottom, which narrows to an inch diameter; this fits into the neck of a large globular vessel B, both being adjusted by grinding. C is a syringe of brass fixed in the glass B as shown, and made air-tight by a caoutchouc washer. a^1, a^2, a^3 are three diaphragms of



Percolator.

porous felt, pierced by the tube *d*, which allows air bubbles to escape from the bottom without disturbing the fluid. The material to be acted upon, as wood, bark, root, leaves, &c., is first powdered, and is then laid on the top of the uppermost diaphragm, a^1, so as to half fill the space between it and the glass-cover *c*; water, or any other required fluid, is then poured in until it is filled; the stop-cock *b* is opened, and the operator draws the air from the outer vessel by means of the air-pump C, the fluid is thus rapidly drawn through the material, and displaces its soluble parts. a^2 and a^3 arrest the fine solid particles which are carried through the first diaphragm with the liquid, and form sediments which are also acted upon by the liquid which is checked at each division for a time. The fluid, when it reaches the globular glass, however dark colored, is beautifully bright and clear, and the preparations so made are remarkable for their good quality and uniformity of strength. In the year 1864, Dr. Redwood, of the Pharmaceutical Institution of Great Britain, invented a new percolator of great efficacy. It consists of a tinned copper cylinder, with a smaller cylinder of flannel inside, in which the materials are put. The whole is filled with the fluid menstruum, and as that which is in more immediate contact with the solid materials becomes charged with the soluble matter displaced, it gives rise, as its density is increased, to an endosmotic action through the flannel walls of the inner cylinder until the whole is equalized, when it is drawn off by the tap, and fresh fluid added until it comes away colorless. The outer cylinder has a tight cover to prevent loss by evaporation.

PERCU'SSION, in Medicine, is the method of eliciting sounds by tapping, or gently striking the surface of the body; its object being to determine by the nature of the sound the comparative density of the subjacent parts. This means of diagnosis was first employed by Avenbrugger in the middle of last century, and it was afterwards adopted by Corvisart in the investigation of heart diseases; but its value was not fully appreciated till Laennec made the diseases of the chest his peculiar study; and since his time, its application and various uses have been considerably extended by the labors of Piorry, Hughes Bennett, and other physicians.

Percussion is chiefly employed in the diagnosis of diseases of the lungs, heart, and abdominal organs. It may be *direct* (or, as some writers term it, *immediate*), or it may be *mediate*. In the former case, the part to be examined is struck with the ends of the three first fingers set close together on the same level, or with a small hammer tipped with India-rubber; while in the latter, which is now almost universally adopted, a flat body is placed upon the chest, or other part to be examined, and is then struck by the fingers or hammer. The flat intervening body is termed a *Pleximeter* (from the Gr. *plexis*, a blow, and *metron*, a measure). The instrument usually sold as a pleximeter is a flat oval piece of ivory, but the left index or middle finger of the physician, with its flat surface fitted accurately to the part to be examined, acts equally well. The force of the stroke on the pleximeter—whether the stroke be made with the fingers or the hammer—must vary according as it is desired to elicit the sound from a superficial or a deep-seated part. The surface to be percussed should be exposed, or, at most, only covered with one layer of clothing; and the blow should fall perpendicularly on the pleximeter. When percussion is made over a considerable cavity filled with air—as the stomach or intestines—a hollow, drum-like, or (as it is usually termed by medical writers) a *tympanitic* sound is produced. When any part of the surface of the chest is struck, below which there is a considerable depth of healthy lung-tissue, consisting of small cells filled with air, a clear sound, less loud and hollow than the tympanitic sound, and termed the *pulmonary percussion note*, depending partly on the vibrations of air in the lung-cells, and partly on the vibrations of the walls of the chest, is evolved.

When the subjacent substance is solid (as the heart, liver, or spleen) or fluid (as when there is effusion in a closed sac), the sound is *dull* in proportion to the density and want of elasticity of the part struck. The first thing that must be acquired in order to make percussion useful in the diagnosis of disease, is an accurate knowledge of the sounds elicited from the different parts in their normal condition. When, for example, the healthy pulmonary percussion note is known, increased resonance of the walls of the chest will indicate a dilatation of the air-cells (or pulmonary Emphysema), while various degrees of dullness will afford evidence of such morbid changes as the effusion of fluid into the pleura (Hydrothorax), or inflammatory solidification of the lung-tissue (the Hepatisation of Pneumonia), or tubercular deposition. The use of percussion in relation to the diagnosis is further shown in the articles PERICARDITIS and PLEURISY.

PERCUSSION CAPS are small copper cylinders, closed at one end, for conveniently holding the detonating powder which is exploded by the act of percussion in percussion-arms. Caps were not used with the earliest percussion-arms, which the Rev. Mr. Forsyth of Belhelvie, Aberdeenshire, patented in 1807; but they became tolerably general between 1820 and 1830, and were adopted for the army by 1840. With the adoption of breech-loading arms, the use of *separate* caps has been discontinued. The cap now forms a part of the catridge, and at one operation is placed with it in the opened breech of the gun. The manufacture is extremely simple: A sheet of thin copper is stamped into pieces of appropriate shape, which are bent into the form of caps by stamping-apparatus closing round a mandril, the whole being done in one machine by two operations. The caps are then placed in a tray, mouths upward; and the inside of each is touched with a strongly adhesive varnish. Over this is dusted the detonating powder, all the particles which fail to adhere being blown, dusted, or shaken out. A stamper once more is forced into the cap, to fix and compress the powder, and the operation is completed.

For muskets, the caps are charged with equal parts of fulminating mercury and chlorate of potash; for cannon, with a mixture composed of two parts of chlorate of potash, two parts of native sulphuret of antimony, and one of powdered glass; the last ingredient taking no part in the chemical action, and being added merely to increase the friction. For the manner in which a cap is used, see LOCK.

PERCUSSION, CENTER OF. See CENTER OF PERCUSSION.

PERCY. This is the name of a noble Norman family who accompanied the Conqueror to England, and whose head, William de Percy, obtained from his sovereign thirty Knights' Fees in the north of England. The representation of the house devolved (temp. Henry I.) on Agnes, daughter of the 3d baron, who married Josceline of Lovain, brother-in-law of the king, only on condition that he adopted either the surname or the arms of P.; he chose to retain his paternal arms and to assume the P. name. The head of the family at the time was one of the chief barons who extorted Magna Charta from King John; and the 9th feudal lord (temp. Edward I.) showed a similar spirit towards the pope, against whose demands he maintained, with others of the greater barons, the spiritual independence of the English crown. This nobleman's great-grandson was a distinguished military commander under Edward III., and acting as Marshal of England at the cor-

onation of Richard II., was created Earl of Northumberland. He subsequently, however, took up arms against Richard, and placed the crown on the head of Henry of Lancaster, who became Henry IV.

Again dissatisfied with the government, he joined in rebellion with his son Hotspur, for the purpose of transferring the crown to Mortimer, Earl of March. The earl, with the other leaders of this rebellion, fell at Bramham Moor (1407—1408), and his titles became forfeited. These, however, were revived in favor of his grandson, who became Lord High Constable of England, and who was killed at the battle of St. Alban's. This earl's son and successor (the third earl) met a like fate on Towton field, fighting in the van of the Lancastrian army. The 4th earl (who obtained a reversal of his father's attainder) was murdered by the populace in Northumberland, when ordered by the avarice of Henry VII. to enforce a subsidy. The executions of the 6th and 7th earls by Edward VI. and Elizabeth are part of the history of England. The 8th earl was committed to the Tower, on a charge of being concerned in a plot in favor of Mary Queen of Scots, and died a violent death in prison. The 10th earl fought in the civil wars against Charles I., though he took no part with the regicides, and eventually joined in the general effort to bring about the Restoration. The 11th earl left an only child, who succeeded to the ancient barony of P., and marrying Charles, Duke of Somerset, became the mother of Algernon, Duke of Somerset, who was created Earl of Northumberland, with remainder to his son-in-law, Sir Hugh Smithson, of Stanwick, in the county of York, a gentleman of respectable lineage. Sir Hugh, succeeding to the earldom, obtained in 1766 his advancement to the dukedom of Northumberland, which title is now held by Algernon-George Percy, born in 1810, who succeeded to the dukedom in 1867.

PERCY, Thomas, D.D., an eminent poetical collector, antiquary, and scholar, was born at Bridgenorth, Shropshire, in 1728; was educated at Christchurch, Oxford; and having entered the church, rose to be Bishop of Dromore, in Ireland, 1782. He died in 1811. This amiable and accomplished prelate, the friend of Johnson, Goldsmith, and other distinguished contemporaries, published translations from the Icelandic, a new version of the *Song of Solomon*, the *Northumberland Household Book*, a translation of Mallet's *Northern Antiquities*, &c. His most popular and valuable contribution to our literature was the *Reliques of Ancient English Poetry*, consisting of old heroic ballads and songs, with some modern imitations, in which the editor himself displayed the taste and feeling of a poet. This work appeared in 1765, and P. lived to see four editions of it called for by the public, and to receive the warm commendations of all poetical readers and critics. The *Reliques* were chiefly obtained from an old folio MS. that had fallen into P.'s hands, with the addition of pieces from the Pepys collection at Cambridge, the Ashmole Library at Oxford, the British Museum, and the works of our earlier poets. Certain liberties were taken with some of the ballads—softening touches, repairs, and renovations—for which the editor was severely censured by Ritson and other antiquaries ; but the collection was of great value to our literature, recalling the public taste to the rude energy, picturesqueness, and passion of the old chivalrous minstrels and Elizabethan songsters. It captivated the youthful imagination of Walter Scott, and was the inspirer and model of his *Minstrelsy of the Scottish Border*. The memory of P. has been still further perpetuated by a Club Book Association, called the Percy Society. See Club Books.

PERDI'DO, a bay and river of Alabama, U. S. The bay, 20 miles long by 6 to 10 miles wide, opens by a narrow channel into the Gulf of Mexico, 18 miles west of the entrance to Pensacola Bay; the river rises in South-Western Alabama, and bay and river form the boundary between Alabama and Florida.

PE'REGRINE FALCON (*Falco peregrinus*), a species of Falcon (q. v.) found in almost all parts of the world. The female is larger than the male, being about 18 inches in length from the tip of the bill to the tip of the tail, whilst the male is only about 15 inches. The female is the *Falcon* of falconers, and the male the *Tercel*. The plumage of the two sexes is very similar. The back, wings, and tail are bluish-slate or ash-gray, the feathers barred with a darker tint; the crown of the head, back of the neck, and a spot below the eye, nearly black; the front of the neck white, with dark longitudinal lines; the breast, belly, and plumage of the legs, whitish, with dark-brown transverse bars. The wings are very long, reaching almost to the tip of the tail; and the bird is remarkable for its power of flight, being capable of maintaining for a considerable time a rate of more than 100 miles an hour, so that it is often seen far from any of its haunts or breeding-places; whence the name Peregrine, from the Latin *peregrinus*, a wanderer. Its swoop, when rushing on its quarry, is wonderful both for rapidity and force. The P. F. can easily carry through the air a bird or quadruped fully its own weight. Its ordinary prey consists of grouse, woodcocks, rabbits, &c. The woodcock in vain seeks to escape from it by threading its way among branches of trees and brushwood; the falcon follows, and exhibits at least an equal power of moving with great rapidity in the thicket without getting entangled or stayed.

Sometimes the quarry soars into the air, and seeks safety by trying to keep above the falcon, till both are lost to ordinary sight; but the falcon generally gets uppermost, and 'strikes' it at last. It has thus been known to cut a snipe in two, and at one swoop to strike off the head of a grouse or pigeon. Owing to the quantity of game the P. F. will capture it is ruthlessly trapped or otherwise destroyed, so that this beautiful bird is in danger, like others of its family, of being exterminated. The P. F. is a bird as remarkable for boldness as for power of flight. It has sometimes been seen to pounce on game shot by a sportsman, before it could fall to the ground; and an instance occurred in Yorkshire of a P. F. dashing through the glass of an aviary in a town, and carrying off a bird. It makes its nest on ledges of high rocks, either on the sea-coast or in inland precipices and ravines, and lays from two to four eggs. Numerous localities in Britain have long been noted as breeding-places of the P. F., and some of them are regularly visited for the young birds, which are still trained in certain places, for the sport of falconry. The bird, caught when adult, although more difficult to train, is, however, believed to possess superior qualities. The P. F. is more docile, and becomes more gentle than the Gyr-falcon. The young female of the P. F. has been by mistake described by Pennant and others under the name of the Lanner (q. v.), a species not found in Britain. For fig. of P. F., see Falconry.

PEREIRA, Jonathan, the pharmacologist, was born in the parish of Shoreditch, London, 22d May 1804. After a distinguished career at a classical academy in Finsbury, where he remained for four years, he devoted himself to the study of medicine, and in 1823 was appointed resident medical officer of the General Dispensary in Aldersgate Street, at which institution he became, three years afterwards, lecturer on chemistry. His attention was early attracted to the study in which he has become famous. In 1824, he published a translation of the *London Pharmacopœia;* which was followed by *A Manual for the Use of Students; A General Table of Atomic Numbers, with an Introduction to the Atomic Theory;* and other text-books for the use of those who were preparing for medical examinations. He contributed numerous papers to the professional journals on the properties and adulteration of drugs, and laid the foundation of those researches which issued in his great work on *Materia Medica*. In 1832, he resigned the office of lecturer for that of Professor of Materia Medica in the New Medical School in Aldersgate Street, and at the same time he succeeded Dr. Gordon as Lecturer on Chemistry at the London Hospital. His *Elements of Materia Medica* (first published in the form of lectures contributed to the *Medical Times and Gazette*) appeared as a separate work in 1839—1840, and at once established his reputation as a pharmacologist. The treatise is remarkable for the extent of its research, the variety of its information, whether scientific, commercial, or practical, and the scrupulous exactness of its statements. In 1841, he procured the licence to practise in London from the College of Physicians; in 1845, he was elected a Fellow of that body; and on the establishment of the London University, he was appointed Examiner in Materia Medica and Pharmacy, a post which he filled with admirable efficiency till his death. Among his other contributions to science, the best known are his excellent treatises on *Diet* and on *Polarised Light*, both of which appeared in 1843. His death, which took place on January 20, 1853, was the result of a fall down a flight of steps in the College of Surgeons, and was deeply felt, not only by his professional brethren, but by the numerous scientific bodies, such as the Royal, the Linnæan, and the other societies of which he was a distinguished Fellow.

PEREJASSLAVL, an ancient town of Russia, in the west of the government of Poltava. Pop. (1880) 9500.

PEREKO'P, Isthmus of, in South Russia, government of Taurida, 18 miles long, 16 miles broad at its southern, and 5 miles broad at its northern extremity, connects the peninsula of the Crimea with the mainland of European Russia. It is an arid waste of mere sand, or sand combined with clay. There are, however, numerous salt lakes, and salt is extensively made. In the north of the isthmus, and forming the key to the Crimea, is the small town of Perekop. Notwithstanding its advantageous position at the convergence of the numerous roads leading from South Russia into the Crimea, P. is of little commercial importance. Pop. of town (1867), 4993.

PÈRE-LA-CHAISE. See La-Chaise.

PE'REMPTORY DEFENCES, in Scotch Law, mean defences to an action or suit, which amount to an entire negative of the right of action, as distinguished from a preliminary or temporary defence.

PERE'NNIAL, in Botany, a term employed in contradistinction to Annual (q. v.) and Biennial (q. v.), to designate plants which subsist for a number of years. Some plants, however, which are annual in cold climates, are perennial in warmer regions. The term perennial is in general applied only to herbaceous plants, and indicates a property only of their roots, the stems of most of them dying at the end of each summer. Perennial herbaceous plants, like shrubs and trees, are capable of producing flowers and fruit time after time, in which they differ from annual and biennial plants, which are fruitful only once. Those plants which are capable of being propagated by cloves, offset bulbs, or tubers, are all perennial. Thus the potato is a perennial plant, although the crop is planted in spring and reaped in autumn, like that of corn, whilst all the corn plants are annuals. —There is great diversity in the duration of life of perennial plants.

PERESLA'V, or PEREIASLA'VLE-ZALIE'SKY, a district town in the middle of Great Russia, in the government of Vladimir, and 70 miles north-west of the city of that name. It was founded in 1052 by George, Prince of Sousdal. It possesses numerous churches and religious institutions; but is principally noteworthy for the factories, which are its main prop, and of which the most important are cotton-mills and print-works for cotton goods. The factories are in an increasingly prosperous condition. The cotton manufactures of P. are exported to the fairs of Nijni-Novgorod and Irbit, and even to China by way of Siberia. Pop. (1867) 7452, employed in the factories and in the productive fishery of Lake Pleshtcheieff.

PEREZ, ANTONIO, minister of Philip II. of Spain, was born in Aragon in 1539. His father was Secretary of State under Charles I. and Philip II., and he himself was appointed to this office when only 25 years of age, and acquired the entire confidence of the king. Don Juan D'Austria, having sent his confidant, Juan de Escovedo, to Spain, to solicit aid against the party of Orange; and Escovedo having rendered himself an object of hatred both to the king and to P., the former resolved to put him out of the way by murder, and intrusted P. with the accomplishment of this design, which P., to gratify his own revenge, accomplished accordingly, 31st March 1578. The family of Escovedo denounced P. as the murderer, and all his enemies joined against him. The king at first sought to shield him; but in July 1581 he was arrested, and by torture forced to confess. He succeeded, however, in making his escape to Aragon, where he put himself under protection of its laws. After a long and severe inquiry into his conduct, he was found guilty of many acts of fraud and corruption, and condemned to death in Madrid; but the *Justicia Major*, or highest court of justice in Saragossa, refused to deliver him up. The king applied for aid in May 1591 to the Inquisition, and the Aragonese court delivered him up to its agents, but the people rose in tumult, and liberated him. This happened repeatedly; and at last, in September 1591, Philip II. entered Aragon with an army powerful enough to subdue all opposition, abolished the old constitutional privileges of the country, and caused a number of the principal people to be executed. P., however, made his escape, avoiding the many plots which the king laid for his assassination. He was condemned in Spain as a heretic, but was treated with great kindness in Paris and London. He spent the latter years of his life in Paris, and died there in 1611 in great poverty. P. wrote an account of his misfortunes, which was published at Paris in 1598, under the title of *Relaciones*.

PERFECTIBI'LITY OF CHRISTIANS, a doctrine held by the Wesleyan Methodists (see METHODISTS) of a *Christian perfection* attainable in this life. It is not a perfection of *justification*, but a perfection of *sanctification;* which John Wesley, in a sermon on Christian Perfection, from the text Heb. vi. 1, 'Let us go on to perfection,' earnestly contents for as attainable in this life by believers, by arguments founded chiefly on the commandments and promises of Scripture concerning sanctification; guarding his doctrine, however, by saying that it is neither an *angelic* nor an *Adamic* perfection, and does not exclude ignorance and error of judgment, with consequent wrong affections, such as 'neeless fear or ill-grounded hope, unreasonable love, or unreasonable aversion.' He admits, also, that even in this sense it is a rare attainment, but asserts that 'several persons have enjoyed this blessing, without interruption, for many years, several enjoy it at this day, and not a few have enjoyed it unto their death, as they have declared with their latest breath, calmly witnessing that God had saved them from all sin, till their spirit returned to God.' Concerning all which, the general belief of Protestant Christians is, that these persons were merely more self-complacent and less sensible of their own corruptions than is usual, and that the commands and promises concerning sanctification are all susceptible of an explanation consistent with remaining corruption in believers, and a need of further sanctification, or a continued going on unto perfection whilst this life endures.

That perfection is attainable in this life, is held by the Franciscans, Jesuits, and Molinists in the Church of Rome, but denied by the Dominicans and Jansenists; and its supporters generally lay stress on the distinction between mortal and venial sins.

PERFE'CTIONISTS, or BIBLE COMMUNISTS, popularly known as FREE-LOVERS, or preachers of Free Love, a small American sect who are equally remarkable for the doctrines which they hold, and for the unfaltering way in which they carry them out in practice. The founder of the sect, John Humphrey Noyes, was born at Brattleborough in Vermont, 11th September 1811, and practised as a lawyer. He then studied theology at Andover and Yale, and became a Congregationalist preacher. He soon adopted new views, and lost his license to preach. The opinions of St. Paul, he held, had been completely misconceived by all the Christian churches; all our ecclesiastical organizations were accordingly blunders. He believed that Christ, on his second advent 'in the spirit,' in 70 A.D., abolished the old Law, and closed the reign of sin which began with Adam; and that he has thenceforth set up His kingdom in the hearts of all willing to accept His reign. For such persons, there was no longer any law or rule of duty; neither the Mosaic code, nor the Sermon on the Mount, nor the ordinances or institutions of civil society, were binding upon them; they were a law unto themselves; they were free to do as they pleased, but—with exceptions which, however, could not invalidate an eternal truth—under the influence of the Divine Spirit which dwelt in them, they could only do that which was right.

His early efforts at establishing a church, made at New Haven, were very discouraging, but he was more successful at Putney. He and his converts, men and women, with their children, put their property into a common stock; they gave up the use of prayer, all religious service, and the observance of the Sabbath; those who were married renounced their marriage ties, and a 'complex marriage' was established between all the males and all the females of the 'Family.' To get rid of the inconveniences which had been found attendant upon the exercise of Christian liberty, Noyes had set up a new principle, viz., sympathy, by which the individual will was to be corrected, which practically imposed upon individuals the duty of deferring to the feelings and opinions of the brethren. He now taught that the Family was wiser than the individual, who *might* stray from the path of grace; that the individual was erring when he differed from the Family; and that the inclinations of individuals must be submitted to the opinion of the Family.

Having dispensed with law, he set up public opinion as a controlling power in its stead; and free criticism of one another by the members of the society became an important feature of his system. Quarrelling, however, broke out among the members; their differences were brought before the law courts; and when the details of the Family system became known, the people of Putney made the place too hot for the Perfectionists. Their establishment was broken up; but a portion of the Putney Family —about fifty men, as many women, and about the same number of children—soon established themselves in a new home, in the sequested district of Oneida, in the state of New York. Among the things which first drew attention to the Putney Family was a controversy which Noyes maintained with the leaders of another society of P. established at Oberlin. The P. were divided upon the question, whether of the two leading features of their system, the profession of holiness and the right of Christian liberty, the one or the other was the more important—some were 'Liberty-men,' others 'Holiness-men.' Noyes took up the controversy on behalf of the latter.

At Oneida Creek, the new 'Family' purchased about 600 acres of forest-land, and proceeded to bring it under cultivation. They have made it one of the most productive estates in the Union; they have also established manufactures of various kinds; and in the course of 30 years, they have become a prosperous, and even a wealthy community of about 250 persons, who live together in a state of great harmony and contentedness. Being already sufficiently numerous, the 'Family' has to reject frequent applications which are made for admission to membership. A similar society has been established at Wallingford. Their neighbors have become accustomed to the P. and their ways, and let them live in peace. On settling at Oneida, the controlling function of criticism was strengthened by being made more systematic; and a regard for the common good, grown strong through habit, has made persons who disavow all laws perfectly submissive to the unwritten laws of public opinion.

In the smallest, as well as in important affairs, the Perfectionist practises submission to the opinion of his brethren: in small matters, he usually gathers it by consultation with some of the older members of the body; important ones are submitted to the 'Family' at their evening meetings. All are busy; and they work as hard for the general interest as men do in the hope of enriching themselves. The men wear no particular garb, but usually

dress like the country people around them; the women have their hair cut short, and parted down the center; abjure stays and crinoline; wear a tunic, falling to the knee, and trousers of the same material; a vest, buttoning high towards the throat; and a straw hat. The 'Family' has breakfast at six o'olock, dinner at twelve, and the evening-meal at six in the afternoon; the more advanced of its members abstain from animal food; they drink no beer, and only a weak home-made wine; and like most of the new American sects, they will have nothing to do with doctors. The women are allowed a good deal of influence.

While all the males and females of the 'Family' are united by a 'complex marriage,' their intercourse—which, in theory, is unfettered by any law—is, in practice, subject to a good deal of regulation. Like everything else, it is subject to the opinion of the society, and certain principles have been so steadily applied to it, that they have gained the force of laws. First, there is the principle of the ascending fellowship. There should be contrast, the P. say, between those who become united in love. That there should be difference of temperament and of complexion has, they say, been well ascertained by physiologists. They hold that there should be a difference in age also, so that the young and passionate may be united to those who have, by experience, gained self-control. In virtue of this principle, the younger women fall to the older men, and the younger men to the older women. A second principle is, that there should be no exclusive attachment between individuals; a third, that persons should not be obliged to receive the attentions of those whom they do not like; and lastly, it is held indispensable that connections should be formed through the agency of a third party—because, without this, the question of their propriety might be withdrawn from criticism, and also, because this affords a lady an easy opportunity of declining.

The human heart, the P. say, is capable of loving any number of times, and any number of persons at the same time, and the more it loves the more it can love. The system of the 'complex marriage' is therefore suitable to, while monogamy imposes a restriction upon, human nature; and they believe that marriage will be spurned by the churches as soon as they get rid of the false notion of the essential sinfulness of love. They are confident that, when they have worked out a few details, still incomplete, their system will be perfect, and that it will, before long, be imitated throughout the length and breadth of America. There are four things, according to Noyes, necessary to the organization of a true family: (1) the reconciliation of its members with God; (2) their salvation from sin; (3) recognition of the brotherhood and equality of man and woman; (4) community of labor and its fruits; and communism can only prosper when the previous conditions exist. The P. hold that for reconciliation to God and salvation from sin nothing is necessary but faith; let a man believe that he is reconciled to God, and his sins are immediately washed away.

PERFO'RMANCE OF CONTRACTS is one of the modes of satisfying the contract, which may be either by doing some specific thing, or not doing something, or by payment of money. It is a good answer to any action brought by one party against another for breach of contract, that what was contracted for has been already performed.

PERFU'MERY, PE'RFUMES (Fr. *perfum*, from Lat. *fumus*, smoke or vapor), delicate fumes or smells. Perfumes are of three distinct classes when derived from plants, and there is a fourth class, which are of animal origin.

CLASS I.—These are the most ancient, and have been in use from the earliest period of which there is record. They consist of the various odoriferous gum-resins, which exude naturally from the trees which yield them; and to increase the produce, the plants are often purposely wounded. The most important are benzoin, olibanum, myrrh, and camphor. No less than 5000 cwt. of these together are annually imported into Britain. Gum-resins form the chief ingredients in 'Incense,' (q. v.), and in Pastilles (q. v.)

CLASS II. are those perfumes which are procured by distillation. As soon as the Greeks and the Romans learned the use of the still, which was an invention imported by them from Egypt, they quickly adapted it to the separation of the odorous principle from the numerous fragrance-bearing plants which are indigenous to Greece and Italy. An essential oil or otto thus procured from orange-flowers bears in commerce to this day the name of Neroly, supposed to be so named after the Emperor Nero. Long before that time, however, fragrant waters were in use in Arabia. Odor-bearing plants contain the fragrant principle in minute glands or sacs; these are found sometimes in the rind of the fruit, as the lemon and orange; in others, it is in the leaves, as sage, mint, and thyme; in wood, as rosewood and sandal-wood; in the bark, as cassia and cinnamon; in seeds, as caraway and nutmeg. These glands or bags of fragrance may be plainly seen in a thin cut stratum of orange-peel; so also in a bay leaf, if it be held up to the sunlight, all the oil cells may be seen like specks. All these fragrant-bearing substances yield by distillation an essential oil peculiar to each; thus is procured oil of patchouly from the leaves of the patchouly plant, *Pogostemon patchouly*, a native of Burmah; oil of caraway, from the caraway seed; oil of geranium, from the leaves of the *Geranium rosa;* oil of lemon, from lemon-peel; and a hundred of others of more infinite variety.

The old name for these pure odoriferous principles was Quintessence. Latterly, they have been termed Essential Oils; they are now, in modern scientific works, often termed Ottos, from the Turkish word attar, which is applied to the well-known otto or attar of roses. See OIL.

All the various essential oils or ottos are very slightly soluble in water, so that in the process of distillation the water which comes over is always fragrant. Thus, elder water, rose water, orange water, dill water are, as it were, the residue of the distillation for obtaining the several ottos. The process of Distillation (q. v.) is very simple; the fragrant part of the plant is put into the still and covered with water; and when the water is made to boil, the ottos rise along with the steam, are condensed with it in the pipe, and remain floating on the water, from which they are easily separated by decanting. In this way 100 pounds of orange, lemon, or bergamot fruit peel will yield about 10 ounces of the fragrant oil; 100 pounds of cedar wood will give about 15 ounces of oil of cedar; 100 pounds of nutmeg will yield 60 to 70 ounces of oil of nutmeg; 100 pounds of geranium leaves will yield 2 ounces of oil.

Every fragrant substance varies in yield of essential oil. The variety of essential oils is endless; but there are a certain relationship among odors as among tints. The lemon-like odors are the most numerous, such as verbena, lemon, bergamot, orange, citron, citronella; then the almond-like odors, such as heliotrope, vanilla, violet; then spice odors, cloves, cinnamon, cassia. The whole may be classified into twelve well-defined groups. All these ottos are very soluble in alcohol, in fat, butter, and fixed oils. They also mix with soap, snuff, starch, sugar, chalk, and other bodies, to which they impart their fragrance.

The principal consumption of the various fragrant ottos is for scenting soap. Windsor soap, almond soap, rose soap, and a great variety of others, consist of various soaps made of oil and tallow, perfumed while in a melted state with the several named ottos or mixtures of them.

Though snuff is by no means so popular an article in the reign of Victoria as it was in Anne's time, yet the increased population, and the extended exports to colonies, cause a production of scented snuff positively greater now than fifty years ago; and it is especially in demand in the fur countries of Northern Canada. There is a large consumption of fragrant essential oils in the manufacture of toilet powders; under the various names of rose powder, violet powder, &c., a mixture of starch and orris, differently scented, is in general demand for drying the skin of infants after the bath.

Precipitated chalk and powdered cuttle-fish bone, being perfumed with otto of roses, powdered myrrh, and camphor, become 'Dentrifice.' The ottos of peppermint, lavender, rose, and others, are extensively used in scenting sweetmeats and lozenges.

More than 200,000 pounds weight of various ottos have been imported into Britain in one year, and valued at over £180,000; to this must be added at least one-third as much again distilled in England. Of the imported articles enumerated, oils of lemon and bergamot, from the Two Sicilies, reached 128,809 pounds, valued at £57,054.

CLASS III.—These are the perfumes proper, such as are used for perfuming handkerchiefs, &c. Contrary to the general belief, nearly all the perfumes derived from flowers are not made by distillation, but by the processes of *enfleurage* and *maceration*. Although this mode of obtaining the odors from flowers has certainly been in practice for two centuries in the valley of the Var, in the south of France, it is only by the publication of a recent work* that the method has been made generally known. The odors of flowers do not, as a general rule, exist in them as a store or in a gland, but are developed as an exhalation. While the flower breathes it yields fragrance, but kill the flower, and fragrance ceases. It has not been ascertained when the discovery was made of condensing, as it were, the breath of the flower during life; what we know now is, that if a living flower be placed near to grease, animal fat, butter, or oil, these bodies absorb the odor given off by the blossom, and in turn themselves become fragrant. If we spread fresh unsalted butter upon the bottom of two desert-plates, and then fill one of the plates with gathered fragrant blossoms of clematis, covering them over with the second greased plate, we shall find that after 24 hours the grease has become fragrant. The blossoms, though separated from the parent stem, do not die for some time, but live and exhale odor; which is absorbed by the fat. To remove the odor from the fat, the fat must be scraped off the plates and put into alcohol; the odor then leaves the grease and enters into the spirit, which thus becomes 'scent,' and the grease again becomes odorless.

**Art of Perfumery*, by Septimus Piesse, Ph. D., 8vo. 50 cuts. Longman. 4th ed., 1880.

The flower farmers of the Var follow precisely this method on a very large scale, with but a little practical variation, with the following flowers—rose, orange, acacia, violet, jasmine, tuberose, and jonquil. The process is termed *enfleurage*. In the valley of the Var, there are acres of jasmine, of tuberose, of violets, and the other flowers named; in due season the air is laden with fragrance, the flower harvest is at hand. Women and children gather the blossoms, which they place in little panniers like fishermen's baskets hung over the shoulders. They are then carried to the laboratory of flowers and weighed. In the laboratory the harvest of flowers has been anticipated. During the previous winter great quantities of grease, lard, and beef-suet have been collected, melted, washed, and clarified. In each laboratory there are several thousand *châssis* (sashes), or framed glasses, upon which the grease to be scented is spread, and upon this grease the blossoms are sprinkled or laid. The *châsse en verre* is, in fact, a frame with a glass in it as near as possible like a window-sash, only that the frame is two inches thicker, so that when one châsse is placed on another, there is a space of four inches between every two glasses, thus allowing space for blossoms. The illustration shows the châsse with grease and flowers upon it (fig. 1), also a pile of the same as in use. The flower blossoms

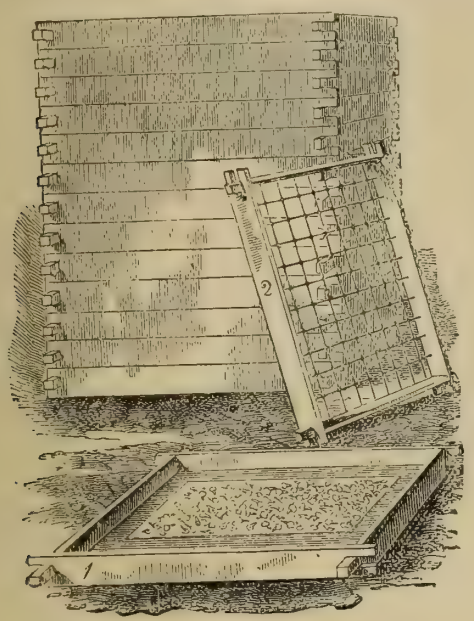


Fig. 1.
1, Châssis en Verre; 2, Châssis en Fer.

are changed every day, or every other day, as is convenient in regard to the general work of the laboratory or flowering of the plants. The same grease, however, remains in the châsse so long as the particular plant being used yields blossoms. Each time the fresh flowers are put on, the grease is 'worked'—that is, serrated with a knife—so as to offer a fresh surface of grease to absorb odor. The grease being *enfleurée* in this way for three weeks or more—in fact, so long as the plants produce blossoms—is at last scraped off the châsse, melted, strained, and poured into tin canisters, and is now fit for exportation. Fat or oil is perfumed with these same flowers by the process of maceration; that is, infusion of the flowers in oil or melted fat. For this end, purified fat is melted in a *bain marie*, or warm bath, and the fresh blossoms are infused in it for several hours. Fresh flowers being procured, the spent blossoms are strained away, and new flowers added repeatedly, so long as they can be procured.

The *bain marie* is used in order to prevent the grease becoming too hot from exposure to the naked fire; so long as the grease is fluid, it is warm enough. Oil does not require to be warmed, but improved results are obtained when it is slightly heated.

Jasmine and tuberose produce best perfumed grease by enfleurage, but rose, orange, and acacia, give more satisfactory products by maceration; while violet and jonquil grease is best obtained by the joint processes—enfleurage followed by maceration. In the engraving a *châsse en fer* (2, fig. 1) is shown; this is for enfleurage of oil. In the place of glass, the space is filled with a wire net; on which is laid a *molleton*, or thick cotton fabric—moleskin, soaked with oil; on this the flowers are laid, just as with solid grease. In due time—that is, after repeated changing the flowers—the oil becomes fragrant, and it is then pressed out of the moleskin cloth. Oil of jasmine, tuberose, &c., are prepared in this way. In order now to obtain the perfume of these flowers in the form used for scenting handkerchiefs, we have only to infuse the scented fat or oil, made by any of the above methods, in strong alcohol.

In extracting the odor from solid fat it has to be chopped up fine as suet is chopped, put into the spirit, and left to infuse for about a month. In the case of scented oil it has to be repeatedly

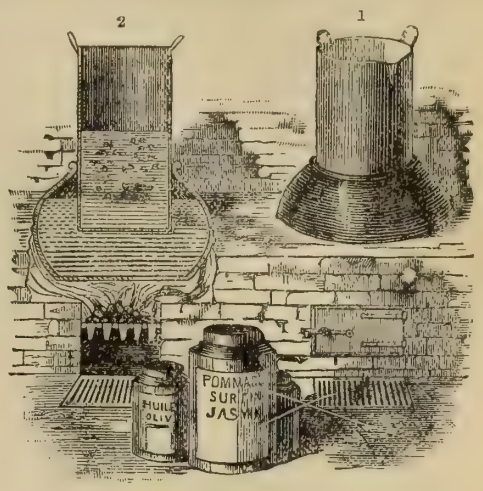


Fig. 2.
1, Bain Marie; 2, Section of Bain Marie.

agitated with the spirit. The result is, that the spirit extracts all the odor, becoming itself 'perfume,' while the grease again becomes odorless; thus is procured the essence of jasmine, essence of orange flowers, essence of violets, and others already named, rose, tuberose, acacia, and jonquil.

It is remarkable that these flowers yield perfumes which, either separate or mixed in various proportions, are the types of nearly all flower odors; thus, when jasmine and orange flowers are blended, the scent produced is like sweet pea; when jasmine and tuberose are mixed, the perfume is that of the hyacinth. Violet and tuberose resemble lily of the valley. All the various bouquets and nosegays, such as 'frangipanni,' 'white roses,' 'sweet daphne,' are made upon this principle.

The commercial importance of this branch of perfumes may be indicated by the quantity of flowers annually grown in the district of the Var. Flower Harvest: orange blossoms, 1,475,000 lbs.; roses, 530,000 lbs.; jasmine, 100,000 lbs.; violets, 75,000 lbs.; acacia, 45,000 lbs.; geranium, 30,000 lbs.; tuberose, 24,000 lbs.; jonquil, 5000 lbs.

CLASS IV. Perfumes of animal origin.—The principal are Musk (q. v.), Ambergris (q. v.), Civet (q. v.), and Castor (q. v.). The aroma of musk is the most universally admired of all perfumes; it freely imparts odor to every body with which it is in contact. Its power to impart odor is such, that polished steel will become fragrant of it if the metal be shut in a box where there is musk, contact not being necessary.

In perfumery manufacture, musk is mixed with other odorous bodies to give permanence to a scent. The usual statement as to the length of time that musk continues to give out odor has been called in question. If fine musk be spread in thin layers upon any surface, and fully exposed to a changing current of air, all fragrance, it is said, will be gone in from six to twelve months.

Civet is exceedingly potent as an odor, and when pure, and smelled at in the bulk of an ounce or so, is utterly insupportable from its nauseousness; in this respect it exceeds musk. When, however, civet is diluted so as to offer but minute quantities to the olfactories, then its perfume is generally admitted; this is so with gas-tar; but the fragrant principle is the same as that breathed by the beautiful narcissus. Castor is in our day almost obsolete as a perfume.

The average importation of musk per annum for a period of five years was 9388 ounces, value £10,688; export 1578 ounces, value £2143; leaving for home-consumption every year 7810 ounces, value £8545. Average importation per annum for a similar period; otto of roses 1117 ounces, value £13,561; vanilla 3525 pounds, value £12.568; ambergris 225 ounces, value £225; civet 355 ounces, value £300; orris root 420 hundredweight.

The works on perfumes are very few; that of Madame Celnart, in the Libraire Roret, is most worthy of notice among the French; a translation of it has been made by Mr. C. Morfit of Philadelphia. In England, *The British Perfumer*, by C. Lilly (1822), was the only work of the kind published in England prior to the *Art of Perfumery* by S. Piesse (1855). See also Rimmel's *Book of Perfumes* (1875).

PE'RGAMUS, or PERGAMUM, anciently a city of Mysia in Asia Minor, on the navigable river Caicus, at the distance of 120

stadia from the sea. According to tradition, the place was of Greek origin, but its early history is quite insignificant. It first acquired prominence when Lysimachus, one of Alexander's generals, chose it as a stronghold in which to keep his treasures. Under Philetærus it became the capital of a state, 283 B.C. His successor, Eumenes I., maintained its independence against the Seleucidæ, although the title of king was first assumed by Attalus I., who reigned from 241 to 197 B.C. He intimately allied himself with the Romans against Philip of Macedon, and this alliance subsisted throughout succeeding reigns, in which the kingdom increased in extent and importance, till at last Attalus III., surnamed Philometer, who died in 133 B.C., left it with all his treasures to the Romans, who successfully maintained the right thus acquired, and under whom the city continued to flourish. It was the focus of all the great military and commercial routes of Asia Minor, and Pliny describes it as *longe clarissimum Asiæ Pergamum*. The Attali collected in P. a library only inferior to that of Alexandria. It was also the seat of a famous grammar-school, and it gave its name to Parchment (q. v.). P. sank under the Byzantine emperors, but the place still exists under the name *Bergamah*, and is noted for the splendor and magnificence of its ruins, which embrace temples, palaces, aqueducts, gymnasia, amphitheaters, and city walls.

PERGOLESE, Giovanni Battista, an eminent musician of the Neapolitan school. Evidence regarding the date and place of his birth is conflicting; probably the correct account is that of the Marchese di Villarosa, his latest biographer, who states that he was born at Jesi, near Ancona, on the 3d of January 1710. In 1717 he was admitted into the Conservatorio dei Poveri di Gesù Cristo at Naples, where he studied the violin under Domenico di Matteis, and musical composition under Gaetano Greco and Durante. Under the conviction that melody and taste were sacrificed to learning by most of the masters of his time, he abandoned the style of Scurlatti and Greco for that of Vinci and Hasse. His first great work was the oratorio of *San Guglielmo d'Aquitania*, composed in 1731. In that and the following year appeared his operas of *La Serva Padrona*, *Il Prigionier Superbo*, and *Lo Frate Innamorato;* in 1734, *Adriano in Siria;* in 1735, *Il Flaminio* and *L'Olimpiade*. In 1734, he received the appointment of *maestro di capella* of the Church of Loretto. In consequence of delicate health, he removed to Pozzuoli, where he composed the cantata of *Orfeo*, and his pathetic *Stabat Mater*. He died there of consumption in 1736. Besides the above-mentioned works, P. composed a number of pieces for the church, which were better appreciated during his lifetime than his secular compositions, also a violin concerto, and thirty trios for volin, violoncello, and harpsichord. His works are all characterized by sweetness and freedom of style.

PERI (Fairy), according to the mythical lore of the East, a being begotten by fallen spirits, which spends its life in all imaginable delights, is immortal, but is for ever excluded from the joys of Paradise. It takes an intermediate place between angels and demons, and is either male or female. So far from there being only female Peris, as is supposed by some, and these the wives of the Devs, the Peris live, on the contrary, in constant warfare with these Devs. Otherwise, they are of the most innocuous character to mankind, and exactly as the fairies, with whom our own popular mythology has made us familiar, are, when female, of surpassing beauty. One of the finest compliments to be paid to a Persian lady is to speak of her as Perizadeh (born of a Peri; Greek, Parisatis). They belong to the great family of genii, or jin : a belief in whom is enjoined in the Koran, and for whose conversion, as well as for that of man, Mohammed was sent (cf. Koran, chaps. lv., lxxii., and lxxiv.).

PERIA'GUA, a large canoe composed of the trunks of two trees, hollowed and united into one fabric; whereas an ordinary canoe is formed of the body of one tree only. Periaguas are used in the Pacific, and were formerly employed among the West India Islands, whence the frequent allusion to them in *Robinson Crusoe*.

PE'RIANTH (Gr. *peri*, around, *anthos*, a flower), in Botany, the floral envelope (see Flower) of those plants in which the calyx and corolla are not easily distinguished. The term is convenient, as it can be applied indifferently to the calyx and corolla; thus, when there is either a calyx or corolla existing, but not both, the perianth is said to be *single;* when both are present, *double*. Both are really present in many endogenous plants, to which the use of the term perianth is confined by some botanists; the single floral envelope of exogenous plants being regarded as a calyx, and the corolla supposed to be wanting. The perianth is *regular* in some plants, *irregular* in others. It often displays great beauty, as in tulips, crocuses, lilies, &c.

PERICARDI''TIS, or Inflammation of the Pericardium (q. v.), is a disease of frequent occurrence; the result of a very large number of post-mortem examinations being to show that about 1 in 23 of all who die at an adult age exhibits traces of recent or old attacks of this disorder.

For reasons which will be obvious when we come to speak of the physical signs of this disease, we shall commence with a notice of the anatomical changes which take place in the inflamed membrane. Very soon after symptoms of pericarditis begin to show themselves there is an abnormal dryness of the serous membrane, which is speedily followed by an increased secretion of fluid.

The secreted fluid is sometimes almost entirely fibrinous, in which case it coagulates, and gives rise to adhesions between the heart and the pericardium; or it may consist almost entirely of serum, which remains liquid; or it may be, and it most frequently is a mixture of the two. When there is a large amount of liquid effusion (as, for instance, a third of a pint or more) which is not re-absorbed, death usually takes place in the course of a few days, in consequence of the interference of the fluid with the heart's actions; but when there is not much liquid effusion, or when the liquid part is absorbed, the pericardium becomes more or less adherent, and apparent recovery usually takes place.

In the cases that prove fatal when fibrinous fluid has been effused, but has not coagulated to such an extent as to cause complete adhesion of the heart to the pericardium, the partially coagulated fibrin (or lymph, as the older authors styled it) is seen to be of a yellowish-white color, and to occur in a rugged, shaggy, or cellular form. Laennec compared the surface on which the lymph is deposited to that which would be produced by suddenly separating two flat pieces of wood between which a thin layer of butter had been compressed. Dr. Watson regards the appearance more like the rough side of pieces of uncooked tripe than anything else; while others have compared it to lace-work, cut sponge, a honey-comb, a congeries of earthworms, &c. When the patient dies at a more advanced stage of the disease—viz., soon after the whole of the membrane has become adherent—incipient blood-vessels, in the form of red points and branching lines, are seen, indicating that organization is commencing in the deposit, which if death had not ensued would have been finally converted into cellular or areolar tissue, and have occasioned the complete obliteration of the pericardial cavity.

The symptoms of pericarditis are pain in the situation of the heart, increased by a full inspiration, by pressure upon or between the ribs in the cardiac region, and especially by pressure upwards against the diaphragm by thrusting the fingers beneath the cartilages of the false ribs; palpitations; a dry cough and hurried respiration; discomfort or pain on lying on the left side; restlessness; great anxiety of countenance; and sometimes delirium. The pulse usually beats from 110 to 120 in a minute, and is sometimes intermittent; and febrile symptoms are always present. These symptoms are seldom collectively present in any individual case, and until the time of Louis the diagnosis of this disease was uncertain and obscure. The physical signs, dependent on the anatomical changes which have been described, are, however, generally so distinct that by their aid the disease can be readily detected. They are three in number. 1. In consequence of irritation propagated to the muscular tissue of the heart at the commencement of the inflammation of its investing membrane, the ventricles contract with increased force, rendering the sounds of the heart louder and its impulse stronger than in health, or than in the more advanced stages of the disease. 2. When much fluid is effused into the pericardium, dulness on percussion is always observable to a greater degree than in health. This sign, which is very characteristic, is seldom perceived till the disease has continued for two or three days. In relation to this increased dulness, we must premise that in the healthy condition of the heart and lungs there is an irregular roundish space with a diameter of somewhat less than two inches, extending from the sternum (or breast-bone) between the level of the fourth and fifth ribs towards the left nipple, in which a portion of the surface of the heart is not overlapped by the lungs, but lies in contact with the walls of the chest. This space should normally be dull on percussion. In pericarditis the extent of the dulness beyond the normal limit indicates the amount of effusion. In extreme cases the dulness may extend over a space whose diameter is seven inches or more. Simultaneous with the increased dulness, there is a diminution of the heart's sounds in consequence of the intervening fluid, and the impulse is often scarcely perceptible.

3. The rubbing of the inflamed and roughened surfaces upon each other gives rise to a sound which is commonly called the *friction sound*, but which has received various names. Thus Dr. Watson calls it a *to and fro* sound, and observes regarding its variations that, 'like all the other morbid sounds heard within the chest, it is capable of much variety in tone and degree. Sometimes it very closely resembles the noise made by a saw in cutting through a board; sometimes it is more like that occasioned by the action of a file or of a rasp; but its essential character is that of *alternate rubbing;* it is a *to and fro* sound.' This sound is heard early in the disease, before the surfaces of the pericardium are separated

by the effusion of fluid; and it is due either to the dryness of the membrane, or to its roughness from the deposition of lymph. When the contiguous surfaces are either separated by fluid, or become adherent, the sound disappears; but when it has been lost from the first of these causes, it reappears after the fluid has been so far absorbed as to permit the surfaces again to come in contact. But here, again, its duration is brief, for the surfaces soon become adherent and cease to rub upon each other.

Pericarditis is a disease which occasionally runs a very rapid course and terminates fatally in forty-eight hours or less. In ordinary cases, however, which terminate in apparent recovery, the disease generally begins to yield in a week or ten days, and excepting that adhesion remains, the cure appears to be complete in three weeks or less. But although these patients *apparently* recover, the pericardial adhesion commonly occasions other structural changes of the heart sooner or later to develop themselves; and in those cases that the physician has the opportunity of subsequently watching, it is observed that fatal disease of the heart, primarily due to the pericarditis, almost always supervenes. In slight cases it is probable that a true cure, without adhesion, may take place.

Pericarditis frequently arises from exposure to cold when the body is warm and perspiring. It is no uncommon result of a contaminated state of the blood, such as occurs in the exanthematous diseases, especially scarlatina, and in Bright's disease of the kidney; but beyond all comparison, it is of most frequent occurrence in association with acute Rheumatism (q. v.), of which it forms by far the most dangerous complication.

At the commencement of the disease, blood should be freely taken (if the patient is tolerably robust) from the region of the heart either by cupping or repeated leeching; and at the same time every attempt must be made to get the system under the influence of mercury to the extent of rendering the gums tender and of affecting the breath. Not only should calomel in small doses, and combined with opium with the view of preventing purging, be frequently given, but mercurial ointment should be rubbed into the arm-pits and inner sides of the thighs, and the mouth should be kept slightly sore for some time. After three or four days, if there should be much fluid effusion, a large blister should be applied over the heart; and if the patient is not already under the influence of mercury, the raw surface may be dressed with mercurial ointment. Perfect rest both of body and mind is of essential importance, and all possible causes of excitement should be excluded. The diet should be mild and chiefly farinaceous, and little or no animal food should be allowed till the beginning of convalescence. Cooling drinks are agreeable to the patient, and may be taken freely with advantage throughout the disease.

PERICA'RDIUM, The, is a conical membranous sac, containing the heart and the commencement of the great vessels, to the extent of about two inches from their origin. It is placed with its apex upwards behind the sternum, and to its left side, in the interval between the pleuræ—the serous sacs in which the lungs are enclosed; while its base is attached to the diaphragm. It is a fibro-serous membrane, consisting of an external fibrous and an internal serous layer. The fibrous layer is a strong, dense, fibrous membrane; the serous layer invests the heart, and is then reflected on the inner surface of the fibrous layer. Like all serous membranes, it is a closed sac; its inner surface is smooth and glistening, and secretes a thin fluid which serves to facilitate the natural movements of the heart. It is inflammation of this serous sac which constitutes the disease known as pericarditis.

PE'RICARP. See Fruit.

PE'RICLES (Gr. Perikles), the most accomplished statesman of ancient Greece, was born of distinguished parentage in the early part of the 5th c. B.C. His father was that Xanthippus who won the victory over the Persians at Mycale, 479 B.C., and his mother, Agariste, was the niece of the great Athenian reformer Cleisthenes. P. received an elaborate education; but of all his teachers, the one whom he most reverenced, and from whose instructions he derived most benefit, was the philosopher Anaxagoras (q. v.). P. was conspicuous all through his career for the singular dignity of his manners, the 'Olympian' thunder of his eloquence, his sagacity, probity, and profound Athenian patriotism. When he entered on public life, Aristides had only recently died, Themistocles was an exile, and Cimon was fighting the battles of his country abroad. Although the family to which he belonged was good, it did not rank among the first in point of either wealth or influence, yet so transcendent were the abilities of P. that he rapidly rose to the highest power in the state as the leader of the dominant democracy. The sincerity of his attachment to the 'popular' party has been questioned, but without the shadow of evidence. At any rate, the measures which either personally or through his adherents he brought forward and caused to be passed, were always in favor of extending the privileges of the poorer class of the citizens. P. seems to have grasped very clearly, and to have held as firmly, the modern 'radical' idea, that as the state is supported by the taxation of the body of the citizens, it must govern with a view to general and not to *caste* interests. In 461 B.C., P. through the agency of his follower, Ephialtes, struck a great blow at the influence of the oligarchy, by causing the decree to be passed which deprived the Areopagus of its most important political powers. Shortly after, the democracy obtained another triumph in the ostracism of Cimon. During the next few years the political course pursued by P. is not very clearly discernible, but in general his attitude was hostile to the desire for foreign conquest or territorial aggrandizement, so prevalent among his ambitious fellow-citizens.

In 454 B.C., or shortly after, he magnanimously proposed the measure (which was carried) for the recall of Cimon, and about the same time commenced negotiations with the other Hellenic states with the view of forming a grand Hellenic confederation, the design of which was to put an end to the mutually destructive wars of kindred people—to make of Greece one mighty nation, fit to front the outlying world. The idea was not less sagacious than noble. Had it been accomplished, the semi-barbarous Macedonians would have menaced the civilized Greeks in vain, and even Rome at a later period might perhaps have found the Adriatic, and not the Euphrates, the limits of her empire. But the Spartan aristocrats were utterly incapable of morally appreciating such exalted patriotism, or of understanding the political necessity for it, and by their secret intrigues brought the well-planned scheme to naught. Athens and Sparta were already, and indeed had for some time been, in that mood towards each other which rendered the future Peloponnesian war inevitable. They are always found on opposite sides. When the Spartans, in 448 B.C., restored to the Delphians the guardianship of the temple and treasures of Delphi, of which they had been deprived by the Phocians, the Athenians immediately after marched an army thither, and reinstated the latter. Three years later, an insurrection broke out in the territories tributary to Athens, Megara, Eubœa, &c., and the Spartans again appeared in the field as the allies of the insurgents. The position of Athens was critical. P. wisely declined to fight against all his enemies at once. A bribe of ten talents sent the Spartans home, and the insurgents were then rapidly and thoroughly crushed.

Cimon was now dead, and was succeeded in the leadership of the aristocratical party by Thucydides, son of Milesias, who in 444 B.C. made a strong effort to overthrow the supremacy of P. by attacking him in the popular assembly for squandering the public money on buildings, and in festivals and amusements. Thucydides made an effective speech; but P. immediately rose and offered to execute the buildings at his own expense, if the citizens would allow him to put his own name upon them instead of theirs. The sarcasm was successful, and P. was empowered to do as he pleased in the matter. But P. did not mean to be simply sarcastic; he wished to point out to the Athenians in a delicate way the spirit and aim of his policy, which was to make Athens, as a city worthy of being the head and crown of Hellas. His victory in the assembly was followed by the ostracism of Thucydides; and during the rest of his career 'there was,' says the historian Thucydides, 'in name a democracy, but in reality a government in the hands of the first man.' The same author, however, informs us that he never did anything unworthy of his high position; that he did not flatter the people, or oppress his adversaries; and that with all his unlimited command of the public purse, he was personally incorruptible. Soon after this the Samian war broke out, in which P. acquired high renown as a naval commander. This war originated in a quarrel between the Milesians and Samians, in which Athens was led to take a part with the former. The Samians, after an obstinate struggle, were beaten, and a peace was concluded in 440 B.C. The position in which Athens then stood towards many of the Greek states was peculiar. Since the time of the Persian invasion she had been the leader of the confederacy formed to resist the attacks of the powerful enemy, and the guardian of the confederate treasury kept in the isle of Delos. P. got the treasury removed to Athens, and, commuting the contingents of the allies for money—Athens, of course, herself undertaking to protect the confederacy—enormously increased the contributions to the 'patriotic fund.'

The grand charge against P. is, that he applied the money thus obtained to other purposes than those for which it was designed; that, in short, he adorned and enriched Athens with the spoils of the allied states. But the objection is more plausible than solid, for, in point of fact, Athens kept up in admirable discipline a great fleet and a fine army, and P. made the Greek name more respected in his time than it had ever been before. It may be that his conduct is open to criticism in some respects, but a broad and just view of the motives which impelled him to act as he did, and a fair consideration of the political exigences of the time will, in the main, justify his procedure. It is unnecessary to give a detailed account of all that he did to make his native city the most glorious in the ancient world. Greek architecture and sculpture,

under his patronage, reached perfection. To P., Athens owed the Parthenon, the Propylæa, the Odeum, and numberless other public and sacred edifices; he also liberally encouraged music and the drama; and, during his rule, industry and commerce were in so flourishing a condition, that prosperity was universal in Attica.

At length, in 431 B.C., the long-foreseen and inevitable 'Peloponnesian war' broke out between Athens and Sparta. With the circumstances that led to it we have not here to do, but as it terminated most disastrously for Athens, it is but right to say that P. is not to blame for the result. Had the policy which he recommended been pursued, one can hardly doubt that Athens, with her immense resources, would have been the victor, and not the vanquished, in the struggle. P. himself died in the autumn of 429 B.C., after a lingering sickness. His character has been sufficiently delineated in the outline of his life which we have given. His connection with the brilliant Aspasia (q. v.) is noticed elsewhere.

PERIER, CASIMIR, a celebrated French statesman, was born at Grenoble, in the department of Isere, France, 21st October 1777. His father had enriched himself by mercantile and industrial pursuits, into which he initiated his two elder sons; but Casimir was still studying at the college of the Oratory at Lyon when the revolution broke out. He immediately went to Paris, and there associated himself with his father and elder brother Antoine-Scipion in their endeavors to found a banking company. It is sufficient to notice here that the banking company was firmly established, and became the Bank of France. Casimir was drafted into the army in 1798, and served in an engineering corps till 1801, when he returned to Paris, and resumed the position of coadjutor to his brother. The house of P. prospered greatly under the empire; the peace which followed the events of 1815 aided the development of their plans, and gave a wider scope to their enterprises; and the public regarded with special favor men such as these two brothers, who devoted their abilities and fortunes to foster the growth of public, as well as their own, prosperity. In 1817, P. published three tracts, in which he condemned the financial policy of the ministry. These papers made a lively impression on the public, and led to the return of the author to the Chamber of Deputies by the electors of Paris. P., in his political principles, was essentially a Constitutionalist, equally far removed from absolutism on the one hand, and extreme democracy on the other. The elections of 1824, conducted under government influence, resulted in the ousting of the greater portion of the Constitutionalists. P., however, and a few others of the chiefs of the party retained their seats; but their opposition to the ministerial measures, though constant and unwearying, was quite ineffective; it, however, raised them greatly in public opinion, and secured their re-election in 1827. In this year, P. had the honor of being elected as representative by both the departments of the Seine and the Aube. He defended the loyal and sagacious administration of M. de Martignac, whose representations to the king, Charles X., seemed to have the effect of reconciling the royal party to government in conformity with the charter; but the subsequent rule of the Prince de Polignac reduced this hopeful state of affairs to its former critical condition.

The revolution (of July 1830), which P., from his experience of that of 1789, had made every endeavor to prevent, now followed, and it only remained for him to render it as bloodless as possible. In this he was successful, through his great influence with the people of Paris. On August 3, he was elected President of the Chamber of Deputies, but resigned this office on the 11th of the same month to become a member of the ministry. When Laffitte became President of the Council (November 2), P., fearing that the tendencies of the ministry were too revolutionary, resigned office, and resumed the presidency of the Chamber of Deputies. On 13th March 1831, he succeeded to Laffitte as minister, and gave his whole attention to the repression of revolution, the maintenance of order at home and of peace abroad, originating the political system known as the *justemilieu* (q. v.). His foreign policy was very successful; he greatly contributed to the maintenance of Belgian independence, the suppression of the Miguelite insurrection in Portugal, the counterbalancing of Austrian influence in Italy, and, in general, to the spread and progress of constitutional liberty both at home and abroad; but the rapid growth of extreme liberalism in France, partly owing to previous encouragement unwittingly afforded by himself, was a source of great annoyance to him. On the outbreak of cholera in Paris, March 1832, P. made the most extraordinary exertions for the enforcement of the necessary sanatory measures; but he was attacked by the disease, and his system being already exhausted by over-exertion, he died, 16th May 1832. No public man in France was ever so generally and sincerely lamented, and a monument to his memory was erected by public subscription in the cemetery of Père-la-Chaise.

PE'RIGEE (Gr. *peri*, near; *ge*, earth), that point in the moon's orbit which is nearest to the earth. The opposite point is the Apogee (q. v.). See MOON.

PÉRIGUEUX, a town of France, capital of the department of Dordogne, and situated on the right bank of the Isle, 68 miles east-north-east of Bordeaux. It consists of the ancient city of P. Proper—which is gloomy in aspect, and has narrow streets, but large and solidly-built houses—and the *Puy St. Front*, which, until the year 1240, was a separate and a rival town. In the old town, there are many curious remains of Gothic architecture. The old ramparts have been demolished, and replaced by beautiful and spacious boulevards. The cathedral of St. Front is a majestic edifice, restored at the end of the 15th century. Quarries of building-stone are worked in the vicinity, and many hands are employed in cutting and polishing marble. Paper, woollen cloths, cutlery, and hosiery are manufactured. The celebrated *Pâtés de Périgueux*, made of partridges and truffles, are largely made and exported. Pop. (1876) 23,290.

P., a town of the highest antiquity, is the *Vesunna* mentioned by Cæsar. In ancient times, it was a city of much importance. It stood at the junction of five Roman roads, and contained a number of splendid edifices. Close to the modern town are still to be seen the remains of a vast amphitheater, oval in form, and larger in its dimensions than the ancient amphitheater of Nimes. There are also remains of ancient aqueducts, baths, and temples. The *Tour de Vésonne* is the most remarkable fragment of Roman architecture. It is still 67 feet high, and appears to have been much higher; is 200 feet in circumference, and has walls 6 feet thick. It has neither doors nor windows. Its purpose is not known.

PERIHE'LION (Gr. *peri*, and *helios*, the sun), that point in its orbit at which a planet is nearest the sun. The point of the orbit opposite to it is called the Aphelion (q. v.). The position of the perihelion, i. e., its longitude east or west of the equinox, is one of the seven elements of a planet's orbit.

PERI'M, a small island belonging to Great Britain, situated in the strait of Bab-el-Mandeb, at the entrance to the Red Sea. Lat. 12° 40′ 30″ N., long. 43° 23′ E. P. is level, and is slightly elevated above the sea, and is 3½ miles long; is 1½ m. from the Arabian, and 9 m. from the African coast. Pop. (1871) 211. On both sides of this island the navigation is easy; the Little Strait, between the island and Arabia, is the passage most generally taken by vessels. The island is bare, destitute of fresh water, and ill-furnished with provisions, which are brought for the most part from Aden. P. owes its importance wholly to its commanding position at the entrance of the Red Sea. On its south-west side is an excellent harbor, capable of accommodating 40 men-of-war, within 100 yards from the shore. There is a walled light-house on the island. Fortifications were erected on the island in 1857, but, with the temporary arsenal, &c., were subsequently removed again. It was captured by Sir David Baird, and then occupied by the English in 1799, and held by them as a check upon the designs of the French, who were then in Egypt. It was abandoned in 1801, but was reoccupied by Great Britian in 1857, with a view to the protection of her Indian possessions, which were thought to be exposed to some chance of danger by the opening of the Suez Canal (q. v.).

PERI'METER (Gr. *peri*, around, *metron*, a measure) and PERI'PHERY (Gr. *phero*, I carry) are terms denoting the boundary, or the length of the boundary, of any closed plane figure; though the term 'perimeter' is generally confined to those figures which are bounded by straight lines.

PERINÆUM. The part of the human body which forms the floor of the true pelvis is by anatomists divided into two portions. Of these, the anterior one, situated in front of the anus, is called the *true perinæum*, or urethral portion of the perinæum; the posterior portion, which contains the anus or termination of the rectum, is called the ischio-rectal region, or anal portion of the perinæum. The anterior portion, or true perinæum, is triangular in form, the apex being in front; the sides, about three inches in length, are formed by the rami of the pubes and ischium; and the base by an imaginary line joining the tuberosities of the ischium, and passing about half an inch in front of the anus. Through this space the urethra passes through a layer of strong fascia—the deep perinæal fascia—to communicate with the bladder, and in this space the opening is made in the operation of lithotomy.

PE'RIOD, a term used in Chronology in the same sense as Cycle (q. v.), to denote an interval of time after which the astronomical phenomena to which it refers recur in the same order. It is also employed to signify a cycle of cycles. Various periods have been invented by astronomers, but we can only notice a few of the most important.

The Chaldæans invented the *Chaldæic Period* or *Period of Eclipses*, from observing that, after a certain number of revolutions of the moon round the earth, her eclipses recurred in the same order and of the same magnitude. This period consists of 223 lunations, or 6798·28 days, and corresponds almost exactly to a complete revolution of the moon's node. The Egyptians made

use of the *Dog-star, Siriacal*, or *Sothric Period*, as it is variously called, to compare their civil year of 365 days with the true or Julian year of 365¼ days. The period consequently consisted of 1460 Julian years, corresponding to 1461 Egyptian years, after the lapse of which the dates in both reckonings coincided. By comparing the solar and lunar years, Meton, an Athenian, invented (432 B.C.) a lunar period of 6940 days, called from him the *Metonic Cycle* (q. v.), also the *Lunar Cycle*. About a century afterwards, the cycle of Meton was discovered to be an insufficient approximation to the truth, and as he had made the solar year too long by about $\frac{1}{4}$th of a day, at the end of 4 Metonic cycles the solar reckoning was in advance of the lunar by about 1 day 6 hours.

To remedy this, a new period, called the *Calippic Period*, was invented by Calippus, and consisted of 4 Metonic cycles less by 1 day, or 27,759 days. But as this period still gave a difference of 6 hours between the solar and lunar reckonings, it was improved by Hipparchus, who invented the *Hipparchic Period* of 4 Calippic periods less by 1 day, or 111,035 days, or about 304 Julian years, which is an exceedingly close approximation, being only 6½ minutes too long, when measured by the tropical year; and too short but by an almost inappreciable quantity, when measured by the *Synodic Month* (see MONTH). The *period of the Heliacal* or *Solar Cycle*, after which the same day of the month falls upon the same day of the week, consists of 28 Julian years. If the year had regularly consisted of 365 days, that is, one day more than an exact number of weeks, it is evident that, at the end of seven years, the days of the month and week would again correspond; but the introduction of an intercalary day into every fourth year causes this coincidence to recur at irregular periods of 6, 11, 6, and 5 years successively. However, by choosing a period such as will preserve the leap-years in the same relative position to the other years, and at the same time consist of an exact number of weeks (both of which objects are effected by using the number 28, which is the least common multiple of 4 and 7), we insure the *regular* recurrence of the coincidence between the days of the week and of the month. The solar cycle is supposed to have been invented abont the time of the Council of Nice (325 A.D.), but it is arranged so that the first year of the first cycle corresponds to 9 B.C. In calculating the position of any year in the solar cycle, care must be taken to allow for the omission of the intercalary day at the beginning of each century, and its insertion in the first year of every fourth century. See LEAP-YEAR. The year 1880 is the 13th of the solar cycle. The *Julian Period* is a cycle of cycles, and consists of 7980 (= 28 × 19 × 15) years, after the lapse of which the solar cycle, lunar cycle, and the Indiction (q. v.) commence together. The period of its commencement has been arranged so that it will expire at the same time as the other three periods from which it has been derived. The year 4713 B.C. is taken as the first year of the first period, consequently, 1 A.D. was the 4714th of it, and the year 1881 was the 6594th.

PERIO'DICAL, a publication which appears continuously at regular intervals, and whose contents may be devoted to criticism, politics, religion, literature, science, arts, amusement, or general and miscellaneous subjects. Those periodicals which consist of a collection of critical essays are called Reviews.

The earliest periodical in Great Britain seems to have been the *Philosophical Transactions of the Royal Society*, which first appeared in 1665, and contained notices of books as well as original papers. Periodicals professing to notice the books that were being published appeared soon after from time to time under the name of *All the Works of the Learned;* and in 1692 appeared the *Gentlemen's Journal, or Monthly Miscellany*, properly speaking, the first English magazine. The *Gentleman's Magazine* was founded in 1731 by Cave the printer, a periodical which secured a fortune for its proprietor, and, after surviving all its competitors, still exists, though lately somewhat assimilated in form to the new class of magazines. The periodical literature of Scotland was long represented by the *Scots Magazine*, founded in 1739. The first English periodical that attempted anything like criticism was the *Monthly Review*, begun in 1749. It was followed in 1756 by the *Critical Review*, founded by Smollett; and these two were long the leading periodicals of their class, though their criticism was but meager and unsatisfactory, according to our present notions. Another critical journal, called the *Anti-Jacobin*, was established in 1798. In 1802 a new era in criticism was inaugurated by the establishment in Scotland of the *Edinburgh Review* (q. v.); which was followed in London by the *Quarterly Review*, of about equal merit and opposite politics, supported by Sir Walter Scott, Southey, S. T. Coleridge, Heber, and at a later period by Hartley Coleridge, Lord Mahon, and Gladstone. Another very important periodical, *Blackwood's Magazine*, sprung up in Edinburgh in 1817, under the auspices of John Wilson and Lockhart, as much above the literary mark of former magazines, as the *Edinburgh* and *Quarterly* were above the mark of preceding reviews, strongly devoted to the interests of conservatism, and in its early years, somewhat violent in its politics.

The review, in the course of time, became the favorite medium for all parties to disseminate their views on political, literary, or theological subjects. Of various reviews after the model of the *Edinburgh* and *Quarterly*, and published, like them, four times in the year, some, as the *North British Review* and *National Review*, after having had a flourishing existence for some time, succumbed to the demand for cheaper periodicals, appearing at more frequent intervals. Among existing reviews appearing quarterly may be mentioned the *Edinburgh* and *Quarterly*, which are still among our foremost periodicals; the *Westminster Review*, established 1824, characterized by freedom in handling philosophical and theological topics, and containing essays by J. S. Mill, Carlyle, Grote, John Sterling, and Lord Houghton; and the *Dublin Review*, Roman Catholic, founded in 1836. Many of the newer reviews appear monthly. Of these, the *Contemporary Review* and *Nineteenth Century* are both very ably conducted; as is also the *Fortnightly Review* (at first published twice a month), considered the organ of the very advanced liberal party. There are also weekly reviews, which unite with the review more or less of the character of a newspaper; of these, the most influential are the *Athenæum*, established in 1828; the *Spectator*, in 1828, the *Saturday Review*, in 1856; and the *Academy*, in 1869. Some daily papers, like the *Pall Mall Gazette*, provide a weekly issue, resembling these. Other reviews are *Nature* (1869), weekly; *Knowledge* (1881), weekly; the *Popular Science Review* (quarterly); and *Mind* (1876), quarterly. The articles in the older reviews are generally anonymous; in the newer, it has become to a large extent the practice for the authors to exhibit their names.

The greater part of magazines or periodicals of a more miscellaneous character appear monthly, and their system of management is somewhat similar to that of reviews; but the articles are generally shorter, the subjects more varied, consisting often of tales and novels, which appear there as serials, continued from number to number. Some of the most popular novels of the present day have first been published in magazines. *Blackwood* was the precursor of half-crown monthly magazines, the most important being *Fraser's Magazine*, established in 1830 (discontinued in 1882); but in 1859 and 1860, several new magazines, *Macmillan's Magazine*, the *Cornhill, Temple Bar, London Society*, and the *St. James's Magazine*, were started at the cheaper price of a shilling. Then followed the era of sixpenny magazines, such as *Good Words, Quiver* (1860), *Longman's Magazine* (1882), the *Cornhill* (new and cheap series), and the *English Illustrated Magazine* (1883—an imitation of the beautifully illustrated American magazines). In Great Britain, there are now many weekly periodicals, chiefly of an instructive and amusing kind, price from a penny to threepence each. This class of publications received an impetus and proper direction by the issue of *Chambers's Journal* and the *Penny Magazine* of the 'Society for the Diffusion of Useful Knowledge' in 1832. These weekly sheets are often issued accumulatively in monthly parts under a cover. The rate of payment for writing in the higher class reviews is usually £10, 10*s.* per sheet of 16 demy 8vo pages; in the weekly periodicals, half a guinea to a guinea per column is ordinarily paid, but in some instances the price paid is very much greater; such particularly is the case as regards novels.

The quarterly reviews, and the magazines in course of weekly or monthly publication, in 1881, numbered 1097, and of these above 300 were denominational or religious. Of this number only about 12 are, strictly speaking, reviews.

France possessed as far back as 1665 a critical review called the *Journal des Savants*, which, after a lengthened interruption, began again in 1816, and holds a respectable position as a scientific journal. A number of literary and scientific journals sprung up in last century, as the *Nouveau Journal des Savants, Journal Littéraire, Journal Encyclopédique*, &c. Among the best was the *Magazin Encyclopédique*, begun in 1795, and from 1819 to 1835, combined with the *Revue Encyclopédique*. One of the most noted critical journals in Europe is published in Paris, the *Revue des Deax Mondes*, which began in 1829, and has, since 1831, appeared fortnightly. In it and the other French periodicals of the same kind, the review form is not so completely preserved as with us: a proportion of tales, poetry, &c., is admitted, and the names of the contributors are required to be attached to their articles. The *Revue des Deux Mondes* has had many shortlived imitators, more or less identified with different political parties. The principal French reviews of more recent date are the *Revue Contemporaine, Athenæum Français*, and *Revue d'Europe*.

In Germany, reviews have taken even a deeper root than in England. The *Göttinger Gelehrte Anzeigen*, which is the oldest publication of the kind, still preserves a high character. German criticism can, however, hardly be said to have begun before the time of Lessing, who, in conjunction with Nicolai of Berlin, established, in 1757, the *Bibliothek der schönen Wissenschaften*, and afterwards various other journals, characterized by an independence of thought unknown before. The *Allgemeine Literaturzeitung*, founded at Jena in 1785, was a periodical of a still higher character, having for contributors the most eminent liter-

ary men of the period. When transferred from Jena to Halle, another journal, called the *Jenaische Allgemeine Literaturzeitung*, sprung up at the former place, under the auspices of the celebrated literary circle at Weimar, of whom Goethe was the center. These two periodicals existed till 1848. Of modern German reviews, the *Deutsche Rundschau* and the *Literarisches Centralblatt* are specimens of two different types. *The Deutsches Museum*, the *Gartenlaube* (the most widely read of German periodicals, with a circulation of nearly 400,000), and *Im Neuen Reich*, are rather magazines than reviews.

Italy possessed a critical journal, *Giornale dei Litterati*, as far back as 1710, conducted by Apostolo Zeno, which continued for 23 years. A new journal of the same name, founded at Pisa in 1771, attained considerable repute. From 1826 to 1830, the *Biblioteca Italiana* and *Antologia di Firenze*, were reviews of considerable ability. The scientific periodicals of Italy are generally creditable. More than 30 periodicals are now published in Rome alone, the number having rapidly increased since the events of 1870.

The United States of America possess a large variety of periodicals, quarterly and monthly, and in a less degree weekly, issuing chiefly from the presses of Boston, New York, and Philadelphia. The most noted critical journal is the *North American Review*, established in 1815; and the best known magazines are *The Atlantic Monthly*, *Harper's Monthly*, and *Scribner's Monthly* (known since 1881 as *The Century*)—all of which, but especially the two latter, are very largely read and sold in the United Kingdom. Many of the less reputable of the American periodicals systematically incorporate articles, without permission or payment, from the periodicals of Great Britain.

Latterly, as is well known, many of the periodicals, both of Europe and America, have acquired an interest by the introduction of wood-engravings. See WOOD-ENGRAVING. See Mitchell's *Newspaper Press Directory*, and Poole's *Index* (new ed., 1882).

PERIODI'CITY (in Physiology and Pathology). The tendency manifested by various phenomena occurring in living animals to recur, after equal, or nearly equal intervals of time, is so marked, that Bichat, the great French anatomist and physiologist, described it under the title of the *Loi d'Intermittence*. The alternation of sleeping and waking, the phenomena of menstruation, and the punctual return of hunger, are some of the most obvious instances of periodicity that can be suggested as occurring in the healthy subject; while less obvious examples are afforded by the apparently regular variations that have been observed in the excretion of carbonic acid from the lungs, and in the number of the pulsations of the heart at different periods of the 24 hours. As is well known by experience, periodicity may be usefully cultivated and fixed in daily habits. This is well exemplified in the case of sleep, but in a more special degree by the daily relieving of the bowels at a particular hour, a habit in which it is important that all young persons should be carefully instructed with a view to health and convenience.

In certain forms of disease, the law of periodicity or intermission is very distinctly seen. The regular periodic recurrence of the paroxysms of intermittent fever (or ague), is universally known, although the cause of the periodicity has hitherto baffled all inquiry. Amongst those who have tried to solve this question may be mentioned Willis, Reil, Bailly, Roche, Cullen (who ascribes periodicity to 'a diurnal revolution affecting the animal economy'), and more recently, Laycock, who refers it to the diurnal atmospheric changes in relation to pressure, electricity, &c.

Ague often gives rise to periodic diseases which present no close analogy to that disease. Thus it—or, at all events, malaria—is a frequent cause of tic douloureux, recurring at regular intervals; cases are recorded in which periodical vomiting, occurring weekly, or, in one case, at an interval of ten days, seemed to be due to it; and Mr. Moore, surgeon to the Middlesex Hospital, not long ago published the case of a woman who experienced a periodical inflammatory swelling of the right knee, as a sequence of that disorder. Epilepsy is a disease in which the intervals (especially in women) tend to a regular period. Sir Henry Holland (*Medical Notes and Reflections*, 2d ed., page 341) records a case in which 'six attacks occurred, with intervals of sixteen or eighteen minutes between; so exactly recurring, as noted by the watch, that it was impossible to suppose it a mere casualty;' and another, 'where a spasmodic seizure, more of tetanic than epileptic character, occurred twice a day for many weeks successively, and almost exactly at the same hours each day.' For many other examples of periodic or intermittent morbid action, the reader is referred to a memoir by Henle, 'On the Course and Periodicity of Disease,' in his *Pathologische Untersuchungen;* and to Sir Henry Holland's essay (to which we have already referred) in his *Medical Notes and Reflections*. The most important practical fact in relation to this class of diseases is, that they almost invariably yield to the action of certain medicines, especially bark and arsenic.

Exercising a beneficial or mischievous influence, as the case may be, the habit of periodicity is to be sedulously shunned in every instance likely to prove morally or physically prejudicial. No more marked example of the injudicious cultivation of periodicity could be given, than in the evil practice of periodical bloodletting, which once prevailed all over Europe, and was only abandoned in recent times as not only useless, but in all respects injurious.

PERIŒ'CI (Gr. *Perioikoi*, literally, 'dwellers round about,' i. e., round about some particular locality or city) was the name given, in ancient Greece, to the original Achaian inhabitants of Laconia by their Dorian conquerors. The P. were not slaves, like the Helots (q. v.); they were merely a vassal population, personally free, cultivating their own ground, and carrying on most of the home and foreign trade of Laconia, but possessing no political rights, incapable of intermarrying with the Dorians of Sparta, or of holding important state-offices, and subjected to a land-tax in token of their dependent condition. They have been—as regards their political position—compared to the Saxons of England after the Norman conquest, and seldom has a historical parallel been so sound. The P. must have been very numerous, for they occupied at one time upwards of 100 cities, several of which were on the coast, whence the whole seaboard of Laconia bore the name of the *Perioikis*, and they produced capital sailors, which doubtless accounts for the anomalous fact of P. being occasionally invested with the command of the Spartan fleet. They also formed a part of the Spartan army. At the battle of Platæa (479 B.C.), there were 10,000 P. present. These dependent Achaians were not, however, all on a dead level of vassalage; they lived in regularly organized communities, where the social distinctions of rank, refinement, and wealth were as marked as elsewhere. Xenophon speaks of 'accomplished and well-born gentlemen' (*kaloi k'agathoi*) among the P. serving as volunteers in the Spartan army; and such artists and men of culture as Lacedæmon produced, in all probability belonged to this class. P. also existed in the other Dorian communities of the Peloponnesus.

PERIO'STEUM (Gr. *peri*, around, and *osteon*, bone), a tough fibrous membrane which surrounds the various bones. It is highly vascular, and is the means by which the outer layers of the shafts and the greater part of the spongy portions of the bones are supplied with blood. 'From the internal surface of the periosteum also is produced a layer of soft blastema (or plastic fluid in which cells are developed), by means of which, additions are made to the exterior of the growing bones. The process of ossification going on in the inner part of this blastema, contributes to the thickness of the bone, while a fresh supply is continually being added to the exterior of the blastema, through the medium of the vessels of the periosteum.'—Humphry *On the Human Skeleton*, page 19. In young bones, this membrane is thick, and in consequence of the intervening blastema, is very easily detached from the bone; but in the bones of the adult it is less thick and vascular, while its connection with the bone becomes closer, in consequence of the blastema being less; while in aged persons it is very thin, its vessels are scanty, and there is no blastema. Numerous experiments show that the formation of bone is essentially due to the action of this membrane; and that, by transplanting detached portions of periosteum into muscular or other tissues, bony tissue is generated in those parts. In most cases in which this membrane has become detached in consequence of a wound or of disease, the exposed bone (except in the instance of the skull, which derives most of its nutrient matter from the dura mater) perishes; but this is not invariably the case. Amongst its other offices, it serves, by isolating the bone from the surrounding tissues, to prevent the spread of disease from them to it. The shin-bone or tibia is thus indebted to the periosteum for its ordinary immunity, in cases of ulcer in that region. In those parts in which the bone is not so completely isolated from the surrounding tissues, as at the ends of the bones of the fingers and toes, inflammation of the soft parts not unfrequently extends to the bony structure.

PERIOSTI'TIS, or INFLAMMATION OF THE PERIOSTEUM, generally occurs on the surface of thinly-covered bones, such as the tibia, clavicles, and cranial bones. Its chief causes are (1) a *syphilitic taint*, in which oval swellings, called *Nodes* (q. v.), are produced; (2) *rheumatism;* and (3) *scrofula*. In the two latter cases, there is a periosteal swelling around the whole circumference or surface of the bone. The affection, especially when due to the first or second of the above causes, is usually accompanied with considerable nocturnal pain. If the disease occurs in an acute form, it must be treated with leeches, fomentations, and the other ordinary antiphlogistic (or lowering) remedies. When it becomes chronic, the treatment must be mainly directed to the cause which has originated it. In almost all cases, the nocturnal pains are best relieved by somewhat large doses

(five to ten grains) of iodide of potassium, taken three times a day on an empty stomach.

PERIPATE'TIC PHILOSOPHY, a designation of the philosophy of Aristotle (q. v.) and of his followers. It is of doubtful origin, being supposed to have been derived either from his custom of occasionally walking about (*peripatein*) during the delivery of his lectures, or from the place in which they were delivered being a shaded walk.

PERIPATUS. See ARTICULATA.

PERIPNEUMO'NIA, an inflammation of the membrane which invests the lungs, accompanied with general disturbance of the whole system; remarkably prevalent among horses in South Africa, in a zone from 20° to 27° S. lat. It is very fatal; and to its prevalence and virulence, Dr. Livingstone is disposed to ascribe the fact that horses, although so abundant in the more northern parts of Africa, were unknown in the south till introduced by Europeans; this invisible barrier being more insurmountable than mountain ranges, deserts, or rivers. The season during which peripneumonia prevails is from December to April. Zebras, antelopes and oxen are liable to its attacks, but no kind of quadruped suffers so much from it as the horse. The flesh of animals which die of peripneumonia is unwholesome, and produces a malignant carbuncle.

PERI'PTERAL (Gr. *peri;* and *pteron*, a wing), a term applied to temples or like buildings having columns all round the cella.

PERISSODACTYLA. See ARTIODACTYLA.

PERISTA'LTIC MOTION. The term *peristaltic* (Gr. *clasping and compressing*) and *vermicular* (or worm-like) are applied to the peculiar motion or action of the muscular coat of the intestines, by which the substances contained within it are regularly moved onward.

This action of the intestines is readily seen on opening an animal (a dog, cat, or rabbit, for example) immediately after it has been killed; and in these circumstances, it is perhaps exaggerated, from the stimulating action of the cold air; and it may be shown in an abnormally active state, although not altered in character, by subjecting the exposed intestines to the influence of the electro-magnetic machine.

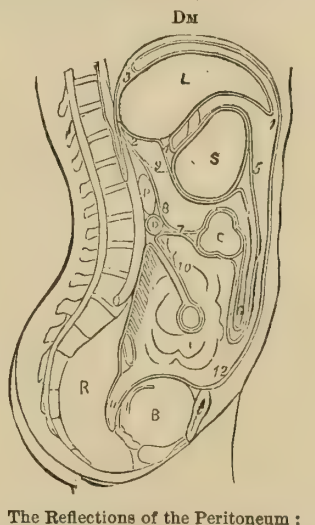
It appears, from the observations made by Brinton, Todd and Bowman, and others on recently killed animals, that the peristaltic motion commences at the pyloric third of the stomach (see DIGESTION, ORGANS OF), whence successive waves of contraction and relaxation are propagated downwards throughout the whole length of the intestinal canal. 'In examining a portion of intestine at the moment of its contraction, we perceive a dilatation above it as well as below it; the latter being produced by the protrusion into it of the contents of the now contracted portion of intestine; the former by the relaxation of a previously contracted portion. The rapid succession of these contractions and relaxations gives to the movements of the intestines the appearance of the writhings of a worm, whence they are distinguished by the appellation *vermicular*.'—Todd and Bowman's *Physical Anatomy of Man*, vol. ii. p. 236. These movements can occasionally be observed during life in the human subject, indirectly, in cases of extreme attenuation of the abdominal walls, and directly in wounds of the abdomen, and during certain surgical operations. There are differences of opinion as to the causes of peristaltic action; thus, Todd and Bowman assert that 'the intestinal movements are partly due to the influence of the stimulus of distention upon the muscular tissue, and partly to the reflex action of the ganglia of the intestinal portion of the sympathetic, stimulated by the contact of the intestinal contents with the mucous membrane;' while Carpenter maintains that 'the intestinal tube from the stomach to the rectum is not dependent upon the nervous centers either for its contractility or for its power of exercising it, but is enabled to propel its contents by its own inherent powers.'

Numerous observations tend to show that this motion has a nearly definite velocity in each individual. Most commonly the act of defæcation takes place with perfect regularity every 24 or (more rarely) every 12 hours, the quantity discharged being almost constant, if the mode of living does not vary. Heberden (*Commentarii*, p. 14) mentions a person who regularly had a motion once a month, and (by way of contrast) another who had twelve motions every day during thirty years, and then seven every day for seven years, and rather grew fat than otherwise. Ponteau (*Œuvres Posthumes*, tome i. p. 27) records the case of a young lady who had no stool for upwards of eight years, although during the last year she ate abundantly of fruit, and drank coffee, milk, and tea, and broth with yelk of eggs; but she had copious greasy sweats. Such a case as this is possible, but far from probable.

That the influence of *expectant attention* on the muscular movements of the intestine (and especially of its lower portion) is very great, is shown in various ways. It is, for the most part, thus that *habit* operates in producing a readiness for defæcation at one special hour in the day, and that bread-pills and other equally inert substances act on the bowels, if the patient believes them to be purgatives. Dr. Carpenter, in his remarks on 'the influence of expectant attention on muscular movements,' in the chapter of his *Human Physiology* treating 'Of Muscular Movements,' mentions two very striking cases of the kind which have fallen within his own knowledge.

PE'RISTYLE, a colonnade around the interior of a courtyard or other building.

PERITONE'UM (Gr. *periteinein*, to extend around), a serous membrane, and like all membranes of this class, a shut sac, which, however, in the female, is not completely closed, as the Fallopian tubes communicate with it by their free extremities. The peritoneum more or less completely invests all the viscera lying in the abdominal and pelvic cavities, and is then reflected upon the walls of the abdomen, so that there is a visceral and a parietal layer. Numerous folds are formed by the visceral layer as it passes from one organ to another. They serve to hold the parts in position, and at the same time enclose vessels and nerves. Some of these folds are termed *Ligaments*, from their serving to support the organs. Thus, we have ligaments of the liver, spleen, bladder, and uterus formed by peritoneal folds. Others are termed *Mesenteries* (from the Gr. *meson*, the middle, and *enteron*, the intestine), and connect the intestines with the vertebral column. They are the Mesentery proper (q. v.), which has been already described, the ascending, transverse, and descending



The Reflections of the Peritoneum:

Dm, the diaphragm; S, the stomach; C, the transverse colon; D, the duodenum; P, the pancreas; I, the small intestines; R, the rectum; B, the urinary bladder; 1, the anterior, and 2, the posterior layer of peritoneum; 4, the lesser omentum; 5 and 6, the greater omentum; 7, the transverse mesocolon; 10, the mesentery encircling the small intestine; 11, the recto-vesical fold; 12, the anterior layer traced upwards upon the internal surface of the abdominal walls to the point (1) with which the examination commenced.—From Wilson's *Anatomist's Vade-mecum*.

meso-colon, and the meso-rectum. (The mesentery and transverse meso-colon are shown in the figure.) Lastly, there are folds called *Omenta*, which proceed from one viscus to another. They are three in number—viz., the *Lesser* or *Gastro-hepatic Omentum*, which extends from the under-surface of the liver to the lesser curvature of the stomach (No. 4 in fig.); the *Gastro-splenic Omentum;* and the *Great* (or *Gastro-colic*) *Omentum* (Nos. 5 and 6 in fig.), which consists of four layers of peritoneum, the two which descend from the stomach, and the same two returning upon themselves, and ascending as high as the transverse colon, where they separate, and enclose that organ. These separate layers may be easily seen in the young subject, but in the adult they are more or less blended. The great omentum always contains some adipose tissue, which, in persons inclined to corpulency, often accumulates to an enormous extent. Its use appears to be (1) to protect the intestines from cold by covering them anteriorly as with an apron, and (2) to facilitate their movement upon each other during their vermicular action.

Like all serous membranes, the peritoneum readily takes on inflammation from various exciting causes. This inflammation is termed Peritonitis (q. v.).

PERITONI'TIS, or INFLAMMATION OF THE PERITONEUM, may be either an acute or a chronic disease.

Acute Peritonitis generally presents well-marked symptoms. It sometimes commences with a chill, but severe pain in the abdomen is usually the first symptom. The pain is at first sometimes confined to particular spots (usually in the lower part of the abdomen), but it soon extends over the whole abdominal region.

It is increased, on pressure, to such an extent that the patient cannot even bear the weight of the bedclothes; and to avoid, as far as possible, internal pressure upon the peritoneum, he lies perfectly still, on his back, with the legs drawn up, and breathes by means of the ribs, in consequence of the pain occasioned by the descent of the diaphragm in inspiration. The breathing is naturally shallow in these cases, and less air being admitted at each movement of respiration, the number of those movements is increased. There are perhaps forty or even sixty respirations executed in a minute, instead of eighteen or twenty. The pulse is usually very frequent, often 120 or more in the minute, and small and tense though occasionally strong and full at the commencement of the attack. After the disease has continued for a certain time, the belly becomes tense and swollen; the enlargement being caused at first by flatus, and afterwards also by the effusion of fluid, as may be ascertained by percussion and auscultation.

The progress of the disease is in general rapid. In fatal cases, death usually takes place within a week, and often sooner. The symptoms indicating that the disease is advancing towards a fatal termination are great distention of the abdomen, a very frequent and feeble pulse, a pinched and extremely anxious appearance of the face, and cold sweats.

Peitontis may arise from any of the ordinary causes of inflammation, such as sudden change of temperature (especially the combined effects of cold and wet on the surface of the body), excessive use of stimulating fluids, the suppression of long-standing discharges, translation of gout and rheumatism, &c. It is frequently the result of local violence, and of wounds penetrating the peritoneal sac, including various surgical operations. Besides the above causes, there are two which give rise to special varieties of peritonitis, viz., contagion or infection, which often prevails epidemically, and produces great mortality amongst women after childbirth, giving rise to puerperal peritonitis, one of the most perilous accompaniments of the awful disorder known as Puerperal Fever (q. v.); and perforation of the stomach, bowels, gall bladder, urinary bladder, &c., by which their contents are allowed to escape into the peritoneal cavity, where they excite the most violent inflammation. *Peritonitis* from *perforation* is characterized by the suddenness of the attack; intense pain, incapable of mitigation by medicine, all at once arising in some part of the abdomen, the whole of which soon becomes tender in every part. This form of the disease is generally fatal, death usually ensuing within two days, and sometimes within a few hours. Perforation of the small intestine, in consequence of ulceration of its glands, is of not uncommon occurrence in continued (typhoid) fever, and sometimes occurs in phthisis. That apparently useless structure, the vermiform appendage of the cæcum, is a comparatively frequent seat of perforation. Sometimes it is the stomach which is perforated, and in these cases the patients are usually unmarried women (especially domestic servants), who had previously appeared in good health, or at most had complained of slight dyspepsia.

The only disease with which peritonitis is likely to be confounded by the well-educated practitioner is a peculiar form of hysteria; but the age and sex of the patient, the presence of hysteria in other forms, and the general history of the patient and of her symptoms, will almost always lead to a correct diagnosis of the disease.

The treatment, in an ordinary case of peritonitis (not arising from mechanical injury, or perforation from disease, or occurring in connection with puerperal fever), consists, if the patient is moderately robust, in bleeding from the arm, till a decided impression has been made on the circulation; after which the abdomen should be covered with twenty or thirty leeches, and the bleeding from their bites should be encouraged by fomenting the belly with flannels rung out of hot water, or, if the patient can bear its weight, by the application of a light poultice. The system must, at the same time, be got as speedily as possible under the influence of mercury, by the means described in the treatment of Pericarditis (q. v.). Opium may be given freely, not merely to guard against the purgative action of the calomel, but with the view of securing sleep to the patient, and quiet to the inflamed membrane. The patient must be kept on low diet, unless indications of sinking appear. In peritonitis from perforation, the only remedy is opium, which must be given in large and repeated doses, so as to keep the bowels perfectly at rest, in order to promote the formation of adhesion, by which alone the patient can be possibly saved. For the same reason, perfect rest must also be insisted on, and even drinks forbidden, thirst being allayed by the application of ice to the tongue.

Chronic Peritonitis occurs in two forms, which differ in their origin and degree of fatality, but are very similar in their symptoms. In the first, the inflammation is of the ordinary character, and although the disease sometimes originates spontaneously, it is more frequently the sequel of an imperfectly cured acute attack; in the second, it depends upon granules (supposed by Louis and most writers to be tubercles) lying in countless numbers in the serous membrane, and serving as a constant source of irritation. The second form is confined almost, if not entirely, to persons of a scrofulous constitution.

The symptoms of chronic peritonitis are more obscure than those of the acute form. There is abdominal pain, often slight, and not always constant, which is increased by pressure, or sometimes is felt only when pressure is made. The patient complains of a sensation of fulness and tension of the belly, although its size is not visibly increased; of a loss of appetite; and of nausea and vomiting; and the bowels are usually more or less out of order. After a time, the abdomen enlarges, and becomes tympanitic, or more or less filled with fluid; and death gradually ensues from debility and emaciation, unless the fatal issue is accelerated by an acute inflammatory attack.

It is not always easy to determine, during life, whether the disease belongs to the first or second form. When its origin cannot be traced to a preceding acute attack, to local abdominal injury, or to chronic affections of the abdominal viscera, there is strong reason to believe it to be of the granular, or, as it is commonly called, the tubercular form, especially if the general constitution and the hereditary tendencies of the patient point in the same direction.

Little can be done in the way of treatment, especially in the tubercular form, further than mitigating the most distressing symptoms, and possibly retarding the final issue. The frequent application of a few leeches to the abdomen, followed by warm poultices, occasional blisters, attention to the bowels, which, if costive, should be acted upon by gentle laxatives, and a mild, nourishing, but unstimulating diet, are more likely to be of service than remedies of a more energetic nature.

PERIWI'NKLE (*Littorina*), a genus of gasteropodous molluscs of the order *Pectinibranchiata* and family *Littorinidæ*, having a proboscis-shaped head, a foot of moderate size, a single gill, and a rudimentary siphonal canal; the shell turbinate, thick, with few whorls, and no nacreous lining; the operculum of few whorls. A very well-known species is the COMMON P. (*L. littorea*), a snail-like mollusc most abundant on rocky parts of the British coasts, living in the lowest zone of sea-weeds between tide-marks, and feeding on fuci, &c. It is oviparous. No mollusc is more generally collected and used for food. Children are generally employed in collecting it. It is boiled in the shell, and so sold, often on the streets, and chiefly to the poorer classes, although few molluscs are more pleasant. It is calculated that 1900 tons, value £15,000, are annually consumed in London alone. It is called *Wilk*, *Wulk*, or *Whulk* in Scotland, but is quite different from the *Whelk* (q. v.) of the English, notwithstanding the sameness of name. Other species, *L. neritoides* and *L. rudis*, are common on all rocky parts of the British coasts, but are less esteemed. *L. rudis* is viviparous, and the shells of the young within the mantle of the parent often make it gritty and unpleasant to eat.

PERIWINKLE (*Vinca*), a genus of plants of the natural order *Apocynaceæ*, having a 5-cleft calyx, and a salver-shaped corolla bearded at the throat, with five obliquely truncated segments. The leaves are opposite and evergreen; the flowers grow singly or in pairs from the axils of the leaves. The LESSER P. (*V. minor*), a native of many parts of Europe, and of the southern parts of Britain, growing in woods and thickets, is a half-shrubby plant with trailing stems, rooting at their extremities, ovatolanceolate leaves, and pale-blue—sometimes white or reddish-purple—salver-shaped flowers. The GREATER P. (*V. major*), which has much larger flowers and ovato-cordate ciliated leaves, is a native of the south of Europe, and is found in a few places in the south of England. Both of these species are very commonly planted in shrubberies and gardens, rapidly cover unsightly objects with pleasing green foliage, and produce their beautiful flowers at almost all seasons of the year, even in winter when the weather is mild. The HERBACEOUS P. (*V. herbacea*), a Hungarian species, is remarkable for the abundance of its flowers. The YELLOW P. (*V. lutea*) is a native of the southern parts of North America. The ROSE-COLORED P. (*V. rosea*), a native of Madagascar, is a favorite greenhouse plant.—The name P. was formerly *Perwinké*. Chaucer speaks of the 'fresh perwinké rich of hue.' It is probably from the French *pervenche*, and that from the Latin *vinca*.

PE'RJURY is the crime committed by one who, when giving evidence on oath as a witness in a court of justice, or before some constituted authority of the same kind, gives evidence which he knows to be false. But in order to make the giving of the false evidence liable to criminal punishment, it must have been not only false to the knowledge of the witness, but the matter must have been material to the issue raised. If the falsehood occurred as to some trifling or immaterial fact, no crime is committed. Moreover, it is necessary, in proving the crime, that at least two persons should be able to testify to the falsehood of the matter, so that there might be a majority of oaths on the matter—there being then two oaths to one. But this rule is satisfied though both witnesses do not testify to one point. The perjury must

also have taken place before some court or tribunal which had power to administer the oath. See OATH. Though in some courts affirmations are allowed instead of oaths, yet the punishment for false affirmation is made precisely the same as for false swearing. The punishment for perjury was, before the Conquest, sometimes death or cutting out the tongue; but latterly, it was confined to fine and imprisonment, and at present the latter is the only punishment, with the addition of hard labor. The crime of Subornation of Perjury—i. e., the persuading or procuring a person to give false evidence, is also punishable as a distinct offence.

PERKIN WARBECK. See HENRY VII.

PE'RLEBERG, a town of Prussia, province of Brandenburg, on the Stepnitz, with woollen and machine manufactures, tanneries, &c. Pop. 7900.

PERM, the most eastern government of European Russia, is bounded on the E. by Siberia, and on the N., W., and S. by the governments of Vologda, Viatka, and Orenburg respectively. Area, 128,210 square miles—more than twice the area of England and Wales. Pop. (1879) 2,439,134. It is divided by the Ural Mountains into two unequal parts, of which the smaller portion is on the eastern or Siberian side of the mountains, although, for administrative purposes, it is reckoned as a part of European Russia. About three-fourths of the government are occupied by the Ural range, which in some places reaches the height of 4000 feet; but which slope so gradually towards the plain, that the traveler reaches their summit before he is aware that he has made any unusual ascent. About two-thirds of the entire surface, comprising all the northern districts, are covered with forests, one-tenth of the area is in meadows, and about the same extent is under cultivation. The more important rivers belong to the systems of the Volga and the Obi. The Kama, together with the Tshousovaia and other affluents from the Ural Mountains, flow south-west, join the Volga, and thus form an important means of communication between the mining districts of P. and Europe. The Tura, the Sosva, and the Losva communicate with the Obi; and access is opened up to the White Sea and the Arctic Ocean by the rivers Dwina and Petchora. The climate is healthy, though somewhat rigorous. At the end of July, the nights are cold; in the middle of September, falls the first snow. In November, when the whole face of nature is covered with snow, the transport of goods by sledges is busily carried on everywhere. In January, the cold is so great that quicksilver sometimes freezes. At the end of March, the snow begins to melt, and before the middle of May, although the cold is still great, the country is clothed in the green of early spring. The chief products are gold, copper, magnetic iron ore, rock-crystal, jasper, agate, topaz, porphyry, malachite, porcelain clay, salt (obtained from salt springs), coal, alabaster, marble, &c., and diamonds in small quantities. The inhabitants are chiefly Russians, but there are also numbers of Tartars, Bashkirs, and Finns.

The agricultural produce of the government, consisting chiefly of corn, vegetables, flax, and hemp, is more than sufficient for local consumption, and is exported so some extent to the neighboring government. The immense forests of the country yield wood for fuel, and timber for the construction of the barges which, during summer, are floated down the rivers, freighted with the products of the mines. Three-fourths of the government are covered by forest; hardly above a twelfth is yet under the plough. The numerous works and factories employ over 100,000 hands, and recently their annual produce was estimated at £6,000,000, of which a third was the value of iron. Here, also, is a platina mine, said on good authority to be the richest in the world. The iron of P. is famous all over Europe. The commerce of the government is very considerable. The fair of Irbit (q. v.) is, after that of Nijni-Novgorod, the most important of the Russian empire. The transit trade, however, is much more considerable than the local trade. The great highway from Siberia to European Russia passes through P., and the government communicates by means of the Volga, Petchora, and the Obi, with the Baltic, White, and Caspian Seas. The central administration of mines has its seat in Ekaterinburg.

The government of P. once formed a portion of the ancient Biarmia, inhabited in the earliest historical times by Finnish tribes, and even then famous for the commerce which it carried on, especially with Asia. In the 11th c., it became connected commercially with the principality of Novgorod, which, little by little, conquered and took possession of the country. At the close of the 15th c., both it and Novgorod were annexed to the territories of the Prince of Moscow, and about the same time the Christian religion was introduced.

PERM, a town of European Russia, capital of the government of the same name, on the Kama, 1357 miles east-south-east of St. Petersburg. It was founded in 1729, under the name of the Egotinsky copper-work, and was the first colony in the government from which it derives its name. It is not in itself important for its commerce, but it is the seat of a most extensive transit trade. Here goods floated down the Tshousovaia from the Ural Mountains, are transferred to larger vessels, and forwarded by the Kama and Volga past Nijni-Novgorod and Rybinsk, and thence to St. Petersburg. Goods from the sources of the Kama, metals, corn, tallow, and leathers, as well as Siberian and Chinese articles, are also sent from P. to the Russian interior, and to Europe generally. Near the town is a large cannon-foundry, possessing one of the largest steam-hammers in the world. Pop. (1880) 22,288.

PE'RMIAN, MAGNE'SIAN LIMESTONE, or DIAS group, is the lower division of the New Red Sandstone rocks, which were separated, chiefly on palæontological grounds, from the upper portion, and being, in 1841, without a collective name, were called Permian by Murchison, because he found them largely developed in that portion of Russia which composed the ancient kingdom of Permia, or Biarmia. The name Magnesian limestone is given to them because of the predominant deposit; and Dias has been proposed by some German geologists, to correspond with Trias, the name universally accepted for the upper section of the New Red Sandstone series.

The Permian strata occupy in Russia an area twice the size of France, and contain an abundant and varied suite of fossils. They are also largely developed in Germany, and as they have been there carefully studied, and described by numerous geologists, the rocks of that country may be considered as the types of the group. They have been thus grouped: 1. Bunterschiefer. 2. Zechstein. 3. Kupferschiefer or Mergel. 4. Rothe-todtliegende.

The Bunterschiefer consists of red and mottled marl and sandstone, which have been separated from the Triassic Bunter Sandstein, because of the occurrence in them of fossils which have a palæozoic facies. The Zechstein is chiefly a compact limestone with beds of colored clays, and cellular magnesian limestone. The well-known Stinkstein belongs to this series; it is a dark-colored and highly bituminous limestone, which gives out an offensive odor when struck or rubbed. The name Zechstein (literally, minestone) was given to these beds, because they must be mined or cut through to reach the Kupferschiefer below. This latter is a marl slate, richly impregnated with copper pyrites, for which it was extensively wrought. It contains numerous beautifully preserved fossil fish belonging to the genera Palæniscus, Cælacanthus, Platysorus, &c. The strange name of Rothe-todtliegende (red dead-layers) was given to a large deposit of red sandstone and conglomerate, by the miners, because the copper obtained from the beds above died out when they reached these red rocks.

The succession of rocks given, by Murchison as occurring in Permia, are easily co-related with those of Germany. They are (1), conglomerates and sandstones, containing the remains of plants; (2), red sandstones and shales, with copper ore and vegetable remains; and (3), sandstones grits, and fossiliferous limestones, with interstratified beds of marl and gypsum, the marls occasionally containing plants, and also seams of impure coal.

In England, the Permian rocks are somewhat extensively developed in Durham, where they have been described by Sedgwick and King. From this county, they continue in a narrow strip bordering the Carboniferous beds down the center of England, until they are lost near Nottingham. In Cheshire, Shropshire, Stafford, and Warwick, they underlie the salt-bearing triassic rocks. The Durham strata are grouped as follow:

1. Concretionary and amorphous limestone	= Bunterschiefer.
2. Brecciated and pseudo-brecciated limestone	= Bunterschiefer.
3. Fossiliferous limestone	= Zechstein.
4. Compact limestone	= Zechstein.
5. Marl slate	= Kupferschiefer.
6. Inferior various-colored sandstone...	= Rothe-todtliegende.

The fractured bones and teeth of saurians found in the basement bed of the sixth group, were considered the earliest evidence of the existence of reptiles, until the discovery of the Archegosaurus in the Carboniferous rocks.

The known organic remains of this period are neither remarkable nor abundant. Many palæozoic forms became extinct within this period; among them are the remarkable Sigillaria and the Neuropteris of the coal-beds, the well-known brachiopod, Producta, and several genera of heterocercal-tailed fish. Some new forms appear, the most important of which are the labyrinthodont reptiles, which, though beginning in the upper Carboniferous beds, increase in number in the Permian, and reach their maximum development in the succeeding Triassic group.

PERMUTA'TIONS AND COMBINATIONS. A combination, in Mathematics, is a selection of a number of objects from a given set of objects, without any regard to the order in which they are placed. The objects are called elements, and the combinations

are divided into classes, according to the number of elements in each. Let the given elements be the four letters *a, b, c, d*; the binary combinations, or selections of two, are *ab, ac, ad, bc, bd, cd* —six in all; the combinations of three are *abc, abd, acd, bcd*—four in all; while there is only one combination of four, namely, *abcd*.

Permutation, again, has reference to the order of arrangement; thus, the two elements, *a* and *b*, may stand *a b* or *ba*, so that every combination of two gives two permutations; the three elements, *a, b,* and *c*, may stand *abc, acb, bac, bca, cab, cba*, one combination of three thus affording six permutations. The combinations of any order with all their permutations are called the *Variations*. Formulas are given in works of algebra for calculating the number of permutations or combinations in any given case. Suppose seven lottery-tickets marked 1, 2, 3, to 7, and that two are to be drawn; if it is asked, how many possible pairs of numbers there are, this is a question of the number of combinations of seven elements, *two* together, which is found to be 21. If we want to know how many times the same seven persons could sit down to table together, with a different arrangement each time, this is to ask how many permutations seven objects admit of, and the formula gives, $7 \times 6 \times 5 \times 4 \times 3 \times 2 = 5040$. The theory of probabilities is founded on the laws of combination. Thus, in the case of drawing two tickets out of seven, since there are 21 possible pairs, the chance or probability of drawing any particular pair is 1 in 21, or $\frac{1}{21}$. In working out questions in 'combinations,' advantage is often taken of the fact that whatever number of elements be *taken* from a group to form a combination, the number *left* gives the same number of combinations; thus the number of combinations of 10 elements *three* together, is the same as that of 10 elements *seven* together, &c.

PERN. See HONEY BUZZARD.

PERNAMBU'CO, or RECIF'E, the most eastern seaport of Brazil, stands at the mouths of the Biberibe and Capeberibe, in lat. 8° 4′ S., long. 34° 52′ W., 80 miles south of Parahiba. It is the greatest sugar-mart in Brazil, and is the third in commercial importance of the cities of the empire. It consists of 3 portions, connected by roads and bridges—*Recife* proper, the chief seat of commerce, on the peninsula; *S. Antonio*, the middle district, on an island between the peninsula and the mainland; and *Boa Vista*, on the mainland. The inner harbor, which has a depth of from 10 to 30 feet, is formed by a reef which extends along the coast at a distance of from a quarter to half a mile from the coast. This reef serves the purposes of a breakwater. Opposite the northern extremity of the city, there is an opening in the reef, resembling an artificial cut, and forming a passage of sufficient width to admit of the entrance of vessels drawing 16 feet of water. No port is more easily accessible than the outer harbor of Pernambuco. There is a light-house in the harbor, and it is defended by several forts. Formerly, the city was extremely dirty, the streets unpaved, and much inconvenience was suffered from want of a proper supply of water. Of late years, however, many improvements have been introduced; water-works have been erected, extensive and spacious quays formed along the margins of the rivers, and the streets have, in most instances, been paved and lighted. Numerous *collegios* and other educational institutions have been established, and the growing wealth and commercial prosperity of the city has been accompanied by an increasing degree of comfort and refinement. The principal exports are sugar, cotton, rum, hides, and dye-woods; the imports are woollens and cottons, hardware, silks, wines, &c. The annual values of exports and imports averaged about £2,000,000. Pop. 120,000.

PERNAMBUCO, a maritime province of Brazil, is bounded on the south-east by Bahia and Alagoas, and on the north-west by Piauhi, Ceara, and Parahiba. It contains 50,000 square miles, and has a population of 850,000. The coast is flat, and fringed with coral reefs, which render navigation dangerous. The chief river is the San Francisco, which forms the southern boundary, and includes the greater portion of the area of the province in its basin. The banks of this river comprise many rich, expansive meadows, and here the cattle are reared which, in the form of beef and hides, form an important article of export at the seaport of Pernambuco. Much of the cotton and sugar brought to the market of the capital is harvested about 300 miles inland, in regions fertilized by streams that rise at the base of the Santa Barbaretta Hills, the first hill-range in this district that arrests the trade-wind from the Atlantic, laden with rain. The San Francisco Railway, 77¼ m. long, has done much to encourage the cultivation of sugar and cotton. The province comprises immense tracts of rich and fertile soil, productive in sugar-cane, cotton, maize, fruits, vegetables, and medicinal herbs. From the forests, balsams, gums, and dye-woods are obtained. In 1873 there were in P. 466 primary and 25 grammar schools, with 17,175 pupils.

PERNAMBUCO WOOD. See BRAZIL WOOD.

PERNO'W (Germ. *Pernau*), a seaport of the Baltic Provinces, Russia, in the government of Livonia, stands on a sandy heath at the mouth of a river of the same name, on the Gulf of Riga, 102 miles north of the port of Riga, and 350 miles west-south-west of St. Petersburg by sea. The mouth of the river is so shallow that large vessels are obliged to anchor in the roads. The exports are chiefly flax, linseed, corn, and timber; the principal imports are salt and herrings. In 1866, 124 ships, of which 44 were English and 24 Prussian, entered the port. Pop. (1880) 12,918.

PERPENDI'CULAR. A straight line standing on another straight line is said to be perpendicular to that other when the angles it makes on both sides are equal (see ANGLE). A line is said to be perpendicular to a plane when it is at right angles to any line in that plane meeting it. Planes are said to be perpendicular to each other when any line in the one plane perpendicular to their common line of intersection is also perpendicular to all lines meeting it in the other plane.

The word 'perpendicular,' in common usage, refers to a direction at right angles to the surface of still water, and is synonymous with vertical.

PERPENDICULAR, the name given to the style of Gothic architecture in England which succeeded the Decorated Style. It prevailed from about the end of the 14 c. to the middle of the 16th c., and was thus contemporary with the Flamboyant Style in France. These styles have much in common, but they derive their names from the features peculiar to each. Thus, the Flamboyant (q. v.) is distinguished by the flowing lines of its tracery;



Nave of Winchester Cathedral.

whilst the Perpendicular is remarkable for its stiff and rectilinear lines. The lines of the window tracery are chiefly vertical, and the mullions are frequently crossed by horizontal bars. The mouldings are usually thin and hard. The same feeling pervades the other features of the style; the buttresses, piers, towers, &c., are all drawn up and attenuated, and present in their shallow recesses and meagre lines a great contrast to the deep shadows and bold mouldings of the earlier styles. The art of masonry was well understood during the Perpendicular period, and the vaulting was admirably built. Fan-tracery Vaulting (q. v.) belongs to this style. The depressed or four-center arch is another of its peculiar features. This arch, over doorways, has the mouldings generally arranged in a square form over the arch, with spandrels containing shields, quatrefoils, &c. Panelling was also much

used, the walls being frequently almost entirely covered with it, as in Henry VII.'s Chapel at Westminster. There are many well-known buildings of this style. Most of the colleges at Oxford and Cambridge belong to it, and in almost every cathedral and church of importance, there are some specimens of it. Open timber-roofs are very common in the Perpendicular Style, and are amongst the peculiar and beautiful features of the architecture of this country. The roof of Westminster Hall, built by Richard II., is the largest example ever erected.

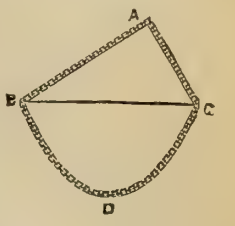
PERPENDICULAR FORTIFICATION owes its origin to the Marquis de Montalembert, a distinguished French general, who published his work upon the subject in 1776. Vauban had, it was admitted, rendered the art of attack superior to that of defence. Montalembert strove to reverse this relation, and, in his endeavors, rejected entirely the bastion system of the older engineers. Instead of the occasional bastions, with intervening curtains (see FORTIFICATION), with which they surrounded their *enceinte*, he broke the whole polygon into salient and re-entering angles, the latter being generally right angles. Before the connected redans thus formed were counterguards of low elevation and ravelins, to which the approaches were through casemated *caponnières*. In the salient angle of each redan, he built a brick tower, 40 feet in diameter, twelve-sided, and four stories high. The second and third tiers were built for heavy guns, and the upper loopholed for musketry. In the center of the tower was a circular *réduit*, intended as a last refuge for the garrison. Montalembert maintained that from these towers every possible approach could be commanded, which to a great extent is true; but it must be also remembered that the greater space a gun commands, by so much the more is it raised above the plain, and rendered visible. These towers would have little chance against the rifled ordnance of the present day. Montalembert's system was violently attacked by the French engineers, but Carnot subsequently adopted it, with some modifications, and it enters largely into the modern German defensive works. The system has never, however, found favor with British engineers.

PERPE'TUAL CURE, a form of ecclesiastical benefice which grew out of the abuse of lay Impropriation (q. v.), the impropriator appointing a clergyman to discharge the spiritual functions of which he himself was not capable. The substituted clergyman, in ordinary cases, is appointed by the bishop, and called a vicar; but when no provision is made for a vicar, the impropriator appoints the clergyman, who is called a perpetual curate. The perpetual curate enters on his office without induction or institution, and requires only the bishop's license. Perpetual cures are also created by the erection and endowment of a chapel subject to the principal church of a parish. Such cures, however, are not benefices, unless endowed out of the fund called Queen Anne's Bounty. Churches so endowed are, by 2 and 3 Vict. c. 49, recognized as benefices. The district churches which have been erected under several recent acts are made perpetual cures, and their incumbents are corporations.

PERPETUAL MOTION, THE. According to Newton's First Law (see MOTION, LAWS OF), all unresisted motion continues for ever unchanged. Thus, *if friction could be avoided*, a top or a gyroscope spinning in vacuo is an instance of motion which would be unchanged for ever, and which, therefore, might be called perpetual. The motion of the sun in space, the earth's rotation about its axis, and numerous other common motions, are in this popular sense perpetual. [It is necessary to remark here, that even these motions are subject to retardation; for instance, those of the bodies of the solar system, by the resistance of the luminiferous medium, which we know to be matter, and which fills all space. This was remarked by Newton himself, for he says, 'the larger bodies, planets and comets, preserve their motions longer (than terrestrial objects), because they move in less resisting media.' The same cause influences the motion of the gyroscope, but in its case there is another retarding influence at work, due to the production of electric currents by the magnetism of the earth.] But this is not what is technically understood by the title *The Perpetual Motion*. It means an engine which, without any supply of power from without, cannot only maintain its own motion for ever, or as long as its materials last, but can also be applied to drive machinery, and therefore to do external work. In other words, it means a device for creating power or energy without corresponding expenditure. This is now known to be absolutely impossible, no matter what physical forces be employed. In fact, the modern physical axiom, the Conservation of Energy (see FORCE), founded on experimental bases as certain as those which convince us of the truth of the Laws of Motion, may be expressed in the negative, thus: *The perpetual motion is impossible*. Helmholtz's beautiful investigations regarding Conservation of Energy (referred to in FORCE), are founded on this axiom. So is the recent application, by Clausius, of Carnot's remarkable investigation of the 'Motive-power of Fire' to the true Theory of Heat. Other instances will be mentioned at the end of the article.

The complete statement of the impossibility of procuring the perpetual motion with the ordinary mechanical arrangements, in which it was most commonly sought, is to be found in the *Principia* (q. v.), as a deduction from Newton's Third Law of Motion. The equivalent principle of Conservation of Energy is there stated in a manner which leaves nothing to be desired; although not given in anything like the modern phraseology. Yet it is usually said, in works on the Perpetual Motion, that De La Hire (in 1678) gave the first proof of its impossibility in ordinary mechanics. This proof, published long after Newton's, is by no means so complete, as it exposes only some of the more patent absurdities which had been propounded for the solution of the problem. It is certain, and worthy of particular notice, that Newton was far in advance of the greatest of his contemporaries and their immediate successors, in even the fundamental notions of mechanics. Thus, we find John Bernouilli seriously propounding a form of the perpetual motion, depending upon the alternate mixture, and separation by a filter, of two liquids of different densities; an arrangement which is as preposterous as the very common suggestion of a water-wheel which should pump up its own supply of water; and whose absurdity must be evident to any one acquainted with Newton's chapter on the Laws of Motion.

It is curious that, long before Newton's time, the physical axiom, that the perpetual motion is impossible, was assumed by Stevinus as a foundation for the science of Statics. This is particularly interesting when we compare it with the magnificent discoveries which have been evolved in our own day from the same principle applied to the physical forces generally, and not to gravitation alone, as contemplated by Stevinus. His process is as follows: Let an endless chain of uniform weight be passed round a smooth triangular prism ABC, of which the face BC is horizontal. The free portion of the chain BDC will hang in a symmetrical curve (CATENARY, q. v.), and its tension will therefore be the same at B and at C. Hence the other portion BAC of the chain will be free to move, unless the resolved part of the weight of AB, acting down the inclined plane AB, just balance that of the corresponding portion of the chain down AC. If these balance, the parallelogram of forces is proved; if not, one side will preponderate, and we shall evidently obtain the perpetual motion.



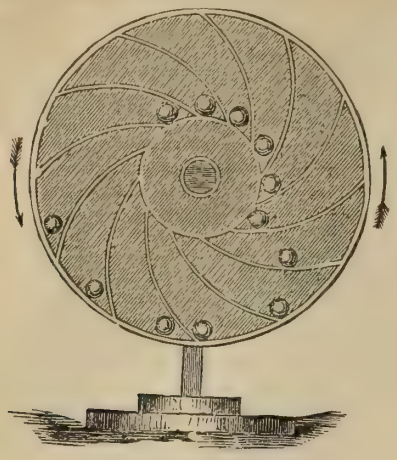
We will briefly sketch the history of the simpler part of the problem, where mechanical and hydrostatical arrangements alone are contemplated, and where the impossibility of procuring the perpetual motion had been completely shown by Newton.

The leading features of the various devices suggested as self-moving engines are three. 1. The machine being a combination of mechanical powers driven by weights, was to be constructed so as constantly to wind up those weights as they fell, and therefore to be constantly in the same circumstances as to power in each successive complete revolution. The ideal of this, in its simplest form, is that of a wheel moving about a horizontal axis, and so adjusting certain heavy sliding pieces on its surface, as to have always a preponderance on one particular side 2. The type of the second class differs from that of the first only in the substitution of liquids for the weights in the first class, and the consequent introduction (often in most extravagant forms) of hydrostatical laws, which the inventors seem to have considered less certain and more pliable than the stern facts of common mechanics. 3. The machine depends on some natural power, such as rain, change of temperature, wind, fluctuations of the barometer, tides, &c. The consideration of the third class is very interesting, but we will defer it for a little.

Of the first class, the only machines that seem ever to have succeeded in permanently deceiving any but their inventors are those of the Marquis of Worcester and of Councillor Orffyreus. Contemporary with the former was Bishop Wilkins, who candidly and ingeniously points out the fallacies of various devices of his own, depending severally on weights, on magnets, and on Archimedes's screw. His first attempt seems to have been closely allied to that of the Marquis of Worcester, of whose engine we have no drawing, and only a very vague description. The following figures give us, however, some notion of its probable nature. The first is one of Wilkins's, the second that of Jackson, the third that of Merlin. Their construction is evident from the figures.

In all three, the attempt is by the sliding of the balls in their cells, or by the turning of the levers, to give the preponderance to the descending side of the wheel. But even the cuts show that, though the weights on the descending side are on the whole further from the axis of the wheel than those on the ascending side, *yet there are more balls* on the latter than on the former side; and

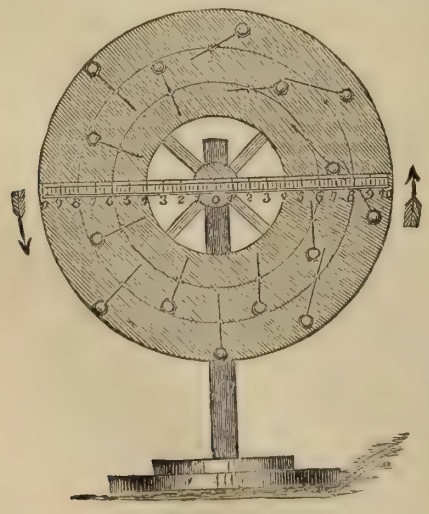
a careful examination, like that made by Wilkins, shows that their moments in opposite directions about the axis balance each other. With reference to the invention of the Marquis of Worcester—who is otherwise well known as one of the first to foresee, and even in part to realize experimentally, the advantage of steam



Merlin's Perpetual Motion.

as a motive-power—we find the following in his *Century of Inventions*: '*Advantageous Change of Centers.*—To prouide and make that all y^e^ weights of y^e^ descending syde of a wheele shal be perpetually further from y^e^ center, then those of y^e^ mounting syde, and yett equall in number and heft of y^e^ one syde as y^e^ other. A most incredible thing if not seene, butt tryed before y^e^late King of happy and glorious memorye in y^e^ Tower by my directions, two Extraordnary Embassadors accompanying his Ma^tie^ and y^e^ D. of Richmond, D. Hamilton, and most part of y^e^ Court attending him. The wheele was 14 foote ouer, and 40 weights of 50 p^d^ apiece; S^r^ Wm. Belford, then Lieu^t^ of y^e^ Tower, and yet liuing can justify it with seuerall others; They all saw that noe sooner these great weights passed y^e^ Diameter Line of y^e^ vpper syde but they hung a foote further from y^e^ center, nor no sooner passed the Diameter Line of the lower syde, butt they hung a foote nearer; bee pleased to judge y^e^ consequence.' *

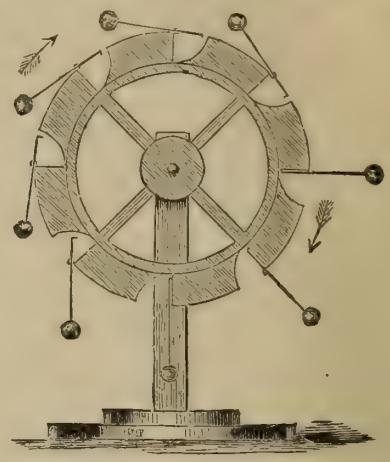
The machine of Orffyreus, by which 'S Gravesande was completely taken in, so much so, that he wrote to Newton expressing his belief that the perpetual motion was really found, consisted of a large wheel or drum covered with canvas, to prevent the interior from being seen, and rotating about a thick horizontal axle. This machine, when set agoing in either direction, moved with accelerated speed till it reached a rate of twenty-five turns in a minute; and on one occasion was sealed up by the Elector of Cassel for two months, and at the expiration of that time found to be moving as rapidly as ever. This, like the celebrated automaton chess-player, was evidently a case of clever imposition; and but for its strange effect on 'S Gravesande, would probably have been forgotten long ago. Tricks of this kind, more or less ingenious, such as that of Spence of Linlithgow (1818), which many of our readers may recollect, are still common, especially in America.



Bishop Wilkins's First Form.

Bishop Wilkins's third form is a good example of the second class of contrivances above mentioned. Its construction will be readily understood from the annexed cut. The water-wheels, driven by the descending water, are intended to turn the Archimedean screw, so as constantly to replenish the tank above. Wilkins's calm investigation of the reasons why his device will not succeed, is very interesting and creditable.

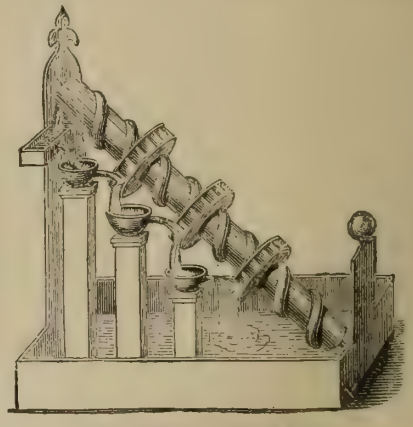
As a contrast, let us take a case of special absurdity, that of Norwood. In the figure, it is supposed that, as the weight of the water or mercury in the large vessel immensely exceeds that in



Jackson's Perpetual Motion.

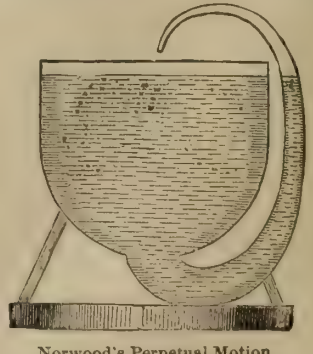
the neck, it will preponderate, and drive the liquid through the spout into the vessel again; thereby furnishing, not only an admirable perpetual motion, but a conclusive disproof of one of the fundamental laws of Hydrostatics.

The second of Wilkins's cases is an instructive one. It depends on magnetism, and will be readily understood from the cut.



Bishop Wilkins's Third Form.

AB is a loadstone, which draws the iron ball C up the incline plane to E, where there is a hole through which the ball falls down the curved incline, pushes open a trap at F, and is dragged again up the plane by the loadstone. The error of this is the neglect of the action

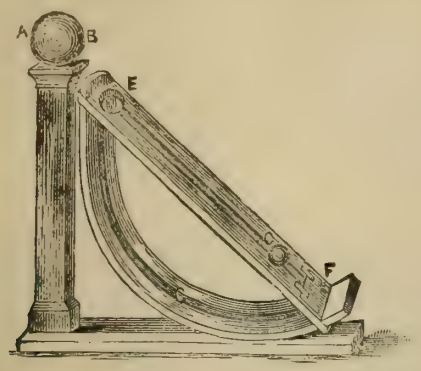


Norwood's Perpetual Motion.

of the loadstone on the falling ball. There would be an admirable case of the perpetual motion if we could remove or annihilate (without expenditure of work) the action of the loadstone during the descent. Unfortunately, the law of magnetic attraction is the same as that of gravitation, and what is impossible with the

* See Harleian MS., No. 2428, in the British Museum.

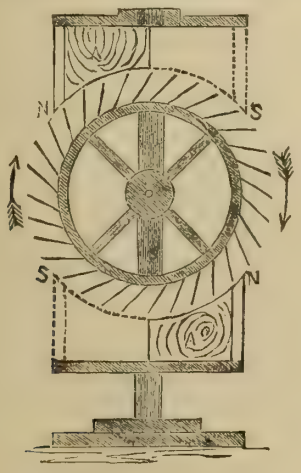
one, must be equally so with the other. A good illustration of this is Addeley's Perpetual Motion, represented in the annexed sketch. The spokes projecting from the wheel are magnets, whose south poles are all turned from the center. These are attracted by the north poles (N), and repelled by the south poles (S) of four fixed magnets; and blocks of *wood* (A) are inter-



Bishop Wilkin's Second Form.

posed, to *prevent* magnetic action where it would tend to stop the machine! If it were possible to find a substance which would deal with gravitation or magnetism as an opaqe body does with light (casting a shadow), the perpetual motion would be obtained with the greatest ease.

It would be tedious and unprofitable to go through the various physical forces, showing how a misconception of their laws has



Addeley's Perpetual Motion.

led to hundreds of patented schemes for the production of perpetual motion. We may merely hint at magneto-electric machines turned by electro-magnetic engines, to which they supply the electric currents; electric machines, driven by a gas-engine, the fuel for which is supplied by the decomposition of water by the electricity produced, &c.; the absurdity of all of which may be imagined from the perfectly analogous case of a steam-engine to which heat might be supposed to be supplied by the friction of bodies driven by the engine itself. An excellent example of this absurdity is furnished by the writings of one of our ablest geologists. He considers that the internal heat of the earth may be due to chemical combination, that the heat so produced may develop thermo-electric currents, and that these in their turn may decompose the compounds formed, so that the process may go on indefinitely.

But the third class of attempts above described merits a few words. It certainly does *not* give the perpetual motion, but it is capable of furnishing prime-movers which will work uninterruptedly for perhaps hundreds of thousands of years. This is done, however, as we should expect, at the expense of other stores of energy in the universe. Thus, the tide-wheel, or tidal engine, a little-used but most effective source of power, derives its energy entirely from the earth's diurnal rotation. Engines driven by collected rain-water, such as mill-wheels, &c., and others driven by power stored up from winds, &c., depend upon energy radiated from the sun, mainly in the form of heat. None of these can, therefore, in strictness be called the perpetual motion, since the energy of the earth's rotation, or of the sun's heat, is drawn upon in their production.

But the complete proof of the impossibility of procuring the perpetual motion by any arrangement whatever, involving any known forces, was arrived at mainly by the experiments of Joule (q. v.), who showed that the principle of the Conservation of Energy extends, not alone to the forces for which it was enunciated by Newton, but to every known form of physical action. The date 1840—1845 may thus be said to have finally settled this long-disputed question; at all events, until new forms of physical forces may happen to be discovered; and we are now in a position to do generally, what was wisely done by the French Academy in 1775 for ordinary mechanical contrivances alone—viz., refuse to consider any scheme whatever which pretends to give work without corresponding and equivalent expenditure. The language in which this decision of the French Academy is recorded (*Histoire de l'Académie*, 1775) is well worthy of being quoted, for its calm scientific clearness and brevity, and for its present applicability to physical science in general: 'The construction of a perpetual motion is impossible. Even if the effect of the motive power were not in the long run destroyed by friction and the resistance of the medium [in which the motion takes place], this power could produce merely an effect equivalent to itself. In order, therefore, to produce a perpetual effect from a finite cause, that effect must be infinitely small in any finite time. Neglecting friction and resistance, a body to which motion has been given will retain it forever; but only on condition of its not acting on other bodies, and the only perpetual motion possible, on this hypothesis (which, besides, cannot occur in nature), would be useless for the object which the devisers of perpetual motions have in view. This species of research has the inconvenience of being costly; it has ruined many a family; and numerous mechanics, who might have done great service, have wasted on it their means, their time, and their talents.

'These are the principal motives which have led the Academy to its decision. In resolving that it will no longer notice such speculations, it simply declares its opinion of the uselessness of the labors of those who are devoted to them.'

It has been asserted that the infatuation of the perpetual motionists, who (as may be seen by a glance at the specifications of patents in Britain, France, Belgium, America, &c.) are perhaps more numerous now than ever, is due to two causes—one, the idea that the perpetual motion is a lost, but recoverable invention; the other, that some immense government reward has been for years laid aside for the successful discoverer. But, unhappily, these ideas are as fallacious as the grand delusion itself; and any one who, in the present state of science, allows himself to be carried away by this fascinating inquiry, loses his time and wastes his talents, more hopeless than even a 'squarer of the circle.'

In conclusion, we may mention a few of the cases already hinted at, in which the impossibility of the perpetual motion formed the basis of an investigation. These will show the great use which may be made of even a negative proposition. Helmholtz has shown from it that the ultimate particles of matter must exert upon each other forces, whose direction is that of the line joining each pair of particles, and whose magnitude depends solely on their distance. J. Thompson employed it to show that the freezing-point of water is lowered by pressure, as otherwise work might be created by the freezing of ice-cold water. W. Thomson has employed it to show that a diamagnetic (see DIAMAGNETISM) body does *not* take the opposite magnetism to iron, when in similar circumstances; for if it did, and if, like iron, it took time for the full development of the action, a perpetual motion might be produced.

The literature of this subject is very extensive, but scattered mainly through Patent Records and ephemeral pamphlets. The *Journal des Savants*, and Montucla's *Histoire des Mathematiques* may be consulted; but especially we would refer the curious to an interesting work by Mr. Dircks (of Patent-Ghost notoriety) entitled *Perpetuum Mobile* (Spon, London, 1861); to which we have been indebted for some of our historical notices. The tenor of the work is such that we cannot easily discover whether the author is a perpetual-motionist or not; but, however this may be, it is extremely complete and interesting as a history.

PERPETU'ITIES, LAW AGAINST, consists in a rule adopted in England to the effect that property cannot be tied up for a period longer than the lives of some parties already in existence, and 21 years more. Those who have the power of disposing of their property have often attempted to regulate the succession of their estate at distant periods. Such was the object of the original practice of entailing property, and so enforcing the devolution of property on a certain series of heirs to the remotest generations. This power of testators was always looked upon with jealousy, as tending to embarrass future dealings with the property, and frustrate the purposes for which property is established. So early as the reign of Edward IV., a decision was come to by the courts in Taltarum's case, which had the effect of allowing the first tenant in tail in remainder, on arriving at majority, to disentail the estate at discretion. Hence, in England, there has

been ever since no mode of settling property in any way so as to tie it up beyond the life of the first who takes an estate of freehold, and the nonage of the tenant in tail next in remainder—i. e., the lives of persons in existence, and 21 years more. This principle applies not only to land, but to personal property. As to the accumulation of the income of property, an attempt was made by the late Mr. Thellusson to create an immense fortune by directing the income of his property to be accumulated during the lives of all his children, grandchildren, and great-grandchildren, who were living at the time of his death, for the benefit of some future descendants, to be living at the death of the survivor. The probable amount of the accumulated fund was expected to be 19 millions. The will was in great measure defeated by the existing law, but in consequence of so conspicuous an attempt, an act of parliament was passed, called the Thellusson Act (39 and 40 Geo. III. c. 98), which in future forbids the accumulation of income for any longer time than the life of the granter or settler, or 21 years from his death. In Scotland, so far from the above doctrines having been early adopted, the contrary doctrine was established. See ENTAIL.

PERPIGNAN, a town of France, and a fortress of the first rank, capital of the department of Pyrénées-Orientales, on the right bank of the river Tet, 5 miles from the Mediterranean, and 40 miles by railway south of Narbonne. It commands the passage by the Eastern Pyrenees from Spain into France, and is defended on the south by a citadel and by ramparts flanked with bastions, and protected by raised works. The works underwent a thorough repair in 1823, and P. now ranks as one of the first strongholds in France. Its appearance is exceedingly picturesque. From a distance, its houses are seen in the midst of a forest of orchards; and a closer examination shows a collection of narrow streets, covered with awnings; houses of semi-Moresque construction, with wooden balconies and courts, and other evidences of Spanish influence. The cathedral, a massive building, begun in 1324; the belfry of St. Jacques and the Castiller (now used as a military prison), with its battlements and machicolations, give character to the town. P. contains barracks for 5000 men, a council-house, palace of justice, mint, a college, numerous schools, museums, and scientific societies. Good *vin ordinaire* (red) is grown in the vicinity; woollen cloths, playing-cards, leather, &c., are manufactured, and there is a good trade in wine, brandy, wool, cork-bark, and silk. Pop. (1872) 20,011; (1876) 24,379.

P., as capital of the former county of Roussillon, remained long in the hands of the kings of Aragon, and in 1349, King Pedro founded a university here. In 1642, it was taken by Louis XIII.; and since that time, the town itself, together with the county of Roussillon, has remained in the possession of the French.

PERRAULT, CHARLES, a French writer, born at Paris, 12th January 1628, was the son of an advocate, and received a good education. In 1651, he became a member of the Paris bar, and obtained a considerable measure of success as a pleader; but having made the acquaintance of the minister Colbert, he was erelong diverted from the practice of his profession by receiving the appointment of Controller-general of the Royal Buildings. In 1671, the influence of Colbert procured for him an entrance into the French Academy, into which learned body he introduced several important reforms. What first made his name well known was his famous controversy with Boileau regarding the comparative merits of the ancients and moderns, which originated in a poem of P.'s, entitled *Le Siècle de Louis le Grand*, read before his confrères of the Academy, and intended to prove that modern authors were superior to Homer, Herodotus, Plato, Aristotle, Virgil, &c. It was followed up by an elaborate and methodically written *Parallèle des Anciens et des Modernes* (4 vols. 1688—1698), which, though an able and learned performance, is a complete failure in its logic. Boileau was his keenest opponent, and fiercely, not to say rudely, assailed him in his *Réflexions sur Longin*, to which P. replied with equal acrimony, but not with equal wit, in his *Apologie des Femmes* (1694). One good effect of this quarrel was to turn P.'s attention still more closely and critically to his contemporaries, the result of which was an admirable work *Hommes Illustres du Siècle de Louis XIV.*, containing 200 critical biographies. But the work that has far more than any other preserved his name is his *Contes des Fées*, or Fairy Tales. See NOVELS. The grace, liveliness, and ingenious child-like fancy displayed in these charming compositions, are beyond all praise, and when we remember that their author was far advanced in years when he wrote them, the feat seems miraculous. 'Second childhood' is not always so like the 'first,' as that of P. seems to have been. P. died 16th May 1703.

PERRY, an agreeable beverage made by fermenting the juice of pears. It is extensively made in Worcestershire, Gloucestershire, Herefordshire, and Devonshire, and forms, with cider, the chief diet-drink of those districts. It contains from five to nine per cent. of alcohol. The best pears for making perry are those which from their rough taste are least agreeable for eating.

PE'RSEA. See AVOCADO PEAR.

PERSECU'TIONS, THE TEN, of the Christian Church, is the name by which are known in ecclesiastical history certain periods of special severity exercised towards the rising community of Christians, for the purpose of compelling them to renounce their new creed, and to conform to the established religion of the empire. The Christian community were at all times regarded with suspicion and dislike in the Roman empire—the constitution of Rome not only being essentially intolerant of those new religions which, like the Christian, were directly aggressive against the established religion of the state, but being particularly hostile to private associations and private assemblages for worship, such as those which every Christian congregation by its very nature presented; and thus there are very few periods, during the first three centuries, in which it can be said that the church enjoyed everywhere a complete immunity from persecution. But the name is given particularly to certain periods when either new enactments were passed against Christianity, or the existing ones were enforced with unusual rigor. The notion of *ten* such periods is commonly accepted almost as an historical axiom; and it is not generally known that this precise determination of the number is comparatively recent. In the 4th c., no settled theory of the number of persecutions seems to have been adopted. Lactantius reckons up but six; Eusebius does not state what the number was, but his narrative supplies data for nine. Sulpicius Severus, in the 5th c., is the first who expressly states the number at *ten;* but he only enumerates nine in detail, and in completing the number to ten, he adds the general persecution which, at the coming of Antichrist, is to precede the end of the world. The fixing of ten as the number seems to have originated in a mystic allusion to the ten horns of the beast in the Apocalypse (xvii. 12).

It need hardly be said, however, that this is only a question of words, the diversity of enumeration arising from the different notions attached by the several historians to the designation *general*. If taken quite strictly to comprise the entire Roman empire, the number must fall below ten; if used more loosely of local persecutions, the number might be very largely increased. The ten persecutions commonly regarded as general are the following: the persecution under Nero, 64 A.D.; under Domitian, 95 A.D.; under Trajan, 107 A.D.; under Hadrian, 125 A.D.; under Marcus Aurelius, 165 A.D.; under Septimius Severus, 202 A.D.; under Maximinus, 235 A.D.; under Decius, 249 A.D.; under Valerianus, 257 A.D.; under Diocletian 303 A.D. The extent and the duration of some of these have been the subject of considerable controversy, and indeed an animated discussion was maintained for a long period as to the probable total number of victims in the pagan persecutions of the church. Such controversies are beyond the scope of this publication. It is quite certain that there have been exaggerations on the Christian as well as on the adverse side; but it has been shown beyond the possibility of doubt, and the most recent explorations have confirmed the arguments, that the data on which the estimates of Dodwell and Gibbon, the most prominent advocates of the theory of the small number, were founded, were uncertain, and even fallacious; and that, not to speak of the many victims of the constantly recurring local violences, the number who fell in each of the above-named persecutions was both large in itself, and spread, in most cases, over a considerable extent of the Roman empire. The most violent, as well as the most widely-spread of these persecutions, were those under Nero, Trajan, Maximinus, Decius, and Diocletian. The last-named, though called by Diocletian's name, was in reality far less the work of that emperor than of his colleague Galerius; but it was extremely cruel, and, with occasional interruptions, continued from the year 303 down to the victory of Constantine over Maxentius—a period of nearly ten years.

PERSE'POLIS (Persian City), the Greek translation of the lost name of the capital of ancient Persia (*Parsa-Karta?*), was situated on the river Araxes (Bendemir), to the east of the river Medus (Polwat, or River of Murghab), in the plain of Merdusht, about 35 miles to the north-east of Shiraz, on the road to Ispahan. A certain number of most remarkable ruins is all that now remains of that city, with which, according to ancient writers, 'no other city could be compared either in beauty or in wealth,' and which was generally designated 'The Glory of the East.' Darius Hystaspes, Xerxes, Artaxerxes, and other Achæmenides, each in his turn contributed towards its aggrandizement. Alexander the Great, in his march of conquest, is said to have destroyed P. completely; but this must probably only be understood to apply to some of the chief palaces. It may also be presumed that after the fall of the Achæmenides, that extension of the original town (afterwards known, and important in history up to within a recent period, as Istakhar), on which were situated the royal edifices and temples used as the royal treasuries up to the time of Epiphanes, gradually fell into decay. The situation of these structures, overlooking the vast luxuriant plain of Merdusht, is described in terms of rapturous enthusiasm by every traveler

from Chardin to our own day. Three groups are chiefly distinguishable in the vast ruins existing on the spot. First, the Chehel Minâr (Forty Pillars), with the Mountain of the Tombs (Rachmed), also called Takht-i-Jamshîd or the structure of Jamshîd, after some fabulous ancient king, popularly supposed to be the founder of Persepolis. The next in order is Naksh-i-Rustam, to the north-west, with its tombs; and the last, the building called the Haram of Jamshîd.

The most important is the first group, situated on a vast terrace of cyclopean masonry at the foot of a lofty mountain-range. The extent of this terrace is about 1500 feet north-by-south, and about 800 east-by-west, and it was, according to Diodorus Siculus, once surrounded by a triple wall of 16, 32, and 60 cubits respectively in height, for the triple purpose of giving strength, inspiring awe, and defence. The whole internal area is further divided into



Ruins of Persepolis.
(Copied from Fergusson's *Palaces of Nineveh and Persepolis Restored*.)

three terraces—the lowest towards the south; the central being 800 feet square, and rising 45 feet above the plain; and the third, the northern, about 550 feet long, and 35 feet high. No traces of structures are to be found on the lowest platform; on the northern, only the so-called 'Propylæa' of Xerxes; but the central platform seems to have been occupied by the foremost structures, which again, however, do not all appear to have stood on the same level. There are distinguished here the so-called 'Great Hall of Xerxes' called (Chehel Minâr, by way of eminence), the Palace of Xerxes, and the Palace of Darius, towering one above the other in successive elevation from the ground. The stone used for the buildings is dark gray marble, cut into gigantic square blocks, and in many cases exquisitely polished. The ascent from the plain to the great northern platform is formed by two double flights, the steps of which are nearly 22 feet wide, 3½ inches high, and 15 inches in the tread, so that several travelers have been able to ascend them on horseback. What are called the Propylæa of Xerxes on this platform are two masses of stonework, which probably formed an entrance-gateway for foot-passengers, paved with gigantic slabs of polished marble. Portals, still standing, bear figures of animals 15 feet high, closely resembling the Assyrian bulls of Nineveh. The building itself, conjectured to have been a hall 82 feet square, is, according to the cuneiform inscriptions, as interpreted by Rawlinson, the work of Xerxes; the inscription reads as follows:

'The great god Auramajda, he it is who has given this world, and who has given life to mankind, who has made Xerxes king, both king and lawgiver of the people. I am Xerxes the king, the great king, the king of kings, the king of the many-peopled countries, the supporter also of the great world, the son of King Darius, the Achæmenian.

'Says Xerxes the king, by the grace of Auramajda, I have made this gate of entrance; there is many another nobler work besides this Persepolis which I have executed, and which my father has executed;' &c.

An expanse of 162 feet divides this platform from the central one, which still bears many of those columns of the Hall of Xerxes from which the ruins have taken their name. The staircase leading up to the Chehel Minâr, or Forty Pillars, is, if possible, still more magnificent than the first; and the walls are more superbly decorated with sculptures, representing colossal warriors with spears, gigantic bulls, combats with wild beasts, processions and the like; while broken capitals, shafts, pillars, and countless fragments of buildings, with cuneiform inscriptions, cover the whole vast space of this platform, 350 feet from north to south, and 380 from east to west. The Great Hall of Xerxes, perhaps the largest and most magnificent structure the world has ever seen, is computed to have been a rectangle of about 300—350 feet, and to have consequently covered 105,000 square feet, or 2½ acres. The pillars were arranged in four divisions, consisting of a center group six deep every way, and an advanced body of twelve in two ranks, the same number flanking the center. Fifteen columns are all that now remain of the number. Their form is very beautiful. Their height is 60 feet, the circumference of the shaft 16, the length from the capital to the torus, 44 feet. The shaft is finely fluted in 52 divisions; at its lower extremity begin a cincture and a torus, the first, two inches in depth, and the latter one foot, from whence devolves the pedestal, shaped like the cup and leaves of the pendent lotus, the capitals having been surmounted by the double semi-bull. Behind the Hall of Xerxes was the so-called Hall of Hundred Columns, to the south of which are indications of another structure, which Fergusson terms the Central Edifice. Next along the west front stood the Palace of Darius, and to the south the Palace of Xerxes, measuring about 86 feet square, similarly decorated, and of similar grand proportions.—For a more minute description, we refer to the travels of Niebuhr, Ker Porter, Rich, &c.; to Fergusson's *Palaces of Nineveh and Persepolis Restored*, to Vaux's *Nineveh and Persepolis*, and to Rawlinson's *Five Great Monarchies*. See also CYRUS, DARIUS, XERXES, CUNEIFORM, and PERSIAN ARCHITECTURE.

PE'RSEUS, also PERSES, the last king of Macedonia, was the eldest son of Philip V., and was born in the latter part of the 3d c. B.C. He was trained to a military life from his earliest years, and after bringing about the death of his younger brother, Demetrius, who was a favorite both with the Macedonians and the Romans, he succeeded his father on the throne 179 B.C. Philip had long foreseen that a contest between Rome and Macedon was inevitable, and he had carefully prepared for it, so that P., on his accession, found himself forearmed. Meanwhile, he governed Macedon with great prudence and moderation, and became decidedly popular with his subjects and neighbors. Seleucus IV. (Philopator) gave him his daughter Laodice in marriage; Prusias, the Bithynian king, married his sister; the Greek states looked favorably on his projects, and his envoys were well received even at Carthage. The Romans took the alarm, and—after some delusive negotiations—sent an army into Thessaly (171 B.C.). The war lasted four years; in the first three, the advantages were so little on the side of the Romans, that there was a widespread feeling in P.'s favor in the countries bordering on the Levant and the Archipelago. In the beginning of the fourth campaign (168 B.C.), L. Æmilius Paulus arrived, and took command of the Roman forces. A great battle was fought at Pydna (June 22), in which the army of P. was utterly routed. The king himself was soon afterwards forced to surrender, and conveyed to Rome, where he adorned the triumph of the conqueror. He died in captivity at Alba, a few years later.

PERSEUS, in Grecian Mythology, the son of Zeus and Danaë (q. v.), and grandson of Acrisius. He was brought up at Seriphos, one of the Cyclades, where Polydectes reigned, who, wishing to get rid of him for private reasons, sent him, when yet a youth, to bring the head of the Gorgon Medusa, on the pretence that he wanted to present it as a bridal gift to Hippodamia. P. set forth under the protection of Athene and Hermes, the former of whom gave him a mirror, by which he could see the monster without looking at her (for that would have changed him into stone); the latter, a sickle; while the nymphs provided him with winged sandals, and a helmet of Hades, or invisible cap. After numerous wonderful adventures, he reached the abode of Medusa, who dwelt near Tartessus, on the coast of the ocean, and succeeded in cutting off her head, which he put into a bag, and carried off. On his return, he visited Ethiopia, where he liberated and married Andromeda, by whom he subsequently had a numerous family, and arrived at Seriphos in time to rescue his mother from the annoyance of the too ardent addresses of Polydectes, whom, along with some of his companions, he changed into stone. After this, he went to Argos, from which Acrisius fled to Thessaly, and P. assumed the vacant throne. But this, like many other details of the myth, is differently narrated. P. was worshiped as a hero in various parts of Greece, and, according to Herodotus, in Egypt too. In ancient works of art, the figure of P. much resembles that of Hermes.

PERSEVE'RANCE OF SAINTS, a doctrine necessarily resulting from the most essential parts of the Calvinistic system, and therefore held by almost all who adopt the Calvinistic or Augustinian doctrines. It is advocated not only by arguments from other doctrines, as those of election, atonement, the intercession and mediatorial dominion of Christ, imputed righteousness, and regeneration, but also from many texts of Scripture, as those which declare *eternal life* to be always connected with believing, and those which encourage the believer to depend on the faithfulness, love, and omnipotence of God. To an objection very commonly urged against it, that it tends to make men careless concerning virtue and holiness, its advocates reply, that this objection is only valid against a doctrine very different from theirs, the true doctrine of Perseverance of Saints being one of perseverance in holiness, and giving no encouragement to a confidence of final

salvation which is not connected with a present and even an increasing holiness.

PE'RSHORE, a market-town in the county of Worcester, and 9 miles south-east of the city of that name, on the Avon. It contains two churches—that of St. Andrew's, small and ancient; and the church of the Holy Cross, in Norman and Early English, with a lofty square tower. This church is the only remaining portion of the ancient abbey-church of the same name. Pop. (1881) 2578, who are employed in wool-stapling, in manufacturing agricultural implements, and in raising fruits and vegetables for the markets of the large manufacturing towns in the vicinity.

PE'RSIA, called by the natives IRAN (see ARYAN RACE), the most extensive and powerful native kingdom of Western Asia, is bounded on the N. by the great plain of Khiva, the Caspian Sea, and the Trans-Caucasian provinces of Russia; on the E. by Bokhara, Afghanistan, and Beloochistan; on the S. by the Strait of Ormuz and the Persian Gulf; and on the W. by Asiatic Turkey. It extends 900 miles from east to west, and 700 miles from north to south, and has an area of about 648,000 miles. It consists for the most part of a great tableland, or elevated plateau, which in the center and on the east side is almost a dead-level; but on the north, west, and south is covered with mountain-chains. The province of Azerbijan, in the north-west, is almost wholly mountainous. From its southern boundary, the majestic range of the Elburz runs eastward, following the line of the Caspian coast at a distance varying from 12 to 60 miles. On reaching Astrabad, the mountains sink into ridges of lower elevation, one of which joins the Paropamisus in Afghanistan. A hill country lies north of this line; it terminates in the Daman-i-koh chain, which sinks abruptly to the low plain of Turkestan. South and east of Azerbijan, a broad mountain-belt traverses P. from north-west to south-east, the chains and valleys of which it consists lying in the same direction. To this region belong the mountains running from Hamadan to Shiraz, many of the peaks of which are clad with perpetual snow; and the Zagros Mountains and Pushti Kuh on the western frontier.

The Persian mountains are mostly primitive; granite, porphyry, felspar, and mountain-limestone enter largely into their composition. They also exhibit indications of volcanic action—Taftan, south of Lake Zirreh, or Zamoon, being an active, and Demavend an extinct volcano; and the destructive earthquakes which are still of frequent occurrence in the north and north-west of P., indicate the presence of subterranean fires. The Persian plateau, which lies in an angle formed between these mountains, and spreads eastward to the plateau of Afghanistan, ranges from 2000 to 5000 feet above sea-level, the lowest portion being the Great Salt Desert in the south-west of Khorassan, which has 2000 feet of elevation above the sea; while the average elevation of the whole plateau above the sea is about 3700 feet.

Almost the whole of Khorassan (q. v.), the north half of Kerman (q. v.), the east of Irak-Ajemi (q v.), which form the great central plain, and detached portions of all the other provinces, with the exception of those on the Caspian Sea, forming more than three-fourths of the surface of P., are desert. In some parts of this waste, the surface is dry, and produces a scanty herbage of saline plants; in other parts, it is covered with salt marshes, or with a dry, hard, salt crust, sometimes of considerable thickness, which glitters and flashes in the sunlight, forcing the traveler on these inhospitable wastes to wear a shade to protect his eyes; but by far the greater portion of this region consists of sand, sometimes so light and impalpable as to be shifted hither and thither by the slightest breeze. This great central desert contains a few oases, but none of great extent. A narrow strip of low and level country extends along the shores of the Persian Gulf and the Strait of Ormuz. It consists of a succession of sandy plains, occasionally interrupted by a plantation of palms near the scanty rivulets which traverse it. It is called Dushtistan, or Gurmsir—that is, the warm region, in opposition to the mountainous districts, called Sirhud, or the cold country.

Although so much of P. is desert, some parts of the country are of exceeding fertility and beauty: the immense valleys, some of them 100 miles in length, between the various ranges of the Kerman Mountains, abound with the rarest and most valuable vegetable productions. Great portions of the provinces of Fars, Khuzistan, Ardelan, and Azerbijan have been lavishly endowed by nature with the most luxuriant vegetation; while the provinces of Ghilan and Mazanderan, which lie between the Elburz and the Caspian Sea, and the southern slopes of the Elburz, are as beautiful as wood, water, and a hot climate can make them—the mountain-sides being clothed with trees and shrubs, and the plain, 300 miles long by from 5 to 30 miles wide, studded with mulberry plantations, rice fields, vineyards, orchards, orange grounds, and sugar and cotton plantations.

Rivers.—P. has hardly one river that can properly be termed navigable, though some of them are several hundred miles in length, and of great width and volume of water; among those of sufficient importance to deserve mention is the Karun, which rises in the mountains to the south of Ispahan, and falls into the Shat-el-Arab, near Mohammerah. The rivers which flow to the southward receive, in the latter part of their course, few tributaries, and fertilize only a narrow strip of land on each side of them, except when their waters are applied, by means of canals or other works, to the artificial irrigation of the soil. This mode of increasing and extending the productive powers of the country was much employed in ancient times; but the constant change of masters, and the never-ending disturbances under which P. has so long suffered, led to the neglect of the practice, and most of these monuments of the architectural skill and laborious industry of the ancient Persians are now ruinous.

Lakes.—P., as a natural consequence of the nature and situation of its surface, abounds with saline lakes, and there are nearly thirty of them having no visible outlets. The chief lake is Lake Urumiah (q. v.), in Azerbijan. Lake Bakhtegan, in the east of Fars, the receptacle for the drainage of the northern half of that province, is about 60 English miles in length by 9 in breadth. Lake Shiraz (q. v.) is much smaller. Part of Lake Zirreh is now included in the frontier of P., but it may still be considered as chiefly belonging to Afghanistan.

Climate and Products.—The climate is necessarily very varied. What the younger Cyrus is reported to have said to Xenophon regarding the climate, 'that people perish with cold at the one extremity, while they are suffocated with heat at the other,' is literally true. P. may be considered to possess three climates—that of the southern Dushtistan, of the elevated plateau, and of the Caspian provinces. In the Dushtistan, the autumnal heats are excessive, those of summer more tolerable, while in winter and spring the climate is delightful. On the plateau, the climate of Fars is temperate. About Ispahan, the winters and summers are equally mild, and the regularity of the seasons appears remarkable to a stranger. To the north and north-west of this, the winters are severe. The desert region of the center and east, and the country on its border, endure most oppressive heat during summer, and piercing cold in winter. The Caspian provinces, from their general depression below the sea-level, are exposed to a degree of heat in summer almost equal to that of the West Indies, and their winters are mild. Rains, however, are frequent and heavy, and many tracts of low country are marshy and extremely unhealthy. Except in the Caspian provinces, the atmosphere of P. is remarkable above that of all other countries for its dryness and purity.

The cultivated portions of P., when supplied with moisture, are very fertile, producing an immense variety of crops. The chief cultivated products are wheat (the best in the world), barley, and other cereals, cotton (of which, according to the statement of the Persian ambassador at London in 1861, enough could be grown in the southern provinces to supply the manufactories of Western Europe), sugar, rice, and tobacco. The vine flourishes in several provinces, and the wines of Shiraz are celebrated in Eastern poetry. Mulberries are also largely cultivated, and silk is one of the most important products of the kingdom.

The forests of the Elburz abound with wild animals, as wolves, tigers, jackals, boars, buffaloes, foxes, and the Caspian cat. Lions and leopards also abound in Mazanderan. Among domestic animals, the horse and camel hold the first place. The horses have always been celebrated as the finest in the East. They are larger and more handsome, but less fleet than the Arabian horses. The Caspian rivers abound with fish, especially sturgeon, great quantities of which are cured and exported to Russia. The mineral products of P. are insignificant, with the sole exception of salt. Iron is abundant in Azerbijan, but is little worked; copper occurs in considerable quantity in the mountains of Mazanderan and Kerman; and lead, antimony, sulphur, and naphtha also abound. Dr. Fulze, of the Imperial Austrian Mining School, who had been sent to P. by Baron Reuter to explore the mineral wealth of the country, reported, in January 1874, the discovery of an important coal-field.

Inhabitants.—The settled population are chiefly Tajiks, the descendants of the ancient Persian race, with an intermixture of foreign blood. To this class belong the agriculturists, merchants, artisans, &c. The Tajiks are Mohammedans of the Shiite sect, with the exception of the remaining Parsees or Guebres (q. v.), numbering 793 in 1868, who are found in Kerman and Fars, and still retain their purity of race and religious faith. The Tajiks have been spoken of as timid, cunning, and servile, but in the cities of Turkestan recently conquered by Russia they make excellent subjects, ready and apt to adopt and appreciate the knowledge and habits of Europe. In the work quoted below, Vambery speaks of their industry, and their capacity for and love of culture. He says, that which the Japanese are in the east the Tajiks may become in the west of Asia; and it is a settled matter, that they will form the medium for the introduction of the civilization of the West into the interior of Asia. The nomad or pastoral tribes, or eylats (*eyl*, a clan), often spelt *illyats*, are of four

distinct ruces—Turkomans, Kurds, Lûurs, and Arabs. Their organization is very similar to that which formerly subsisted among the Highland clans of Scotland, with the exception that the former are nomad, while the latter inhabited a fixed locality. Each tribe is ruled by its hereditary chief (*ujak*), and under him by the heads of the cadet branches (*tirehs*) of his family. Of the four nomad races, the Turkoman is the most numerous, and forms at the present day the ruling race in Persia. The Kurds are few in number, the greater part of their country and race being under the sway of Turkey. The Arabs are also few in number, and at the present day can hardly be distinguished from the Persians, having adopted both their manners and language. The Lûurs are of nearly pure Persian blood. The nomad races, especially the Turkomans, profess the Sunni creed; they are distinguished from the Tajiks by their courage, manliness, and independence of character; but they are inveterate robbers, and since their entrance into the country in the 10th c., it has been continually distracted by civil wars and revolutions. There is a small population of native Christians—the Nestorians of Urmah and Telmais. Including those who have joined the Roman Catholic and Protestant churches, their whole number does not exceed 25,000. They are agriculturists, and suffer great wrong and oppression from the chiefs who own the villages in which they live. The Jews number 15,000.

We have no certain information regarding the population of Persia. There can be no doubt that in antiquity, and even during the middle ages, while the irrigation works still fertilized great tracts of country, it supported a great population. A native estimate, referred to by Sir John Malcolm, fixed the modern population at 200 millions. In the 17th century, the French traveler, Chardin, thought 40 millions not too high a figure. Recent travelers, however, reduced these sums to numbers varying from 15 to 8 millions. Much surprise was accordingly expressed when Mr. R. Thompson (see below), who had traveled in every province of P., and collected statistical information, made careful calculation from the taxes collected, &c., and reported that the entire population did not exceed 5 millions, and was probably not over 4 millions. His estimate has since been generally accepted as the most trustworthy we have. He divides the total roughly into one million inhabitants of cities, 1,700,000 nomads, and 1,700,000 peasants and villagers; and the following are his estimates of the population of the chief cities: Tabreez, 110,000; Teheran, 85,000; Meshid, 70,000; Ispahan, 60,000; Yezd, 40,000; Kerman, 30,000; Kermanshah, 30,000; Hamadan, 30,000. There can be no doubt that the population has been long diminishing, a fact attributable to misrule and extortion—neglect of the great irrigation works—and the frequent occurrence of famines in a dry country where cultivation depends on an artificial supply of water.

The insecurity of property has prevented the improvement of land, the extension of trade, and public works of every kind. The roads are utterly neglected. The houses, those of the wealthiest people not excepted, appear contemptible, being generally built of earth or mud, and are grouped, even in the towns, with little attention to uniformity or order. They scarcely ever exceed one story in height, and they are surrounded by high blank walls. The public buildings, such as mosques, colleges, and caravansaries, are of similar appearance to the ordinary houses, and built of the same materials. The interiors, however, of the houses of the rich are sometimes perfect paradises of luxury and elegance; and however much dwellings constructed of mud may offend a European eye, it is questionable whether, with all its disadvantages, mud is not a better building material than wood or stone in a country possessing such a climate as Persia. The miserable look of the towns is, however, greatly improved by the beauty of the gardens which surround them.

Manufactures and Trade.—The trade of P. is comparatively of little importance. The silk is the great staple, and is produced in every province, but chiefly in those of the north. The failure of the crop since 1870 has, however, interfered very seriously with this branch of industry. Cotton and woollen fabrics, shawls, carpets, and felts are largely manufactured for use and export in Khorassan. Trade is carried on by caravans with the interior of Asia and the chief towns of Persia. These caravans exchange the products of P. for muslin, leather, skins, nankeen, china, glass, hardware, gums, dye-stuffs, and spices. The greater part of the commerce of P. centers at Tabreez, to which are conveyed all the products of Eastern P., Turkestan, Cabul, Beloochistan, and India. European goods are brought to Tabreez by Constantinople and Trebizond. While in recent times the great overland routes have been rendered insecure by the unsettled state of Turkestan and Afghanistan, the communication between P. and foreign countries has been increased by the Caspian and the Persian Gulf. On the former sea, in 1873, there was a Russian fleet of schooners and screw steamers. Two or three of these vessels sailed weekly from Astrakhan with merchandise for the Persian coast. There were three passenger steamers, one of which ran weekly to the southern shores of the Caspian, touching at Entzdi, Mashadisar, and Ashurada. In the Persian Gulf the British India Steam Navigation Company had recently a regular line of fine steamers running fortnightly from Bombay to Bassorah, and touching at Bender-Abbas and Bushire. The exports to India consist chiefly of horses, dried fruit, and drugs; and the imports from that country and Europe, of broadcloths, cotton-goods, jewelry, arms, cutlery, watches, earthen, glass, and metal wares, &c. The whole foreign trade of P. has been estimated roughly at—imports, £2,500.000; exports, £1,500,000. British produce exported to P. in 1875 was £45,723; in 1880, £226,408. Exports from P. to Britain in those years were valued at £44,331 and £81,614. It is doubtful, however, how far the existing commerce of P. will make the construction of railways a profitable speculation. Baron Reuter, under a concession made to him by the Shah, obtained power to construct railways from the Caspian to Teheran, and from Teheran to the Persian Gulf; but there is little expectation of this concession being successful.

Government, Taxation, Education, &c.—The government of P. is a pure despotism, limited only by domestic intrigues, dread of private vengeance, and an occasional insurrection. The last-named is the principal check against unjust government on the part of the monarch, while the former two operate as powerful restraints on his ministers. The monarch, who has the title of 'Shah' and 'Padishah,' possesses absolute authority over the lives and property of his subjects. His deputies, the governors of provinces and districts, possess similar authority over those under them; their actions are, however, liable to revision by the Shah, who may summarily inflict any punishment upon them for real or alleged misgovernment. Oppression of the working and mercantile classes is almost a necessity of such a form of government. The central government consisted until lately of the *Sadri-Azem* or Grand Vizier, with various dependent officials. Now there is a ministry, nominally modelled after the cabinets of European states, of which the head is called President of the Council. He is supported by the ministers of foreign affairs, and of war, of justice, of public worship, and of mines, of commerce, telegraphs, agriculture, industry, and public works, the commander-in-chief, and the master of the ceremonies. The law, which in civil cases is administered by Mollahs (q. v.), in criminal cases by a state court, is founded on the Koran and on tradition. The punishments commonly inflicted are fines, flogging (the bastinado), and death, either by decapitation, stabbing, or torture. The Beglerbegs or governors of provinces, who are always chosen from the governing race, the Turkomans, and are generally of the blood-royal, oppress to the utmost the poor Tajiks. They are seldom able, however, to protect their provinces from the ravages of the predatory eylat hordes, who, though nominally subject to the Shah, are governed by their own khans, and are really independent. The revenue is derived—(1.) From a tax on the gross produce of land, 20 per cent. is supposed to be the amount payable to the crown by the landholders.

As a general rule, however, this amount is somewhat exceeded, and 25 per cent. may be taken as the average assessment; (2.) Duties on cattle and flocks—in case of goats, sheep, and cows, 8 per cent. on value of wool and butter yielded; (3.) Customs dues; (4.) Capitation tax of 8*d.* on each male over 18; (5.) Rates levied on incomes of artisans and dealers of 20 per cent., and duties on provisions brought to market. In theory, these are the taxes authorized by the government, but Mr. R. Thomson states that in practice a frightful system of bribery and extortion prevails. The wealthy and influential escape the rapacity of the provincial governors, but as much as possible is taken from the hard-working peasants. He believes that the irregular exactions amount to a sum equal to the legal assessments, and that not a penny of the money so extorted is applied to public purposes. Large sums are extorted from the Jews. The revenue in 1876 was about £1,643,200, of which £1,240,000 were from the direct taxes.

Elementary education is very generally diffused among all classes. There are a large number of colleges where students are instructed in religion, and Persian and Arabian literature. Among the upper classes it is asserted that the Mohammedan religion is rapidly loosing its hold, and that unbelief is widely prevalent.

Political Divisions, &c.—From the earliest times down to the present century, P. was divided into seven or eight great divisions; but about the time when it was attempted to introduce European civilization into the country, and discipline into the army, the country was anew divided into 25 provinces—viz., the three Caspian provinces of the Ghilan, Mazanderan, and Astrabad, in the north; Azerbijan, Ardelan or Persian Kurdistan, Luristan, and Khuzistan, in the west; Fars, Laristan and Kerman with Mogistan, in the south; while the great province of Irak-Ajemi in the center was divided into Khamsah, Kasbin, Teheran, Hamadan, Kûm, and Ispahan; and that of Khorassan in the east, into Yezd, Tabas, Ghayn and Birjun, Turshiz, Meshid, Damghan, Semnum, and the Dasht Beyad, or the Great Salt Desert. There are many interesting ruins of ancient, populous, and celebrated cities in Persia—for example, Persepo-

lis (q. v.), Rhages or Rhé, Shahpur, Istakhar, Tûs, Merv, Shushan, Hamadan, &c.; and the monuments and inscriptions found at some of these places form a highly-interesting study. See BEHISTUN.

Army.—The standing army, according to the recent army laws, consists of 200,000 men, but the majority of these exist only on paper. The regular army is really composed of about 30,000 infantry and 1000 artillery, while there are about 10,000 irregular cavalry, a few thousand irregular infantry, and the guards. The officers in the Persian army are said to be ignorant and inefficient, but the soldiers are described as being obedient, sober, intelligent, and capable of enduring great fatigue. The irregular cavalry, which forms the bravest portion of the Persian army, is equal to the Cossacks in the Russian army, and much superior to the Turkish sultan's Bashi-Bazouks.

History.—According to the *Shah Nameh* of Firdusi (q. v.), the history of P. begins some thousands of years before the Christian era. Little has yet been done towards extracting the grains of historical truth that may be contained in the mass of fable that constitutes the native Persian annals; although hopes are cherished that by aid of the many inscriptions and monuments that are being daily discovered, light may yet be thrown upon many points. In the meantime, we must rest contented with the accounts derived from Greek writers. The north-western part of Iran, anciently called Media (q. v.), was, at the earliest period known to the Greeks, a part of the Assyrian empire, but the Medes revolted, and (708 B.C.), under Dejoces, established an empire which subdued both that of Assyria and their own kindred tribes of Persis. See MEDIA. About 537 B.C., the Persians under CYRUS (q. v.)—the Kai-Khusru of the Persians—(559—529 B.C.) rebelled, subdued their former masters, the Medes (who from this time became amalgamated with them), and established a mighty empire, which included, besides P., as far as the Oxus and Indus, Asia Minor, Syria, Palestine, and Mesopotamia. His son, CAMBYSES, a most ferocious and bloodthirsty tyrant (529—522 B.C.), subdued Tyre, Cyprus, and Egypt.

After the brief rule of the usurper SMERDIS (522—521 B.C.), DARIUS I. (q. v.) surnamed HYSTASPES—the Gushtasp of the Persians—(521—485 B.C.), mounted the throne. He was a politic and energetic prince, and succeeded in firmly establishing his dynasty, and adding Thrace and Macedonia to his empire; but his two attempts to subdue Greece were completely foiled, the first by the Thracians, and the second by the Athenians at Marathon (490 B.C.) His son, XERXES I. (485—465 B.C.)—the Isfundear of the Persians—renewed the attempt to subdue the Greek states, and though at first successful, the defeats of Salamis and Platæa compelled him to limit himself to a defensive warfare, which exhausted the resources of his kingdom. His son, ARTAXERXES I. (465—425 B.C.), surnamed LONGIMANUS (the Bahman of the Persians, better known as Ardeshir Dirazdust), was a valiant prince, but he was unable to stay the decadence of P., which had now commenced. He, however, crushed a formidable rebellion in Egypt, though his wars with the Greeks and Ionians were unsuccessful. The empire now became a prey to intestine dissensions, which continued during the reigns of his successors, Xerxes II, Sogdianus, Darius II, Artaxerxes II., and Artaxerxes III. DARIUS III. CODOMANNUS (336—329) (the Darab II. of the Persians), the last of the dynasty, was compelled to yield his throne to Alexander (q. v.) the Great, king of Macedon (known as Secunder by the Persians), who reconquered all the former provinces of P., and founded a vast empire, which, at his death in 324 B.C., was divided into four parts, P. along with Syria falling to the share of the Seleucidæ (q. v.), and its old dependency, Egypt, to the Ptolemies (q. v.) The Seleucidæ soon lost Bactria (now Balkh), which became independent under a series of Greek sovereigns; and about 246 B.C., Parthia (q. v.)—now Northern Khorassan—also rebelled under ARSACES I. (the Ashk of the Persian writers) who founded the dynasty of the Arsacidæ, under whom the greater part of P. was wrested from the Greeks, and maintained against both the Greeks and Romans.

The Greek empire of Bactria, which is said to have included a great part of Hindustan, was overthrown by an influx of nomad tribes from Turkestan, and these invaders having been driven out by the Parthians, Bactria was added to their empire. But the dynasty of the Arsacidæ was brought to an end by a Persian named Ardeshir Babegan, who managed to gain possession of Fars, Kerman, and nearly the whole of Irak, before Arduan, the Parthian king, took the field against him. At last, a great battle was fought (218 A.D.) on the plain of Hormuz, in which the Persians were completely victorious. Babegan was now hailed as Ardeshir, king of P., and 'Shahan Shah,' or king of kings. The history of this dynasty will be found under the head of SASSANIDÆ. The Sassanian kings raised P. to a height of power and prosperity such as it never before attained, and more than once perilled the existence of the Eastern Empire. The last king was driven from the throne by the Arabs (636 A.D.), who now began to extend their dominion in all directions; and from this period may be dated the gradual change of character in the native Persian race, for they have been from this time constantly subject to the domination of alien races. During the reigns of Omar (the first of the Arab rulers of P.), Othman, Ali, and the Ommiades (634—750), P. was regarded as an outlying province of the empire, and was ruled by deputy governors; but after the accession of the Abbaside dynasty (750 A.D.), Bagdad became the capital, and Khorassan the favorite province of the early and more energetic rulers of this race, and P. consequently came to be considered as the center and nucleus of the califate. But the rule of the califs soon became merely nominal, and ambitious governors, or other aspiring individuals, established independent principalities in various parts of the country.

Many of these dynasties were transitory, others lasted for centuries, and created extensive and powerful empires. The chief were the TAHERITES (820—872), a Turkish dynasty in Khorassan; the SOFFARIDES (Persian, 869—903), in Seistan, Fars, Irak, and Mazanderan; the SAMANI, in Transoxiana, Khorassan, and Seistan; the DILEMI (Persian, 933—1056), in Western Persia; and the GHIZNEVIDES (q. v.), in Eastern Persia. These dynasties supplanted each other, and were finally rooted out by the Seljuks (q. v.), whose dominion extended from the Hellespont to Afghanistan. A branch of this dynasty, which ruled in Khaurezm (now Khiva, q. v.) gradually acquired the greater part of Persia, driving out the Ghiznevides and their successors, the GHURIDES (q. v.); but they, along with the numerous petty dynasties which had established themselves in the south-western provinces, were all swept away by the Mongols (q. v.) under GENGHIS-KHAN (q. v.) and his grandson, Hulaku-khan, the latter of whom founded a new dynasty, the PERSO-MONGOL (1253—1335). This race becoming effeminate, was supplanted by the EYLKHANIANS in 1335, but an irruption of the Tartars of Turkestan under TIMUR (q. v.), again freed P. from the petty dynasties which misruled it. After the death of Timûr's son and successor, Shah Rokh, the Turkomans took possession of the western part of the country, which, however, they rather preyed upon than governed; while the eastern portion was divided and subdivided among Timûr's descendants, till, at the close of the 15th c., they were swept away by the Uzbeks (q. v.), who joined the whole of Eastern P. to their newly-founded khanate of Khiva. A new dynasty now arose (1500) in Western P., the first prince of which (Ismail, the descendant of a long line of devotees and saints, the objects of the highest reverence throughout Western P.), having become the leader of a number of Turkish tribes who were attached by strong ties of gratitude to his family, overthrew the power of the Turkomans, and seized Azerbijan, which was the seat of their power. Ismail rapidly subdued the western provinces, and in 1511 took Khorassan and Balkh from the Uzbeks; but in 1514, he had to encounter a much more formidable enemy—to wit, the mighty Selim (q. v.), the Sultan of Turkey, whose zeal for conquest was further inflamed by religious animosity against the Shiites, or 'Sectaries,' as the followers of Ismail were termed.

The Persians were totally defeated in a battle on the frontiers; but Selim reaped no benefit from his victory, and after his retreat, Ismail attacked and subdued Georgia. The Persians dwell with rapture on the character of this monarch, whom they deem not only to be the restorer of P. to a prosperous condition, and the founder of a great dynasty, but the establisher of the faith in which they glory as the national religion. His son Tamasp (1523—1576), a prudent and spirited ruler, repeatedly drove out the predatory Uzbeks from Khorassan, sustained without loss a war with the Turks, and assisted Homayun, the son of Baber, to regain the throne of Delhi. After a considerable period of internal revolution, during which the Turks and Uzbeks attacked the empire without hinderance, Shah Abbas I. the Great (1585—1628), ascended the throne, restored internal tranquillity, and repelled the invasions of the Uzbeks and Turks. In 1605, he inflicted on the Turks such a terrible defeat as kept them quiet during the rest of his reign, and enabled him to recover the whole of Kurdistan, Mosul, and Diarbekir, which had for a long time been separated from P.; and in the east, Candahar was taken from the Great Mogul. Abbas's government was strict, but just and equitable; roads, bridges, caravansaries, and other conveniences for trade, were constructed at immense expense, and the improvement and ornamentation of the towns were not neglected. Ispahan more than doubled its population during his reign. His tolerance was remarkable, considering both the opinions of his ancestors and subjects; for he encouraged the Armenian Christians to settle in the country, well knowing that their peaceable and industrious habits would help to advance the prosperity of his kingdom. His successors, Shah Sufi (1628—1641), Shah Abbas II. (1641—1666), and Shah Soliman (1666—1694), were undistinguished by any remarkable talents, but the former two were sensible and judicious rulers, and advanced the prosperity of their subjects.

During the reign of Sultan Hussein (1694—1722), a weak and bigoted fool, priests and slaves were elevated to the most impor-

tant and responsible offices of the empire, and all who rejected the tenets of the Shiites were persecuted. The consequence was a general discontent, of which the Afghans (q. v.) took advantage by declaring their independence, and seizing Candahar (1709). Their able leader, Meer Vais, died in 1715; but his successors were worthy of him, and one of them, Mahmud, invaded P. (1722), defeated Husssein's armies, and besieged the king in Ispahan, till the inhabitants were reduced to the extremity of distress. Hussein then abdicated the throne in favor of his conqueror, who, on his accession, immediately devoted his energies to alleviate the distresses and gain the confidence of his new subjects, in both of which objects he thoroughly succeeded. Becoming insane, he was deposed in 1725 by his brother Ashraf (1725—1729); but the atrocious tyranny of the latter was speedily put an end to by the celebrated Nadir Shah (q. v.), who first raised Tamasp (1729—1732) and his son, Abbas II. (1732—1736), of the Suffavean race, to the throne, and then, on some frivolous pretext, deposed him, and seized the sceptre (1736—1747). But on his death, anarchy again returned; the country was horribly devastated by the rival claimants for the throne; Afghanistan (q. v.) and Beloochistan (q. v.) finally separated from P., and the country was split up into a number of small independent states till 1755, when a Kurd, named Kerim Khan (1755—1779), abolished this state of affairs, re-established peace and unity in Western Persia, and by his wisdom, justice, and war-like talents, acquired the esteem of his subjects, and the respect of neighboring states. After the usual contests for the succession, accompanied with the usual barbarities and devastations, Kerim was succeeded in 1784 by Ali-Murad, Jaafar, and Luft-Ali, during whose reigns Mazanderan became independent under Aga-Mohammed, a Turkoman eunuch of the Kajar race, who repeatedly defeated the royal armies, and ended by depriving Luft-Ali of his crown (1795).

The great eunuch-king (as he is frequently called), who founded the present dynasty, on his accession announced his intention of restoring the kingdom as it had been established by Kerim Khan, and accordingly invaded Khorassan and Georgia, subduing the former country almost without effort. The Georgians besought the aid of Russia; but the Persian monarch, with terrible promptitude, poured his army like a torrent into the country, and devastated it with fire and sword; his conquest was, however, hardly completed, when he was assassinated, May 14, 1797. His nephew, Futteh-Ali (1797—1834), after numerous conflicts, fully established his authority, and completely subdued the rebellious tribes in Khorassan, but the great commotions in Western Europe produced for him bitter fruits. He was dragged into a war with Russia soon after his accession, and by a treaty, concluded in 1797, surrendered to that power Derbend and several districts on the Kur. In 1802, Georgia was declared to be a Russian province. War with Russia was recommenced by P., at the instigation of France; and, after two years of conflicts disastrous to the Persians, the treaty of Gusistan (October 12, 1813) gave to Russia all the Persian possessions to the north of Armenia, and the right of navigation in the Caspian Sea. In 1826, a third war, equally unfortunate for P., was commenced with the same power, and cost P. the remainder of its possessions in Armenia, with Erivan, and a sum of 18,000,000 rubles for the expenses of the war. The severity exercised in procuring this sum by taxation, so exasperated the people, that they rose in insurrection (October 12, 1829), and murdered the Russian ambassador, his wife, and almost all who belonged to, or were connected with the Russian legation. The most humiliating concessions to Russia, and the punishment by mutilation of 1500 of the rioters, alone averted war. The death of the crown-prince, Abbas-Mirza (q. v.), in 1833, seemed to give the final blow to the declining fortunes of P., for he was the only man who seriously attempted to raise his country from the state of abasement into which it had fallen.

By the assistance of Russia and Britain, Mohammed Shah (1834—1848), the son of Abbas-Mirza, obtained the crown. He conceived ambitious ideas of annexation. In the days of Nadir Shah, and indeed at many other periods, the Persian frontier had extended over a great part of the Afghan, Belooch, and Khivan boundary. Mohammed resolved to demand reacknowledgment of sovereignty from his alleged vassals in these countries, but an attempt he made to reannex Herat, 'the key to India,' was resisted by England. The war was terminated in 1838, by the landing of a small sepoy force on the shores of the Persian Gulf. Nazir-uddin succeeded to the throne on his father's death in 1848; and the new government announced energetic reforms, but failed as completely as those which had preceeded it in carrying them out. Following his father's example, the new Shah resolved to reassert his claims in Afghanistan and Beloochistan. The ruler of Herat having recognized the claims of Persia, the English Government remonstrated with the Shah, and he was compelled to sign an engagement on the 25th January 1853, by which he became bound not to interfere farther with the internal affairs of Herat. In October 1856, however, on the pretext that Dost Mohammed the Ameer of Cabul, was about to invade Herat, the Persians again took the city. Having thus violated the terms of the treaty with Britain, war was declared against them, and a British army was landed on the coast of the gulf, which, under Generals Outram and Havelock, repeatedly defeated the Persians, and compelled them to restore Herat (July 1857). Since this time the Persians have not interfered with the 'key to India,' to which so much importance has been attached by England, but they have been engaged in a long series of disputes with regard to their frontier north and south of it. After the war of 1857, their encroachments became systematic. In 1868, they occupied Seistan, a province claimed by the Afghans, and extended their jurisdiction over the western third of the country appearing on our maps as Beloochistan. To put an end to the incessant strife to which these pretensions gave rise, the Persians at length agreed with the Ameer of Afghanistan and the Khan of Kelat to refer the questions in dispute to an English commissioner.

General Sir Frederick Goldsmid accordingly visited the eastern frontier of P., and in 1872 delivered his award. It entirely alters the form familiar to us as that of south-eastern P. It carries the Belooch frontier back from 58° to 63° east longitude, so as to include in P. the inland town of Jalk, and Guadar on the Indian Ocean. All the western shores of the Lake of Zirreh, and a large triangular tract to the east of it, watered by the Helmund, are also annexed to Persia. The north-eastern frontier has not yet been settled. In 1870 the Russians admitted that the jurisdiction of P. should extend over the whole basin of the Atrek. It has been found, however, that between it and the Khivan desert there lies the fertile ridge of the Daman-i-koh and the water-course of the Tejend Rud, along which lies a route from the Caspian to Merv and Herat. Merv, the center of the oasis of Margiana, and which is almost as much a key to India as Herat itself, has been claimed both by Khiva and P., and now that the Russians have become masters of the former country, the settlement of the frontier of P. in this direction has become the most urgent question of Persian politics, connected closely as it is with the determination of the Anglo-Russian frontier in Central Asia. In 1873 the Shah visited Europe. By the treaty of Berlin in 1878, the town and territory of Khotour, on the Turco-Persian frontier, was ceded to P. by Turkey.

See *Report on the Population, Revenue, Military Force, and Trade of Persia*, by Mr. Ronald Thomson, dated Teheran, 20th April 1868; *Glimpses of Life and Manners in Persia*, by Lady Shiel (Lond. 1856); *History of Persia from* 1800 *to* 1858, by R. G. Watson (Lond., 1873); *History of Persia*, by G. Clements R. Markham (1874); *Central Asia and the Anglo-Russian Frontier Question*, by A. Vambery (1874); *Through Persia*, by Arnold (1876); *Persia*, by Goldsmid (1880); and F. Martin's *Statesman's Year-Book*. Also German works on Persia by Spiegel (1863), Brugsch (1864), Polak (1865).

PE'RSIAN ARCHITECTURE. The architecture of Persia is of considerable interest, both on its own account, and as supplementary to and explanatory of that of Assyria, which, together with the similar edifices in Egypt, is the earliest architecture of which we have any knowledge. The buildings of Persia and Assyria closely resemble one another, and, owing to the mode and the materials in which they were constructed, their remains serve to illustrate and complete each other's history. In Assyria, where no solid building materials exist, the walls are composed of masses of sun-dried brickwork, lined on the inside, to a certain height from the floor, with large sculptured slabs of alabaster. These have been preserved to us by the falling in of the heavy earthen roofs, with which, as the later Persian buildings explain to us, the Assyrian palaces were covered. The explorations of Layard and Botta, and the specimens brought home by the former, and now in the British Museum, have made these sculptures familiar to us. The subjects usually are large bulls with human or lions' heads; priests with human bodies, and eagles' or lions' heads, performing religious services before the 'sacred tree.' The Assyrian remains are all of palace-temples, buildings somewhat resembling the Egyptian temples (which were also palaces); and many of the sculptures represent the exploits of the king in war and in peace. The palaces are always raised on lofty artificial mounds, and approached by magnificent flights of steps.

The buildings of Assyria extend over a very long period, the oldest at Nimroud being from 1300 to 800 B.C., and the more recent at Khorsabad and Koyunjik from 800 to 600 B.C. To these succeeded Babylon in the reign of Nebuchadnezzar, and the Birs Nimroud; but these are mere masses of decomposed brickwork, without any sculptures of harder material.

After Babylon came Pasargadæ—where the splendid palaces of Cyrus and Cambyses still exist in ruins—and Persepolis, the capital of Darius and Xerxes (560—523 B.C.), and some remains are still to be found at Susa, Ecbatana, and Teheran. At Persepolis, we find the very parts preserved which at Nimroud and Khorsabad are awanting; for here there is abundance of stone, and the

pillars, walls, doorways, &c. (which, in the early examples, were no doubt of wood, and have decayed), being of stone, are still preserved. This has enabled Mr. Fergusson to 'restore' these buildings, and to produce most interesting designs, showing not only how the palaces of Persia were constructed and lighted, but from them to suggest how the arrangements of all the ancient architecture of Egypt and Syria must have been designed.

The halls at Persepolis were square in plan, having an equal number of pillars in each direction for the support of the roof, which was flat. In the center, a portion was left open for the admission of light, and sheltered by another roof raised upon pillars. The accompanying section (fig. 1) of the Great Hall of



Fig. 1.- Section of Hall of Xerxes at Persepolis.

Xerxes (from Fergusson's *Handbook of Architecture*) will explain this arrangement. This hall is the most splendid building whose remains exist in this part of the world. The remains of the 72 columns with which it was adorned are still extant (fig. 2). The

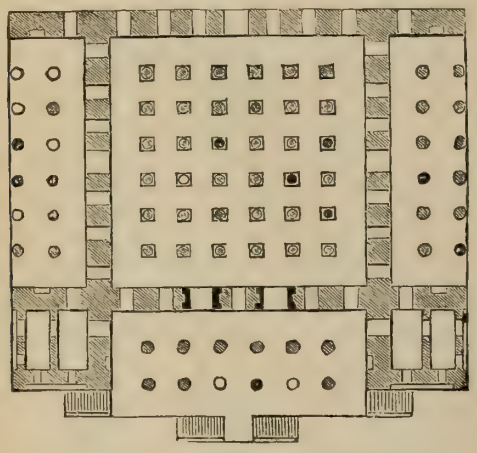


Fig. 2.—Plan of Great Hall of Xerxes at Persepolis.

hall had 36 columns, six on each side, and on three sides had an external portico, each with two rows of six columns. These columns had capitals, composed of bulls' heads and shoulders (fig. 3), between which the beams of the roof rested; while others were ornamented with scrolls like the Ionic order (fig. 4). The bases



Fig. 3. Fig. 4.

Details of Persian Architecture.

also are suggestive of the origin of that Greek style. This hall was 350 feet by 300, and covered more ground than any similar buildings of antiquity, or any medieval cathedral except that of Milan.

The palaces of Persepolis stand on lofty platforms, built with walls of Cyclopean masonry, and approached by magnificent flights of stairs, adorned, like the palaces, with sculptures somewhat similar to those of Assyria. The interiors were ornamented with paintings. The use of the arch was known in Assyria, as has been shown by the subterranean arched conduits discovered by Layard, and the gates of Khorsabad discovered by M. Place. The arches of the latter spring from the backs of sculptured bulls, and are beautifully ornamented with enamelled bricks.

PERSIAN GULF, an arm of the Indian Ocean which penetrates between Arabia and Persia to the extent of 650 English miles in a general north-westerly direction. Its breadth varies from 55 miles at the mouth to 250 miles, and the area is estimated at 117,300 square miles, from which about 1930 square miles must be subtracted for the islands, which are scattered over the western half, or lie close inshore along the eastern side. The chief of these islands are Ormuz (q. v.), at the mouth; Kishm, 810 square miles in extent; and the Bahrein Islands (q. v.), chief of which is Samak. The Great Pearl Bank stretches along the western side from Ras Hassan to nearly half-way up the gulf. The coast is mostly formed of calcareous rocks. On the Arabian side, it is low and sandy, occasionally broken by mountains and cliffs; while, on the Persian side, it is higher and abrupt, with deep water close inshore, owing to the mountain-ranges of Fars and Laristan running close to the water's edge. The islands are partly of limestone and partly of ironstone, and are generally destitute of springs, barren, desolate, and presenting numerous traces of volcanic eruptions, With the exception of the Shat-el-Arab (q. v.), the P. G. receives only insignificant streams. Its eastern side presents abundance of good anchorage, either in the numerous bays or in the lee of islands. The greater portion of its shores now belongs to the Imaum of Muscat. The coasts of the gulf have been explored by successive British expeditions, the last of which, in 1821—1825, made a complete trigonometric survey of the Arabian shore. The order of the periodic currents in this gulf is precisely the reverse of that of the Red Sea (q. v.) currents, as they ascend from May to October, and descend from October to May.

Oriental geographers give to this gulf the name of the 'Green Sea,' from a remarkable strip of water of a green color, which lies along the Arabian coast. It is strange that from the time of Nearchus, the admiral of Alexander the Great, who was the first to make the P. G. known to Europeans, the Persians have never ruled supreme over its surface.

PERSIAN LANGUAGE AND LITERATURE. The ancient and modern idioms of Persia, which are in general designated as Iranian or West Aryan, belong to the great class of the Indo-Germanic languages; but the term Persian itself applies more particularly to the language as it is now spoken, with a few exceptions, throughout Persia, and in a few other places, formerly under Persian dominion, like Bokhara, &c. The more important and better-known of the ancient idioms are (1) the *Zend* (the East Indian or Bactrian languages, in two dialects—the 'Gâtha idiom,' and the 'ancient' or 'classical Zend'), which died out in the 3d c. B. C.—one of the most highly-developed idioms, rich in inflections, in the verbs as well as in the nouns, and in the former almost completely agreeing with Vedic Sanscrit; yet such as we find it in the small remains which have survived, it is no longer in the full vigor of life, but almost decaying, and grammatically somewhat neglected; it is in fact held by a great authority on the subject (Haug), that the grammar was never fixed in any way by rules. To increase the difficulty still more, the texts—the Zoroastrian books—never seem to have been copied with proper care, or by men who had any correct knowledge of the language; so that the critical restoration of the literary remains is matter of extreme difficulty, and Zend studies in general may be said to be in their infancy yet. Geographically, this idiom may be placed in Northern Persia. Its alphabet is of Semitic origin, and the writing goes from right to left (see ZEND, ZEND-AVESTA).

(2) *Ancient Persian*, the chief remnants of which are found in the cuneiform inscriptions of the time of the Achæmenides, discovered in the ruins of Persepolis, on the rock of Behistun, and some other places of Persia (see CUNEIFORM). Some relics, chiefly consisting of proper names for gods and men, and terms for vessels and garments, have survived in the writings of the classical period, and in the Bible, chiefly in Daniel. This idiom is much nearer to Zend and Sanscrit than to modern Persian. It has still the structure of an ancient organic Indo-Germanic language, with the distinct peculiarities of an Iranic tongue. (3) *Pehlevi* (q. v.) (West Iranian, Median, and Persian), in use during the period of the Sassanides (3d to 7th c. A.D.), an idiom largely mixed with Semitic words, and poorer in inflections and terminations than Zend. Its remnants consist of a certain number of books relating to the Zoroastrian religion, of coins and inscrip-

tions; and the language is not quite the same in all cases—according to the larger or smaller infusion of foreign words. The non-Iranian element is known as Huzvaresh, and is simply Chaldee; while the Iranian element is but little different from modern Persian. There are three distinct idioms to be distinguished in Pehlevi, and the writing varies accordingly, yet it is not certain whether the difference arises from their belonging to different districts or periods. When, however, Pehlevi ceased to be a living language, and the restoration of the pure Iranian had begun, people, not daring to change the writings, chiefly of a sacred nature, as they had descended to them from the Sassanian times, began to substitute, in reading, the Persian equivalents to the Huzvaresh words. At last a new form of commentaries to the sacred writings sprang up, in which more distinct and clear Zend characters were used, where each sign has but one phonetical value, and where all the foreign Huzvaresh words were replaced by pure Persian ones; and this new form was called (4) *Pâzend.*

The transition from the ancient to the modern Persian is formed by the *Parsee*, or, as the Arabs call it, *Farsi*, in use from 700 to 1100 A.D., once the language purely of the south-western provinces, and distinguished chiefly by a peculiarity of style, rigid exclusion of Semitic words, and certain now obsolete forms and words retained in liturgic formulas. It is the Persian once written by the Parsees or fire-worshipers, and is in other respects very similar to the present or *modern Persian*, the language of Jâmi, Nizâmi, and Hâfiz—from 1100 to the present time—with its numerous dialects. The purest dialect is said to be that spoken in Shiraz and Ispahan and their neighborhood. In general, the language is pronounced by universal consent to be the richest and most elgant of those spoken in modern Asia. It is the most sonorous and muscular, while at the same time it is the most elegant and most flexible of idioms; and it is not to be wondered at, that, throughout the Moslem and Hindu realm, it should have become the court language, and that of the educated world in general; holding a position somewhat similar to that which the French language held up to within a recent period in Europe. Its chief characteristic, however, is the enormous intermixture of Arabic words, which, indeed, almost make up half its vocabulary. Respecting its analytical and grammatical structure, it exhibits traces only of that of the ancient dialects of Zend and Achæmenian, of which it is a direct descendant. The elaborate system of forms and inflections characteristic of those dialects has been utterly abandoned for combinations of auxiliary words, which form independent connective links, and which impart fulness and an incredible ease to speech and composition, but which at the same time, correspond as little to the classical notion of inflection.

The grammar of the Persian language has been called 'regular;' but the fact is, that there is hardly any grammar worth mentioning—at all events, no grammar the rules of which could not be mastered in the briefest possible period. To begin with: there is no gender distinguished in declension; the plural is always formed in the same manner, the only distinction consists in animate beings receiving the affix *án*, while the inanimate are terminated in *hâ;* further, that instead of the inflection in the different cases found in the ancient languages, either a *mar* (hitherto unexplained) is prefixed, or a *râ* (*râh* = way, by reason of, Pehlevi, Parsi) is affixed. Between the genitive and the word which governs it, also between a noun and its following adjective, an *i* is inserted. This is the whole declension, not only of the noun, but also of the adjective and pronoun. The comparative is formed, as in the mother-tongue, by the addition of *ter;* the superlative adds *terîn*, which is New-Persian exclusively. Not even the pronouns have a gender of their own; the distinction between masculine and feminine must be expressed by a special word, denoting male or female. There is no article, either definite or indefinite. Singularity of a noun is expressed by an appended *ê*, a remnant of *aêva*, one. The flection of the verb is equally simple. There is a set of personal terminations for all tenses:—*am, i, ad* or *ast; êm, êd, nd;* the infinitive ends in *tan* or *dan*, the past participle in *tah* or *dah*. The aorist is formed by adding to the root the terminations *am, i, ad; em, ed, and;* the preterite by dropping the *n* of the infinitive, and substituting the usual terminations. The prefix *mi* or *hamí* (Parsi and Huzvaresh = always) transforms the preterite in to the imperfect; while the prefix *bi* or *bih* (the present of the verb 'to will') alters the aorist into the simple future. The other tenses are compounds of the past participle and auxiliary verbs, as in the Teutonic and other modern tongues. The passive is formed by the various tenses of the verb *shudan*, 'to be, to go, to beware,' being placed after the past participle.

As to syntax, there is none, or, at all events, none which would not come almost instinctively to any student acquainted with the general laws of speech and composition. As the time of its greatest brilliancy may be designated that in which Firdusi wrote, when Arabic words had not swamped it to the vast degree in which it is now found, and were still, as far as they had crept in, amenable to whatever rules the Persian grammar imposed upon the words of its own language.

In the history of the Persian writing, three epochs are to be distinguished. First, we have the Cuneiform (q. v.), by the side of which there seems, however, to have been in use a kind of Semitic alphabet for common purposes. This, in the second period, appears to have split into several alphabets, all related to each other, and pointing to a common Syriac origin (such as the different kinds of Pehlevi characters and the Zend alphabet) cleverly adapted to the use of a non-Semitic language. In the third period, we find the Arabic alphabet enlarged for Persian use by an addition of diacritical points and signs for such sounds as are not to be found in Arabic (*p, ch, zh, g*). The characters are written in a somewhat more pending manner (Talik) in Persian, and the writing is thus slightly different from the usual Arabic Neskhi.

The much-spoken-of close connection between German and Persian—both of Indo-Germanic kin—is neither more nor less than a popular fallacy, caused by a misunderstood dictum of Leibnitz: 'Integri versus Persice scribi possunt quos Germanus intelligat.' which was enthusiastically taken up and 'proved' by Adelung, Hammer-Purgstall, and others, and which has even led to the assumption, that the Germans came direct from Persia, or that the Goths once were mixed with the Persians. We only mention it as a philological absurdity of bygone days.

Of the Literature of Persians before the Mohammedan conquest, we shall not speak here, but refer to the special articles ZEND, PEHLEVI, PARSEES, &c. The literary period now under consideration is distinguishable by the above-mentioned infusion of Arabic words into the Persian language, imported together with the Koran and its teachings. The writers are, in fact, one and all, Mohammedans. With the fanaticism peculiar to conquering religions, more particularly to Islam, all the representatives of old Persian literature and science, men and matter, were ruthlessly persecuted by Omar's general, Saad Ibn Abi Wakkas. The consequence was, that for the first two or three centuries after the conquest, all was silence. The scholars and priests who would not bow to Allah and his Prophet and to the new order of things, and who had found means to emigrate, took with them what had not been destroyed of the written monuments of their ancient culture; while those that remained at home were forced to abandon their wonted studies. Yet by slow degrees, as is invariably the case under such circumstances, the conquered race transformed the culture of the conquerors to such a degree, that native influence soon became paramount in Persia, even in the matter of theology—the supreme science. It is readily granted by later Mohammedan writers, that it was out of the body of the Persains exclusively that sprang the foremost, if not all, the greatest scholars and authors on religious as well as grammatical subjects, historians and poets, philosophers and men of science; and the only concession they made consisted in their use of the newly-imported Arabic tongue. A further step was taken when, after the Islam sway had ceased, the Persians, under upstart native dynasties, returned also to the ancient language of their fathers during the first centuries of Mohammedanism.

The revived national feeling, which must have been stirring for a long time previously among the masses, then suddenly burst forth in prose and in verse, from the lips of a thousand singers and writers. The literary life of Persia, the commencement of which is thus to be placed in the 9th c. A.D., continued to flourish with uabated healthy vigor for five centuries, and produced a host of writers in every branch of science and belles-lettres, of whom we can only here give the most rapid of surveys, referring for the most important names to the special articles throughout this work. Beginning with poetry, we hear, under the rule of the third of the Samanides, Nasr (about 952), of Abul Hasan Rudegi, the blind, who rose by the king's favor to such an eminence that he had 200 slaves to wait upon him. But little has remained of his 1,300,000 distichs, and of his metrical translation of Bidpai's Fables. About 1000 A.D., we hear of Kabus, the Dilemite prince, as the author of *The Perfection of Rhetoric*, and Poems. In the time of the Gasnevides, chiefly under Mahmud, who surrounded himself with no less than 400 court-poets, we find those stars of Persian song, Ansari (1039), the author of *Wamik and Asra*, and 30,000 other distichs and Kassidahs in honor and praise of the king; further, Ferruchi, who, besides his own poems, also wrote the first work on the laws of the Persian metrical art; and above all Firdusi (q. v.), that greatest epic poet, the author of the *Shah-Nameh*, or Book of Kings; who led one of the most brilliant and romantic lives that ever fell to the lot of genius, and ended if forgotten and in misery. With him, but darkened by his brightness, flourished Esedi, his countryman, from Tus. Among the poets who flourished under the Atabek dynasty, we find that most brilliant Persian panegyrist, Anhad Addin Enweri, who, with his praise, well knew how to handle satire. The best of the older mystic poets of that period is Senayi, author of 30,000 distichs,

who for his poem *Hadikat* was nominated official singer of the Sufis. Nizami (about 1200) is founder of the romantic epos; the greater part of his *Chamshe*, or collection of five romantic poems (*Chosru and Shirin, Mejnun and Leila*, &c.), being almost as well known in Europe as it is in the East; and to whom Kisilarslan the king presented for one of these poems no less than fourteen estates.

His grave at Gendsheh is still visited by many a pious pilgrim. And here we must mention that the branch of eastern theosophical literature pre-eminently cultivated in Persia is the mystic (Sufistic) poetry, which, under Anacreontic allegories, in glowing songs of wine and love, represented the mystery of divine love and of the union of the soul with God (see SUFISM). In this province we find chiefly eminent poets like Senáji (about beginning of 13th c.), and Ferid Eddin Attar (born 1216), the renowned author of *Pend Nameh* (Book of Counsel), a work containing the biographies of saints up to his day. His principal strength, however, lay in his mystic poems; and such is the depth and hidden meaning of his rhymes, that for centuries after him, the whole Moslem world has busied itself with commentaries and conjectures on the meaning of a great part of his sacred poetry. He died about 1330, more than a hundred years old, as a martyr. Greater still, in this peculiar field, is Djalal Eddin Rumi, born at Balkh (died 1266), the founder of a still existing most popular order of dervishes (Mewlewi). His poem on *Contemplative Life* has made him the oracle of oriental mysticism up to this day. He wrote also a great number of lyrical poems, which form, as far as they have been collected for this special purpose, a breviary for the faithful Sufi. Anhadi of Meraga (died 1297) also deserves mention.

The 13th c. cannot better be closed than with Sheik Muslih Eddin Sadi of Shiraz (died 1291), the first and unrivalled Persian didactic poet. His *Bostan* and *Gulistan* (Rose and Fruit-Garden) are not only of Eastern but also of European celebrity, and most deservedly, embodying as they do all the mature wisdom, the grace and happiness of composition of a true poet, ripe in years as in experience. At the beginning of the 14th c., we meet several meritorious imitators of Sadi in didactic poetry.

But far above all these, as above all other Persian lyrical and erotic poets, shines Hâfiz (q. v.), the 'Sugar-lip,' who sang of wine and love, and nightingales and flowers, and who so offended mock-piety, that it even would have tried to refuse him a proper burial, had not the oracle of the Koran interposed. After him, the full glory of Persian poetry begins to wane. Among those that came after him, stands highest Djâmi, who died in 1492, a poet of most varied genius, second only in every one of the manifold branches to its chief master—in panegyric to Enveri, in didactic to Sâdi, in romance to Nizami, in mysticism to Jelaled-din in lyric to Sâdi; and he, with these and Firdusi, form the brightest representatives of Persian poetry. Most brilliant, however, is Djâmi as a romantic poet. Of prose works, we have by him a history of Sufis, and an exceedingly valuable collection of epistolary models. Before concluding this branch of literature, we must take notice of the dramatic poetry of the Persians, which is not without merit, but of small extent, and to be compared principally with the ancient French mysteries.

The numerous tales, stories, novels, anecdotes, anthologies, and all the miscellaneous entertaining literature in which Persia abounds—and of which the best known, perhaps, are the adaptation of Bidpai's Fables; *Anvari Suheili*, by Husein Vais Kashifi; the *Tutinameh*, or Book of Parrots, a collection of fairy tales, by Nechshebi; the *Behari-Danish*, by Inajeth Allah, &c.—form a fit transition from poetry to prose, for little more is to be said of Persian poetry after the 15th century. Modern imitations of ancient classical works, such as the New Book of Kings, the *Shahinshah-Nameh*, which treats of modern Persian history; the *George Nameh*, which sings the English conquests in India, &c., are hardly worth pointing out in so brief a summary as ours.

Of native writers on the poets, are to be named Dewlet Shah (who describes the poets from the 10th to the 15th centuries), Sam Mirsa (the poets of the 16th), and Luft Ali Beg (the poets of modern time). In prose, it is chiefly history which deserves our attention. Able rivals of the great Arabic historiographers sprang up at an early period. For the mythical times, or those of which no knowledge, save through a medium of half-legend, has reached later generations, Firdusi's gigantic epos remains the only source. But after the chroniclers we find Fadhl Allah Reshid Eddin, the vizier of Ghazan, born 1247 at Hamadan, who was executed in 1320. He wrote the *Collector of Histories*, in three volumes, to which he afterwards added a fourth geographical volume: a summary of the history of all Mohammedan countries and times, containing besides a complete history of sects. Worthy and contemporaneous rivals are Fachr Eddin Mohammed Bina Kiti, author of a universal history; and Khodja Abdallah Wassaf, the panegyrist, the model of grand and rhetorical style. His most successful imitator in the 14th c. is Abdel Ressak; and in the 15th, Sheref Eddin Ali Yezdi, who wrote the history of Timûr. Up to that period, pomposity of diction was considered the principal beauty, if not the chief merit, of a classical Persian history. From the 15th c. downwards, a healthy reaction set in, and simplicity and the striving after the real representation of facts, became the predominant fashion. As the *facile princeps* among these modern historians is to be mentioned Mirkhond, whose Universal History (*Ranset Essafa*) comprises the period from creation to the reign of Sultan Hasan Beikara, in seven books. After him are to be mentioned his son Khondemir, Gaffari, Moslih Eddin Mohammed Lari, and Abu Tahir of Tortosa in Spain, who wrote the *Derab Nameh*, a biographical work on the Persian and Macedonian kings, and the ancient Greek physicians and philosophers.

Among Indian historians—and they form a most important class—who wrote in Persian, we have Mohammed Kasim Ferishtah (1640), who wrote the ancient history of India up to the European conquest; Mohammed Hashim, Abul Fadel Mobarrek (*Akbar Nameh*); further, Abdel Ressak (*History of the Padishahs*), Mirza Mehdi, Cholam Hussein Khan, and others. One of the most recent works of this description is the *Measiri Sultaniye*, which contains the history of the present dynasty of Persia, and which was published in Teheran, 1825, and translated by Bridges (Lond. 1833).

Biographies, legends, histories of martyrs, and the like are legion. Most of the biographies of the Prophet, however, are taken from the Arabic.

Little is to be said of Persian productions on special branches of exact science. There are a few works on geography—more generally treated together with history—such as those of Mestafi, Ahmîn Ahmed Rasi, Berdshendi, &c. In theology, little beyond translations of the Koran, and a few commentaries on single chapters, and of some portions of the Traditions (*Sunnah*), has been produced—the Arabic works being completely sufficient, in religious matters, for all Mohammedans. For the history of early Persian religion are of importance the *Ulemai Islam* and the *Dabistan*, a description of all the creeds of the East. Jurisprudence has likewise to show little that is original, and not mere translation, partial commentary, or adaptation in Persian. The *Hedadshah*, the *Inadshah*, the *Futawa Alemgiri*, are the most important legal works to be mentioned here. A great deal has been done in the field of medicine, surgery, pharmacy, physical sciences, by Persians; but nearly all their chief works being written in Arabic, they do not concern us here. Mathematics, astronomy, and philosophy, have received due attention; rhetoric, the art of letter-writing, metrical and poetical arts, have likewise been cultivated with great assiduity, but few standard works are to be enumerated.

Grammar and lexicography found their principal devotees in India; and of dictionaries, the *Ferhengi-Shiuri*, *Burhani Katiu*, and principally the *Heft Kulzum* (the Seven Seas), by the Sultan of Oude, deserve attention. Translations from Greek, Indian, Arabic, Turkish, and other works into Persian, exist in great abundance, and some of them have paved the way to the knowledge of the original sources in Europe.—Chief authorities and writers on the subject of Persian Language and Literature, are Meninsky, Richardson, Lumsden, Forbes, Ibrahim De Lacy, Hammer-Purgstall, Briggs, Jones, Duperron, Stewart, Quatremere, Wilken, Defrémery, Vullers, Iken, Kosegarten, Ouseley, Chodzko, Bland, Sprenger, Graff, Brockhaus, Dorn.

PERSIAN POWDER, a preparation of the flowers of the composite plant *Pyrethrum carneum* or *roseum*, which are dried and pulverized. This powder has wonderful efficacy in destroying noxious insects, and is extensively used for that purpose in Russia, Persia, and Turkey. It has lately been introduced into France and Britain, and promises to be of great use, not only in ridding houses of their insect pests, but in aiding the horticulturist in protecting his plants. The plant is a native of the Caucasus, where the flowers are gathered wild, and sent to be manufactured chiefly at Tiflis. It might readily be cultivated in this country, where its value for destroying moths alone would render it a profitable crop. Its habit is very similar to that of camomile.

PERSIGNY, JEAN GILBERT VICTOR, DUC DE, whose proper name was FIALIN, a noted adherent of the Emperor Napoleon III., was born at Saint-Germain-Lespinasse, in the department of Loire, 11th January 1808, entered the *Ecole de Cavalerie* at Saumur in 1826, and obtained an appointment to the 4th regiment of hussars in 1828. At this period, Fialin was royalist in his politics; but he soon changed to a liberal, and took an active part in the July revolution. Insubordination, however, led to his final expulsion from the army in 1833. After a brief trial of Saint-Simonianism, Fialin was converted to the Bonapartist cause, dropped the name of Fialin, and took up that of P. (from an 'hereditary estate'), with the title of Vicomte. Introduced to Louis Napoleon by the ex-king Joseph, he at once formed the most intimate relations with the Prince, and commenced a career of Bonapartist propagandism throughout France and Germany,

in which he displayed extraordinary energy, pertinacity, and fertility of resource. He had the chief hand in the affair of Strasburg, and subsequently apologized of its humilating failure in a pamphlet entitled *Relation de l'Enterprise du Prince Napoleon Louis* (Lond. 1837), in which he throws the blame of the disaster on 'Fate.' He also took part in the descent on Boulogne, where, like his master, he had the misfortune to be captured, and was condemned to twenty years' imprisonment. His confinement, however, after a short time, became almost nominal, and he beguilded his leisure by literary study, a partial result of which may be seen in his voluminous memoir, addressed to the Institute, on the *Utilité des Pyramides d'Egypte* (1844). On the breaking out of the revolution in 1848, P. hurried to Paris, and set himself, with all his accustomed vigor and swiftness, to organize the Bonapartists. It is hardly too much to affirm that it was this dexterous agitator who made his master President of the Republic. He was then appointed aide-de-camp to the President and Major-general of the Parisian National Guard—perhaps with a view to future contingencies. In 1849, he was chosen a member of the Legislative Assembly, and immediately signalized himself in parliament, as he had previously done out of doors, by his absolute devotion to the policy of the Elysée. He was sent to Berlin as ambassador at the close of the same year, and afterwards held other high diplomatic offices; took a prominent part in the *coup d'état* of December 1851; and, in January 1852, succeeded M. de Morny as Minister of the Interior.

On the 27th of May following, he married a grand-daughter of Marshal Ney, when the president conferred on him the title of *Comte*, and presented him with 500,000 francs. In 1855, he became ambassador at the English court, which office he held till 1858, and again during 1859—1860, leaving on both occasions the most favorable impression on English statesmen, by his talent and diplomatic tact. In the latter year, he was recalled, to assume the office of Minister of the Interior. He laid down the portfolio of this office in June 1863, when the elections of Paris and other large towns showed dissatisfaction with his policy. In September of the same year he was created duke. Thereafter he proved himself in the Senate a zealous Bonapartist till the overthrow of the empire. He did not long survive it, having died in 1872.

PE'RSIMON. See DATE PLUM.

PE'RSIUS (Aulus Persius Flaccus), one of the most famous Roman satirists, was born at Volaterræ in Etruria, 34 A.D. He was of a distinguished equestrian family, was educated under the care of the Stoic, Cornutus, lived on terms of intimacy with the most distinguished personages of his time in Rome, among whom were Lucan and Seneca, and died 24th November 62 A.D., in the 28th year of his age. The principal authority for the life of P. is an abridgment of a 'commentary' by one Probus Valerius, which presents the character of the satirist in a most amiable light. Modest and gentle in his manners, virtuous and pure in his whole conduct and relations, he stands out conspicuously from the mass of corrupt and profligate persons who formed the Roman 'society' of his age; and vindicated for himself the right to be severe, by leading a blameless and exemplary life. His six Satires are very commonly printed with those of Juvenal. They were immensely admired in P.'s own day, and long after, all down through the middle ages. The Church Fathers, Augustine, Lactantius, and Jerome, were particularly fond of him—the latter, it is said, has quite saturated his style with the expressions of the heathen satirist; but the estimate which modern critics have formed of his writings, in a literary point of view, is not quite so high. They are remarkable for the sternness with which they censure the corruption of morals then prevalent at Rome, contrasting it with the old Roman austerity and with the Stoic ideal of virtue.

The language is terse, homely, and sometimes obscure, from the nature of the allusions and the expressions used, but his dialogues are the most dramatic in the Latin tongue. The *editio princeps* appeared at Rome in 1470; later editions are those of Isaac Casaubon (Par. 1605), Passow (Leip. 1809), Jahn (Leip. 1843), and Heinrich (Leip. 1844). P. has been frequently translated; as many as fourteen English, twenty French, and considerably more German versions, being known. The two best English ones are those by Dryden and Gifford.

PERSON (Lat. *persona*, a mask) has come, from its original signification, to be applied to the individual wearing the mask, and thus to mean in general an individual, or a numerically distinct being. Beyond the idea of individuality, it involves that of a sentient or intelligent nature, in which it differs from 'substance' or 'thing.' The theological use of the word, although strictly identical with its philosophical signification, is made difficult of apprehension from its being applied to the Christian doctrine of the Trinity, which in itself involves a mystery. Nevertheless, when theologians declare that there are Three Persons in one God, they intend to strictly convey that each of the Three Persons is a Being individually subsisting and numerically distinct; and the difficulty of apprehension is derived, not from these terms, but from the reconciliation of the numerical distinction of Persons with the unity of the Divine Nature.

The name *Persona*, Person, was first applied to the Trinity by the Latins; the corresponding Greek word *Prosopon*, being of later use. The earlier Greek Fathers used the word *Hypostasis*, substance, where the Latins used *Persona*, and considerable controversy for a time grew out of this diverse use. It became apparent, however, that the difference was but of words; and after the condemnation of the Sabellian heresy (see SABELLIANISM), and still more after the council of Nicæa, all ambiguity of words being at an end, the controversy turned upon the substance of the doctrine, in the well-known form of the Arian controversy. See ARIUS.

PE'RSONAL ACTIONS, in English Law, are actions which are brought to try the right to damages for breach of contract, or for injuries to the person or personal estate; in contradistinction to real actions, which were designed to try the right and title to real property.

PERSONAL EXCEPTION means, in the Roman law, a ground of objection which applies to an individual, and prevents him doing something which, but for his conduct or situation, he might do. The term is adopted in the law of Scotland. In England, it is generally called an estoppel. Thus, a person who executes a deed is prevented by personal exception or estoppel from disputing the obligation thereby contracted, unless a case of fraud be made out.

PE'RSONALTY, in English Law, means all the property which, when a man dies, goes to his executor or administrator, as distinguished from the realty, which goes to his heir-at-law. Personalty consists of money, furniture, stock in the funds; while realty consists of freehold land and rights connected with land. See INTESTACY, KIN, NEXT OF.

PERSONIFICA'TION (called by the Greeks *Prosopopœia*) is a figure of rhetoric by which inanimate objects, or mere abstract conceptions, are invested with the forms and attributes of conscious life. Oratory and poetry often derive great power and beauty from the employment of this figure. Nowhere do we find more sublime examples than in the Hebrew Scriptures, e. g., 'The sea *saw* it, and fled.' Such abstract conceptions as Wisdom, Justice, Charity, are often personified in the gravest and most argumentative compositions.

PERSONNEL, in speaking of an army, represents the officers and soldiers, as opposed to the *matériel*, in which are comprised the guns, provisions, wagons, and stores of every description.

PERSPE'CTIVE (Lat. *perspicio*, I look through), is the art of representing natural objects upon a plane surface in such a manner that the representation shall affect the eye in the same way as the objects themselves. The distance and position of objects affect both their distinctness and apparent form, giving rise to a subdivision of perspective into *linear perspective*, which, as its name denotes, considers exclusively the effect produced by the position and distance of the observer upon the apparent *form* and *grouping* of objects; while *aërial perspective* confines itself to their *distinctness*, as modified by distance and light. The necessity of attending to the principles of perspective in all pictorial drawing is apparent when we consider, for instance, that a circle, when seen obliquely, appears to be not a circle, but an ellipse, with its shortest diameter in line with the spectator, and its longest at right angles to this. A square, when looked at from a position opposite the center of one of its sides appears as a trapezoid, the sides which are perpendicular to the direction of vision appearing to be parallel, while the other two appear to converge to a point in front of the spectator, &c. For the same reason, two rows of parallel pillars of equal height, seen from a point between and equidistant from each row, appear not only to converge at the further end, but to become gradually smaller and smaller. An excellent idea of a perspective plan can be easily obtained by interposing a vertical transparent plane (as of glass—a window, for instance) between the observer and the objects of his vision, and supposing that the objects he sees are not seen *through* the glass, but painted *on* it.

A sketch made on a glass plane in this position by following with a pencil all the lines and shades of the objects seen through it, the eye being all the time kept quite steady, would form a picture in perfect perspective. In practice, however, it is found, unfortunately, that glass is not a suitable material for sketching on, and that the vertical position is not the most convenient; it is therefore preferable to make a careful study of the effects produced by change of position and distance on the appearance of objects in nature, and from the results of this to compile a bodyof rules, by the observance of which painters may be enabled to produce an effect true to nature. After the 'scope' (i. e., the number of objects to be introduced, and the distance at which they are to be viewed) of the picture has been determined, and before the design is com-

menced, it is necessary to draw upon the perspective plan three lines: 1. The *base line*, or *ground line*, which limits the sketch towards the operator, and is the base line of the picture. 2. The *horizontal line*, which represents the ordinary position of the sensible horizon. The height of the horizontal line is about one-third of the height of the picture, when the sketcher is placed at or little above the level of the horizon; but it may rise in a degree corresponding to his increase of elevation till it reaches near to the top of the perspective plan. The general rule is to have a high horizontal line when the view is taken, or supposed to be taken, from an eminence; but when the station is on a level, either actual or assumed, as is the case when a statue or a mountainous landscape is figured, the horizontal line must be low. The horizontal line in nearly all cases is supposed to be level with the spectator's eye. 3. The *vertical line*, which is drawn from the supposed position of the sketcher, perpendicular to the *ground* and *horizontal* lines, meeting the latter in a point which is called the *point of sight*, or center of the picture.

The vertical line has no representative in nature, and is merely a mechanical adjunct to the construction of the picture, all vertical lines in nature being parallel to it in the picture. The point of sight being the point directly opposite to the observer, it is properly placed in the center of the picture, for it is most natural that the view should lie symmetrically on each side of the principal visual line; but this is not by any means a universal rule, for we very frequently find it on the right or left side, but always, of course, on the horizontal line. All lines which in nature are perpendicular to the ground line, or to a vertical plane which is raised upon it as a base, meet in the point of sight, which is thus their *vanishing point* (see the line of the tops and bottoms of the pillars in fig. 1). *The points of distance* are two points in the horizontal line on each side of the point of sight, and in a 'direct' sketch are at a distance from it equal to the horizontal distance of the sketcher's eye from the ground line. The equality of distance of these points from the point of sight is not, however, necessary, as it occurs only in those cases where the lines, of which the points of distance are the *vanishing points*, are inclined (in nature) at an angle of 45° to the base line; but, in all cases, the two points of distance are about twice as far apart as the eye is from the picture. One important use of the points of distance is to define the distance of objects in a row (fig. 1) from each other. For this purpose, two points of distance are not necessary, as, when the position of one pillar is found, that of the one opposite is at once obtained by drawing a line parallel to the base or ground line. We have seen that the point of sight is the vanishing point of all level lines which meet the ground line or a vertical plane on it at right angles, and that the points of distance (in a *direct* picture) are the vanishing points of all lines which cut the ground line at an angle of 45°; but there are many other groups of parallel lines in a picture which have different situations, and therefore different vanishing points. Such lines with their vanishing points (called, for distinction's sake, *accidental points*) are represented in fig. 2.

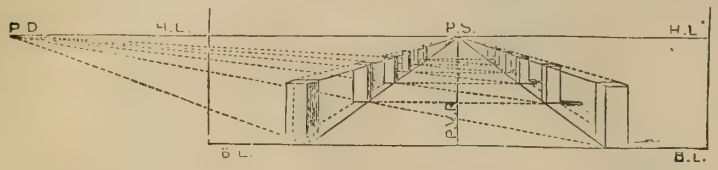


Fig. 1.
Illustrating the more important points and lines; PVR is the principal visual ray.

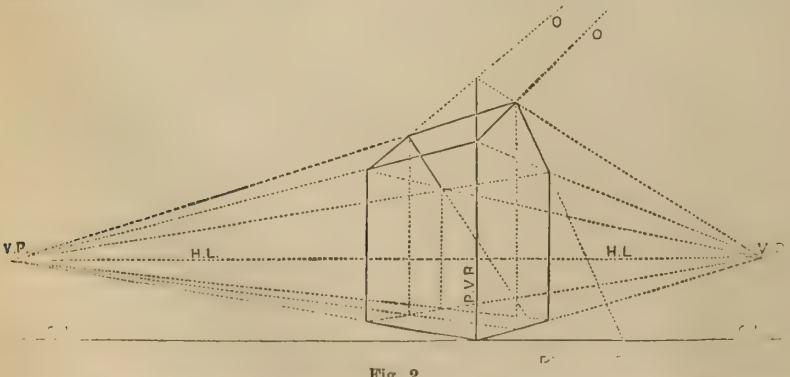


Fig. 2.
The lines O O converge to the accidental point aërial, and P P to the accidental point terrestrial.

If the accidental point is above the horizontal line, it is called the *accidental point aërial*—if below, the *accidental point terrestrial;* and a little consideration makes it evident that these points may or may not be situated within the plane of the picture. Such are the points and lines necessary for the construction of a plan in true perspective; and from the above explanation, we may deduce the two general principles: 1. That all parallel straight lines in nature are no longer parallel when projected on the perspective plane, but meet in a point which is called the vanishing point, and is some one of the three above described, unless these lines happen to be also parallel to the ground line or the vertical line, in which case they remain parallel when transferred to the picture; and 2. That since the bodies drawn below the horizontal line are seen as if from above, those above as if from below, and those to the right and left of the point of sight as if observed from the left and right, it follows, that straight lines which in the picture are above the horizontal line lower themselves, those below raise themselves to it; those to the left, following the same law, direct themselves to the right, and *vice versâ*.

Aërial perspective, consists in a modulation of the brightness and colors of objects in accordance with the state of the atmosphere, the depth of the body in the perspective plane (i. e., distance in nature from the ground line), and other accidents of place and time. As the distance of objects increases, their illuminated parts are made less brilliant, and their shaded parts more feeble. The bluish tint imparted by a large mass of the atmosphere to the bodies seen through it, is frequently imitated by the mixing of a slight tint of blue with the colors to be applied; a yellow object thus assumes a greenish tint; a red one, a violet tint, &c. The air, when charged with vapor, is represented by a diminution of the brightness of colors, and by the grayish tint imparted to them. But in this part of the subject, rules are of little avail, for experience alone can guide the painter in faithfully copying the myriad aspects presented by nature.

A thorough knowledge of perspective is a *sine quâ non* to the painter or designer, and though many are inclined to think it a superfluity, and that the sketcher has only to make use of his eyes, and copy justly, the very fact that such is their opinion, shows that they have never made the attempt; for it is impossible for the painter, and much more so for the designer, to execute a copy of nature with sufficient accuracy by the sole aid of the eye and hand, a fact that is unfortunately much too frequently proved by many of the sketches exhibited in fine-art collections. Perspective was known to the ancients, but seems to have become extinct during the disturbances that convulsed Italy, and was revived by Albert Dürer, Pietro del Borgo, and Bramantino of Milan (1440), whose body of rules was extended and completed by Peruzzi and Ubaldi about 1600. Dr. Brook Taylor was the first Englishman who discussed the subject scientifically. Works on perspective are now abundant in every language.

PERSPIRA'TION. See SWEAT.

PERTH, a city, royal, municipal, and parliamentary burgh, and capital of the county of the same name, is situated on the right bank of the Tay, 45 miles north-north-west of Edinburgh by railway (through Fife). The charming scenery of the immediate vicinity; the Tay, a broad and noble river, sweeping southward along its eastern side; and the superb background of the Grampians on the north, render the site of the 'Fair City' exceedingly interesting and beautiful; while its rank as in some sort the ancient metropolis of Scotland, the important *rôle* it has played in the history of the country, and the picturesque associations with which history and fiction have invested it, claim for it a high rank among the cities of Scotland. A handsome bridge of nine arches, 880 feet in length, and stretching over a water-way 590 feet in width, connects the town with the suburb of Bridgend, on the left bank of the river. Further down, the Perth and Dundee Railway crosses the river on a fine stone and iron bridge, which also admits foot-passengers. The appearance and salubrity of P. are much enhanced by two beautiful public parks, called the North and South Inches. The water supply, obtained from the Tay, is filtered, raised by steam into two elevated reservoirs, and thence distributed over the town, rising to the upper stories of the highest houses.

Among the most interesting public buildings are the church of St. John, an ancient structure in the Pointed Style, surmounted by a massive square tower; the County Buildings, a Grecian edifice; the Town-house (part of which is as old as 1210); King James VI.'s Hospital; the Infirmary; and the local prison. At the head of the South Inch stands the Penitentiary, or General Prison, one of the largest buildings of the kind in Scotland, where all criminals sentenced to imprisonment for long periods are confined. The town also contains a statue of the late Prince Consort; Marshall's Monument, erected in honor of a former lord provost, and containing a public library and the Museum of the Antiquarian Society; the public seminaries, Sharp's and other educational

institutions. The river is navigable to P. for vessels of considerable burden. The linen and wincey manufactures are thriving. There are dye-works, iron-foundries, breweries, &c.; but shipbuilding has declined. The salmon-fishery on the Tay is very valuable, the rental being upwards of £15,000. In 1880, 204 vessels, of 16,573 tons, entered and cleared the port. Six fairs are held annually, and horse-races take place every year on the North Inch. P. has a charter as a royal burgh from King William the Lion (1165—1214). It returns a member to the House of Commons. Pop. (1871) of royal and parliamentary burgh, 25,585; (1881) 28,948. There are above 20 places of worship. The city revenue in 1879–80 was £7380.

PERTH, THE FIVE ARTICLES OF, memorable in the ecclesiastical history of Scotland, were five articles agreed upon in a meeting of the General Assembly of the Church of Scotland, convened at Perth, by command of James VI., on 25th August 1618. These Articles enjoined kneeling at the Lord's Supper, the observance of Christmas, Good Friday, Easter, and Pentecost, and confirmation, and sanctioned the private administration of baptism and of the Lord's Supper. They were highly obnoxious to the Presbyterians of Scotland, not only on their own account, but as part of an attempt to change the whole constitution of the church; and because they were adopted without free discussions in the Assembly, and in mere compliance with the will of the king, who was also regarded as having unduly interfered with the constitution of the Assembly itself. They were, however, ratified by the parliament on 4th August 1621—a day long remembered in Scotland as *Black Saturday*—were enforced by the Court of High Commission, and became one of the chief subjects of that contention between the king and the people, which produced results so grave and sad for both, in the subsequent reign. The General Assembly of Glasgow, in 1638, declared that of Perth to have been 'unfree, unlawful, and null' and condemned the Five Articles.

PERTHES, FRIEDRICH CHRISTOPH, an eminent German publisher, distinguished not only in his professional capacity, but for his sincere piety and ardent patriotism, was born at Rudolstadt, 21st April 1772. In his 15th year, he was apprenticed to a Leipzig bookseller, with whom he remained six years, devoting much of his leisure time to the acquisition of knowledge. In 1793, he passed into the establishment of Hoffmann, the Hamburg bookseller; and in 1796, started business on his own account; and, by his keen and wide appreciation of the public wants, his untiring diligence, and his honorable reputation, he ultimately made it the most extensive of the kind in modern Germany. During the first few years or so of his Hamburg apprenticeship, his more intimate friends had been either Kantian or sceptical in their opinions, and P., who was not distinguished for either learning or speculative talent, had learned to think with his friends; but a friendship which he subsequently formed with Jacobi (q. v.), and the Holstein poet and humorist, Matthias Claudius, led him into a serious but liberal Christianity. The iron rule of the French in Northern Germany, and the prohibition of intercourse with England, nearly ruined trade, yet P., even in this great crisis of affairs, found ways and means to extend his. He endeavored to enlist the intellect of Germany on the side of patriotism, and in 1810 started the *National Museum*, with contributions from Jean Paul Richter, Count Stolberg, Claudius, Fouqué, Heeren, Sartorius, Schlegel, Görres, Arndt, and other eminent men. Its success was far beyond P.'s expectations, and encouraged him to continue his patriotic activity, till Hamburg was formally incorporated with the French empire. He subsequently took a prominent part in forcing the French garrison to evacuate Hamburg, 12th March 1813; and on its re-occupation by the French, he was one of the *ten* Hamburgers who were specially excepted from pardon.

After peace had been restored to Europe, P. steadily devoted himself to the extension of his business, and to the consolidation of the sentiment of German national unity, as far as that could be accomplished by literature and speech. In 1822, he removed to Gotha, tranferring his Hamburg business to his partner Besser. Here he laid himself out mainly for the publication of great historical and theological works. His subsequent correspondence with literary, political, and theological nobilities—such as Niebuhr (one of his dearest friends), Neander, Schleiermacher, Lücke, Nitszch, Tholuck, Schelling, and Umbreit—is extremely interesting, and throws a rich light upon the recent inner life of Germany. He died 18th May 1843.—See *Friedrich Perthes' Leben* (12th edit. 1853), written by his second son, Clemens Theodor Perthes, Professor of Law at Bonn, who died in 1867.—The uncle of Friedrich Christoph P. was JOHANN GEOR. JUSTUS PERTHES, who established a publishing and bookselling house at Gotha in 1785, which has acquired, in the hands of his sons, a great reputation, and from which issues the famous *Almanach de Gotha*. He died in 1816.

PE'RTHSHIRE, one of the most important counties in Scotland, is bounded on the S. by the shires of Stirling and Clackmannan; on the N. by Inverness and Aberdeen; on the W. by Argyle and Dumbarton; and on the E. by Forfar, Fife, and Kinross. It extends from east to west about 70 miles, and from north to south about 66 miles. Its area is 2834 miles, or 1,814,063 acres, of which above 32,000 are covered with water. It is divided into the Highland and Lowland districts, the former occupying much the larger surface, and these are subdivided into 10 divisions —viz., Menteith, Strathearn, Gowrie, Stormont, Strathardle, Glenshee, Athole, Breadalbane, Rannoch, and Balquidder. P. from its insular position and other advantages, has a comparatively mild climate; and the soil, in Strathearn, Carse of Gowrie, and other less extensive tracts, being mostly composed of a rich loam, crops of all kinds are brought to the utmost perfection. These districts are also famed for their fruit and floral productions.

P. is not less distinguished for its magnificent mountain, lake, and river scenery. The Grampians here attain to nearly their maximum height, Ben Lawers being within a few feet of 4000 in altitude; while Ben More is 3843; and several others above 3000. The lakes are numerous, the principal of which are Lochs Tay, Ericht, Rannoch, Tummel, Lydock, Garry, Lyon, and Dochart. There are several streams of note, the principal being the Tay, which is fed by numerous other streams, and is said to discharge as much water into the sea as any other river in the kingdom. These lakes and streams afford excellent fishing, and the Tay is valuable for its salmon, yielding in rent about £15,000 a year.

The monuments of hoar antiquity to be found in this county afford an interesting field of investigation for the curious. Lying northward of the Roman wall, P. comprises the scenes of the last struggle for independence, which the inhabitants of the lowland districts of Scotland made against those formidable enemies of theirs who were regarded as invincible. The last battle fought by the Caledonians against the Romans was at Mons Gramp, or rather, as it should be read, Graup, supposed to be indicated by the great camp at Ardoch, between Dunblane and Crieff, and which does not at all seem to be connected with the Grampian range. In this final stuggle, the result of which was that the Lowlanders were defeated, Agricola commanded the conquering host, and the Caledonians were led by a chief named *Galgacus*.

The chief towns of P. are Perth, Coupar-Angus, Auchterarder, Crieff, Dumblane, and Blairgowrie. According to agricultural statistics taken in 1881, the number of acres under all kinds of crops, bare fallow, and grass, was 345,788; under corn crops, 105,013; under green crops, 53,303; clover, sanfoin, and grasses under rotation, 100,451; permanent pasture and meadow land (exclusive of heath or mountain land), 84,823. Horses used for agriculture, &c., 14,328; cattle, 76,634; sheep, 675,081; pigs, 7741. The valued rent of P. for 1674 was equal to £28,330; for 1879—1880, £890,995—exclusive of £110,047 for railways and waterworks. The rate of assessment is: for prisons, 2*s*.; police, 6*s*. 2*d*.; lunacy, 5*s*.; sheriff court-houses, 2*s*.; bridge money, 1*s*.; contagious diseases, animals, 6*d*.; general, 9*d*.; and land valuation and voters, 7*d*. per £100.

The Old Red Sandstone, granite, and slate abound. In this county are situated some of the stateliest mansions in Scotland, but, except Scone Palace, none of them contain any historical memorials; and objects of antiquarian interest more recent than Roman roads and camps, are the Cathedrals of Dunblane and Dunkeld, and the Abbey of Culross. There are two royal burghs, Perth and Culross, besides which there are several villages of considerable size, where trade in flax, &c. is carried on to some extent. Pop. (1871) 127,768; (1881) 128,985.

PE'RTINAX, HELVIUS, Roman emperor, was born, according to Dio Cassius, at Alba-Pompeia, a Roman colony of Liguria, August 1, 126 A.D. He received a good education, and, entering the military service, rose through the various grades till he obtained the command of the first legion, at the head of which he signalized himself in Rhætia and Noricum against the native tribes. In 179, he was chosen consul, aided to repress the revolt of Avitus in Syria, and was governor successively of the provinces of Mœsia, Dacia, and Syria. Being sent by the Emperor Commodus to take the command of the turbulent legions in Britain, these troops, against his will, proclaimed him emperor; on which he solicited to be recalled, and was appointed proconsul of Africa, prefect of Rome, and consul (a second time) in 192.

On the death of Commodus, his assassins almost forced P. to accept of the purple, which with great hesitation he did; but, in spite of his promise of a large donation, he was unable to gain over the prætorian guard. His accession was, however, hailed with delight by the senate and people, who were rejoiced to have, as ruler, an able captain, instead of a ferocious debauchee; and P., encouraged by this favorable reception, announced his intention of carrying out an extensive series of reforms, having reference chiefly to the army, in which he hoped to re-establish the ancient Roman discipline. Unfortunately for his reforms and himself, he was attacked by a band of the rebellious prætorians, two months and twenty-seven days after his accession; and dis-

daining to flee, was slain, and his head carried about the streets of Rome in triumph. From his history, nothing can be gathered respecting his character and talents (except in military affairs); but the respect and esteem in which he was held by the senate and people of Rome, argue well in favor of his disposition.

PERTURBA'TIONS, in Physical Astronomy, are the disturbances produced in the simple elliptic motion of one heavenly body about another, by the action of a third body, or by the non-sphericity of the principal body. Thus, for instance, were there no bodies in space except the earth and moon, the moon would describe accurately an ellipse about the earth's center as focus, and its radius-vector would pass over equal areas in equal times; but only if both bodies be homogeneous and truly spherical, or have their constituent matter otherwise so arranged that they may attract each other as if each were collected at some definite point of its mass. The oblateness of the earth's figure, therefore, produces perturbations in what would otherwise be the fixed elliptic orbit of the moon. Again, when we consider the sun's action, it is obvious that in no position of the moon can the sun act equally upon both earth and moon; for at new moon, the moon is nearer to the sun than the earth is, and is therefore more attracted (in proportion to its mass) than the earth—that is, the *difference* of the sun's actions on the earth and moon is equivalent to a force tending to draw the moon away from the earth.

At full moon, on the other hand, the earth (in proportion to its mass) is more attracted than the moon is by the sun; and the perturbing influence of the sun is again of the nature of a force tending to separate the earth and moon. About the quarters, on the other hand, the sun's attraction (mass for mass) is nearly the same in amount on the earth and moon, but the *direction* of its action is not the same on the two bodies, and it is easy to see that in this case the perturbing force tends to bring the earth and moon nearer to each other. For any given position of the moon, with reference to the earth and sun, the *difference* of the accelerating effects of the sun on the earth and moon is a disturbing force; and it is to this that the perturbations of the moon's orbit, which are the most important, and amongst the most considerable, in the solar system, are due. [By the word *difference*, just employed, we are of course to understand, not the arithmetical difference, but the resultant of the sun's direct acceleration of the moon, combined with that on the earth reversed in direction and magnitude; as it is only with the *relative* motions of the earth and moon that we are concerned.] This disturbing force may be resolved into three components; for instance, we may have one in the line joining the earth and moon, another parallel to the plane of the ecliptic, and perpendicular to the moon's radius-vector, and the third perpendicular to the plane of the ecliptic. The first component, as we have already seen, tends to separate the earth and moon at new and full, and to bring them closer at the quarters; but during a whole revolution of the moon, the latter tendency is more than neutralized by the former; that is, in consequence of the sun's disturbing force, the moon is virtually less attracted by the earth than it would have been had the sun been absent. The second component mainly tends to accelerate the moon's motion in some parts of its orbit, and to retard it at others. The third component tends, on the whole, to draw the moon towards the plane of the ecliptic. We cannot, of course, enter here into even a complete sketch of the analysis of such a question as this; but we may give one or two very simple considerations which will, at all events, indicate the nature of the grand problem of perturbations.

The method, originally suggested by Newton, which is found on the whole to be the most satisfactory in these investigations, is what is called the *Variation of Parameters*, and admits of very simple explanation. The path which a disturbed body pursues is, of course, no longer an ellipse, nor is it in general either a plane curve or re-entrant. But *it may be considered to be an ellipse which is undergoing slow modifications in form, position, and dimensions, by the agency of the disturbing forces.* In fact, it is obvious that any small arc of the actual orbit is a portion of the elliptic orbit which the body would pursue for ever afterwards, if the disturbing forces were suddenly to cease as it moved in that arc. The *paramters*, then, are the elements of the orbit; that is, its major axis, eccentricity, longtitude of apse, longtitude of node, inclination to the ecliptic, and epoch; the latter quantity indicating the time at which the body passed through a particular point, as the apse, of its orbit. If these be given, the orbit is completely known, with the body's position in it at any given instant. If there be no disturbing forces, all these quantities are constant; and therefore, when the disturbing forces are taken into account, they change very slowly, as the disturbing forces are in most cases very small. To give an instance of the nature of their changes, let us roughly consider one or two simple cases. First, to find the nature of some of the effects of a disturbing force acting in the radius-vector, and tending to draw the disturbed, from the central, body. Let S be the focus, P the nearer apse, of the undisturbed elliptic orbit. When the moving body passes the point M, the tendency of the disturbing force is to make it describe the dotted curve in the figure—i. e., the new direction of motion will make with the line MS an angle more nearly equal to a right angle than before; and therefore the apse Q in the disturbed orbit will be sooner arrived at than P. would have been in the undisturbed orbit—that is, the apse *regredes*, or revolves in the contrary sense to that of M's motion. Similarly, the effect at M_1 is also to

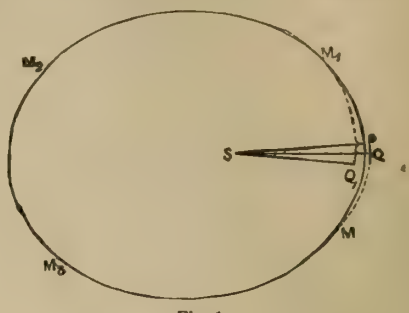


Fig. 1.

make the apse regrede to Q_1. At M_2 and M_3, on the other hand, the tendency is to make the apse progrede. Also, as the velocity is scarcely altered by such a force, the major axis remains unaltered. Thus at M the eccentricity is diminished, and at M_1 increased, since the apsidal distance is increased at M, and diminished at M_1.

Next, consider a tangential acclerating force. Here the immediate effect is to increase the velocity at any point of the orbit, and therefore to make it correspond to a larger orbit, and consequently, a longer periodic time. Conversely, a retarding force, such as the resistance of a medium, diminishes the velocity at each point, and thus makes the motion correspond to that in an ellipse with a less major axis, and therefore with a diminished periodic time. This singular result, that the periodic time of a body is *diminished* by resistance, is realized in the case of Encke's comet, and this observed effect furnishes one of the most convincing proofs of the existence of a resisting medium in interplanetary space.

Again, the effect of a disturbing force continually directed towards the plane of the ecliptic, is to make the node regrede. Thus, if N'N represent the ecliptic, NM a portion of the orbit, the tendency of the disturbing force at M is to make MQ the new orbit, and therefore N' the node. Thus the node regredes, and the inclination of the orbit to the ecliptic is diminished, when the planet has just passed the ascending node. In the second figure, let M_1 be a position of the planet near the descending node N_1. The effect of the dis-

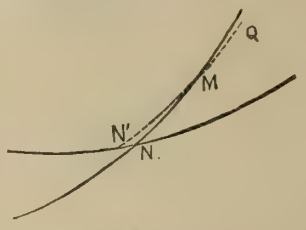


Fig. 2.

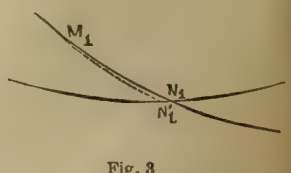


Fig. 3

turbing force is to alter the orbit to MN_1'. Thus, again, the node regredes, but the inclination is increased. If NN' and N_1N_1' in these figures represent the earth's equator, the above rough sketch applies exactly to the case of the moon as disturbed by the oblateness of the earth. The reaction of the moon on the earth gives rise to the Precession of the Equinoxes (q. v.).

By processes of this nature, Newton subjected the variation of the elements of the moon's orbit to calculation, and obtained the complete explanation of some of the most important of the lunar inequalities. See MOON. Others of them—for instance, the rate of progression of the apse—cannot be deduced with any accuracy by these rough investigations, but tax, in some cases, the utmost resources of analysis. Newton's calculation of the rate of the moon's apse was only about half the observed value; and Clairaut was on the point of publishing a pamphlet, in which a new form was suggested for the law of gravitation, in order to account for the deficiency of this estimate; when he found, by carrying his analysis further, that the expression sought is obtainable in the form of a slowly converging series, of which the second term is nearly as large as the first.

The error of the modern Lunar Tables, founded almost entirely on analysis, with the necessary introduction of a few data from observation, rarely amounts to a *second* of arc; and the moon's place is predicted four years beforehand, in the *Nautical Almanac*, with a degree of precision which no mere observer could attain even from one day to the next. This is the true proof, not only

of the law of gravitation, but of the Laws of Motion (q. v.), upon which, of course, the analytical investigation is based.

With respect to the mutual perturbations of the planets, we may merely mention that they are divisible into two classes, called *periodic* and *secular*. The former depend upon the configurations of the system—such, for instance, is the diminution of the inclination of the moon's orbit, after passing the ascending node on the earth's equator, already mentioned, or its increase as the moon comes to the descending node. The secular perturbations depend upon the period in which a complete series of such alternations have been gone through, and have, in the case of the planets, complete cycles measured by hundreds of years.

A very curious kind of perturbation is seen in the *indirect* action of the planets on the moon. There is a secular change of the eccentricity of the earth's orbit, due to planetary action, and this brings the sun, on the average, nearer to the earth and moon for a long period of years, then for an equal period takes it further off. One of the effects of the sun's disturbing force being, as we have seen, to diminish, on the whole, the moon's gravity towards the earth, this diminution will vary in the same period as the eccentricity of the earth's orbit; and therefore the moon's mean motion will be alternately accelerated and retarded, each process occupying an immense period.

With special reference to the planetary motions, we may notice that the major axis of each planetary orbit is free from all secular variations; and those affecting the inclination and eccentricity are confined within small limits, and ultimately compensate themselves. These facts, which have been clearly and beautifully demonstrated by Laplace and Lagrange, assure the stability of the planetary orbits, if we neglect the effects of resistance due to the interplanetary matter; which, however, must, in the long run, bring all the bodies of the system into collision with the sun, and finally stop the rotation of the sun itself.

Newton commenced the investigation of perturbations by considering those of the moon; Euler followed with a calculation of Saturn's inequalities; while Clairaut, D'Alembert, and others successively gave those of the other planets.

Every one knows that it was by observing the perturbations of Uranus, and thence discovering the direction of the disturbing force, that Adams and Leverrier were led to their great and simultaneous discovery of the planet Neptune.

PERU', an important maritime republic of South America, bounded on the N. by Ecuador, on the W. by the Pacific, on the S. and S.E. by Bolivia, and on the E. by Brazil. It lies in lat. 3° 25′—21° 30′ S., and in long. 68°—81° 20′ W. The general outline resembles a triangle, the base of which is formed by the boundary-line between P. and Ecuador on the north. Its area is above 500,000 sq. m.; and according to a census made in 1876, the population is 2,720,735, not including wild Indians. On the east side of the Andes, and between the Amazon and the Purus, there is a wide and unexplored expanse of country, upon which both P. and Brazil have claims, though the boundary is now generally regarded as marked by the Rio Javary. The country is 1100 miles in length, 780 miles in extreme breadth along the northern boundary, but is little more than 50 miles wide in the extreme south. Following the general direction, and not including windings, the coast-line is 1660 miles in length. The shores are in general rocky and steep; in the south, lofty cliffs rise from the sea, and, in some places, the water close inshore has a depth of from 70 to 80 fathoms.

Further north, however, sandy beaches occur, and in the extreme north, the shores are often low and sandy, and covered with brushwood. Owing to the comparative unfrequency of bays and inlets along the coast, the harbors are few and unimportant. Those of Callao (the port of Lima) and Payta afford the most secure anchorage, and the others are Trujillo, Cañeto, Pisco, Camaná, Islay, Ilo, Arica, and Inquique. Landing by boats is always dangerous, on account of the dreaded surf, occasioned by the swell of the Pacific, which perpetually beats upon the coast; and when goods or passengers require to be landed on unsheltered shores, recourse is had to the primitive *balsas*, or rafts, worked by the natives, and capable of carrying two or three persons.

Islands.—The islands on the Peruvian coast, although valuable, are extremely few in number, and small in extent. In the north, are the Lobos (i. e., *Seal*) Islands, forming a group of three, and so called from the seals which frequent them. The largest of them, Lobos de Tierra, is 5 miles long by 2 miles broad, and the others, lying 30 miles south-west, are much smaller. On their eastern sides, they are covered with guano, and the quantity on the whole group, when it began to be exported from them, was stated to be 4,000,000 tons. The islands or Macabi and Guañope, near the Lobos, were originally calculated to contain 2,280,000 tons of guano; but the guano exported has very greatly exceeded that amount, and in 1872, it was calculated that there were still 750,000 tons of guano on the former and 500,000 tons on the latter. The Chincha Islands, three in number, and the most famous of the whole, which began to supply Europe in 1841, had very little guano left on them in 1873. They are called the North, Middle, and South Islands respectively. Each presents, on the eastern side, a wall of precipitous rock, with a general slope towards the western shore. The cavities and inequalities of the surface used to be filled with guano, and this material covered the western slopes to within a few feet of the water's edge. There was no vegetation. The North Island has an area of 202 acres. It is formed of felspar and quartz, and is slowly but certainly decreasing in size. This island used to be wholly covered with thick layers of guano, which was quarried in some places to a depth of 80 feet. Hundreds of convicts were employed in cutting the guano and loading the vessels.

The Chincha Islands ceased to be worked for foreign export in 1872, and now guano is only taken for Peruvian use from the northern island, where there is still supposed to be 150,000 tons. In 1874, however, valuable new deposits of guano were discovered on the southern coast of Peru, which are estimated to contain about 8,000,000 tons.

The grand physical feature of the country, and the source of all its mineral wealth, is the great mountain system of the Andes. A general description of the formation and character of the Peruvian Andes is given under the article ANDES (q. v.).

Surface, Soil, and Climate.—The surface of P. is divided into three distinct and well-defined tracts or belts, the climates of which are of every variety from torrid heat to arctic cold, and the productions of which range from the stunted herbage of the high mountain-slopes, to the oranges and citrons, the sugar-canes and cottons, of the luxuriant tropical valleys. These three regions are the *Coast*, the *Sierra*, and the *Montaña*.—The *Coast* is a narrow strip of sandy desert between the base of the Western Cordillera and the sea, and extending along the whole length of the country. This tract, varying in breadth from 30 to 60 miles, slopes to the shore with an uneven surface, marked by arid ridges from the Cordillera, and with a rapid descent. It is for the most part a barren waste of sand, traversed, however, by numerous valleys of astonishing fertility, most of which are watered by streams that have their sources high on the slopes of the Cordillera. Many of the streams are dry during the greater part of the year. Between these valleys extend deserts, which are sometimes 90 miles in width. These are perfectly trackless, being covered with a fine, shifting, yellow sand, which is often carried about by the wind in pillars of from 80 to 100 feet in height.

In the coast-region, properly so called, rain is unknown. This is caused by the coast of P. being within the region of perpetual south-east trade-winds. These winds, charged with vapors from the Atlantic, strike upon the east coast of South America, and traverse that continent obliquely, distributing rains over Brazil. But their vapor is thoroughly condensed by the lofty Cordilleras, and their last particles of moisture are exhausted in powdering the summits of these ranges with snow, after which they fall down upon the coast of P., cool and dry. The want of rain, however, is compensated for to some extent by abundant and refreshing dews, which fall during the night. The climate of the coast is modified by the cool winds. In the valleys, the heat, though considerable, is not oppressive. The highest temperature observed at Lima in summer is 85°, the lowest in winter is 61° F.

The *Sierra* embraces all the mountainous region between the western base of the maritime Cordillera and the eastern base of the Andes, or the Eastern Cordillera. These ranges are, in this country, about 100 miles apart on an average, and have been estimated to cover an area of 200,000 square miles. Transverse branches connect the one range with the other, and high plateaux; fertile plains, and deep tropical valleys lie between the lofty outer barriers. The superiority in elevation alternates between the two principal ranges. The east range, or, as it is generally called, the Andes, has the superiority in height in the southern half of this mountain system. It abuts upon the plain, from the Bolivian frontier, in a majestic mass, surmounted by stupendous pinnacles, rugged in outline, and most frequently rising in splintered needle-like peaks, covered with snow. North of lat. 13° S., however, the Western Cordillera assumes the grander character, and preserves it until it crosses the northern frontier. The scenery of the Western Cordillera is broader and more massive in character, and its summits less pointed than those of the Andes.

Rugged paths, sometimes so narrow as barely to afford footing to the mules which are invariably used in such ascents, lead up its steep sides. Occasionally, from these narrow passes, gaping and apparently bottomless precipices slide perpendicularly downward from the very feet of the traveler, and the prospect is rendered still more hideous by the distant roar of a torrent, hidden by mists, at the bottom of the ravine. Occasionally, also, the mountain route leads over abysses 500 feet in depth, across which, by way of bridge, a few poles are thrown, which roll about in an uncomfortable manner under the feet. In traversing these dangerous passes, which line the huge rocks like aërial threads,

the traveler often comes upon scenery of the most picturesque and beautiful description. The clefts and sides of the hills, even at altitudes which might be called alpine, are clothed with wild-flowers, many of which, now long cultivated in Britain, have become highly prized among us as garden-plants. Verbenas, lupines, blue and scarlet salvias, fuchsias, calceolarias, and the fragrant heliotrope, add a sense of beauty to the sense of power which the stupendous scenery imparts. The following are the most striking and distinctive physical features of the Sierra, beginning from the south: 1. The plain of Titicaca, partly in P., and partly in Bolivia, is enclosed between the two main ridges of the Andes, and is said to have an area of 30,000 miles—greater than that of Ireland. In its center is the great Lake Titicaca, 12,846 feet above sea-level, or 1600 feet above the loftiest mountain pass (the Col of Mont Cervin) of Europe. The lake is 115 miles long, from 30 to 60 miles broad, from 70 to 180 feet deep, and 400 miles in circumference. Its shape is irregular; it contains many islands, and several peninsulas abut upon its waters. 2. The Knot of Cuzco. The mountain-chains which girdle the plain of Titicaca trend toward the northwest, and form what is called the Knot of Cuzco. The Knot comprises six minor mountain-chains, and has an area thrice larger than that of Switzerland. Here the valleys enjoy an Indian climate, and are rich in tropical productions; to the north and east of the Knot extend luxuriant tropical forests, while the numberless mountain-slopes are covered with waving crops of wheat, barley, and other cereals, and with potatoes; and higher up, extend pasture-lands where the vicuña, and alpaca feed.

3. The valley of the Apurimac, 30 miles in average breadth, and extending north-west for about 300 miles. This valley is the most populous region of Peru. 4. The Knot of Pasco. From Cuzco proceed two chains toward the north-west; they unite again in the Knot of Pasco. This Knot contains the table-land of Bombon, 12,300 feet above sea-level; as well as other table-lands at a height of 14,000 feet, the highest in the Andes; otherwise, however, the physical features of the country resemble those of the vicinity of Cuzco. 5. The vale of the river Marañon. This valley, which is upwards of 300 miles in length, is narrow, deep, and nearer the equator than any other valley of the Sierra, and consequently, it is the hottest portion of this region; and its vegetation is thoroughly tropical in character. The conformation of the surface of the Sierra is of the most wonderful description. After the table-lands of Tibet, those of the Peruvian Andes are the highest in the world; but, unlike those of Tibet, which are mere grassy uplands, the table-lands of P. are the seat of a comparatively high civilization, and are studded over with towns and villages, perched on heights exceeding in elevation the summits of the Jungfrau and the Wetterhorn. Nor are such towns the mere eyries of miners who are tempted to ascend thus high in search of the precious metals; for, even at this elevation, the climate is pleasant, and wheat, maize, barley, rye, and potatoes thrive well. The city of Cuzco, situated in a region of rare beauty, and enjoying a temperate climate, is 11,380 feet above sea-level, or 2000 feet higher than the Great St. Bernard. The climate of the Sierra, however, is not always so charming. In general terms, it may be described as mild and variable, with moderate rains. In the district of Paucartambo, rain falls 300 days in the year. A country, however, of such an uneven surface, of snow-covered peaks and tropical valleys, embraces every variety of climate.

In all the lower regions of the country the climate is warm, but healthy; in the uplands, and on the highest plateaux, it is often inclement. Violent storms beat upon the plain of Titicaca; and terrific tempests, accompanied by thunder and lightning, roll frequently around the table-lands of Pasco (q. v.); where, indeed, the climate is so cold, that but for the mines, which have attracted hither a numerous population, this region might have remained uninhabited. At the height of 9000 feet above sea-level, the mean temperature is 60° Fahr., and the variation throughout the year is not great. The highest peaks of the country reach to upwards of 22,000 feet, and many peaks in both ranges are from 17,000 to 20,000 feet high. In the Western Cordillera, and in the south of the country, are four volcanoes—Candarave, Ubinas, Omate, and Arequipa. The soil of the Sierra is of great variety; but wherever it is cultivated, it is productive.

The *Montaña*, forming two-thirds of the entire area of the country, stretches away for hundreds of leagues eastward from the Andes to the confines of Brazil. On the N., it is bounded by the Amazon, on the S. by Bolivia. It consists of vast impenetrable forests and alluvial plains, is rich in all the productions of tropical latitudes, is of inexhaustible fertility, and teems with animal and vegetable life. It is still, however, almost wholly unproductive to man. The silence of its central forests has never been disturbed by the civilized explorer, and its only human inhabitants are a few scattered tribes of Indians. The Montaña is watered by numberless streams, and by a large number of important rivers. It belongs wholly to the basin of the Amazon. Along the head-waters of the Purus, which, flowing through beautiful forest-covered plains, approaches to within 60 miles of Cuzco, there were at one time numerous Spanish farms, where great tracts of forests had been cleared, and where crops of coco, cocoa, sugar, and other tropical productions, were regularly raised. These farms have since 1861 been abandoned, and the encroaching forest has already obliterated their sites. The upper waters of the Purus are the headquarters of a savage and barbarously cruel tribe of wild Indians called Chunchos.

These untamable savages have shown the greatest hostility to the advance of civilization. They murdered the settlers, or drove them to take refuge in some less advanced settlement. When Mr. Markham visited this region in 1853, a few farms still existed; in a paper, however, which he communicated to the *Journal of the Royal Geographical Society*, and which is dated 1861, he further reported that the Chunchos have finished their barbarous work, for the settlers have either all been massacred or driven back from the forest, so that now not a single settlement remains. The rich valleys of Paucartambo, once covered with flourishing Spanish farms, have again become one vast tropical forest. The virgin soil of the Montaña is of amazing fertility; while its climate, though not oppressively hot, is healthy. The forests consist of huge trees, of which some are remarkable for the beauty of their wood, others for their valuable gums and resins, and others as timber trees. A rank undergrowth of vegetation covers the country, and the trees are often chained together and festooned with parasites and closely-matted creepers. In this region, for the most part undisturbed by the voice of man, civilized or savage, animal life flourishes in endless variety, and birds of the brightest plumage flit among the foliage. Among the products which are yielded here in spontaneous abundance, are the inestimable Peruvian bark (see CINCHONA), India-rubber, gum-copal, vanilla, indigo, copaiba, balsam, cinnamon, sarsaparilla, ipecacuanha, vegetable wax, &c. On the western fringe of the Montaña, where there are still a few settlements, tobacco, sugar, coffee, cotton, and chocolate, are cultivated with complete success.

Hydrography.—The hydrography of P. may be said to be divided into three systems—those of Lake Titicaca, the Pacific, and the Amazon. The streams that flow into Lake Titicaca are few and inconsiderable. The rivers which, having their sources in the Western Cordillera, flow west into the Pacific, are about 60 in number; but many of them are dry in summer, and even the more important are rapid and shallow, have a short course, are not navigable even for canoes, and are mainly used for the purpose of irrigation. All the great rivers of Peru are tributaries of the Amazon. The Marañon, rising between the Eastern and Western Cordilleras, and flowing tortuously to the north-north-west, is generally considered to be the head-water of the Amazon (q. v.). The Huallaga rises near the town of Huanuco, and flows northward to the Amazon. It is navigable for 600 miles, the head of its navigation (for canoes) being at Tingo Maria, within 100 miles of its source. The Yucayali, or Ucayali, an immense river, enters the Amazon 210 miles below the Huallaga. Its tributaries and upper-waters, among which are the Pampas and the Apurimac, drain the greater portion of the Peruvian Sierra. The Purus, which reaches to the valleys of Paucartambo, within 60 miles of Cuzco, has recently been explored. We know several of its sources, and that it enters the Amazon by four mouths, a little above Barra. It flows through what is perhaps the richest and most beautiful region of Peru. Many attempts have been made to explore this river, but none were successful till Mr. Chandless (1865—1866) explored it and its tributary, the Aguirey. Sailing down the Rio Negro, from Manoas to the Amazon, he reached the mouth of the Purus, and ascended it a distance of 1866 miles. He found that it flowed in a tortuous course through a rich alluvial plain, and that the few Indians on its upper course were still as primitive as is indicated by the use of only stone hatchets. He ascertained that the Rio Madre de Dios is not the head-water of the Purus. He then ascended the Aguirey, the principal affluent of the Purus, in the hope that it might afford communication with that south Peruvian river, but failed, owing to difficulties insuperable by him, to settle the question.

Productions, Exports and Imports, Revenue, &c.—The wealth and resources of P. consist, not in manufactures, but entirely in mineral, vegetable, and animal products. As no statistics are taken in the country, it is impossible to give the quantity and value of the productions, and of the exports and imports, even approximately. Of the precious metals, the production has greatly fallen off since P. became an independent state; and this country, which once stood in the same relation to Spain that Australia does to Great Britain, now contributes little to the metallic wealth of the world. The immense stores of gold and silver found here by the Spanish invaders represented the accumulation of centuries, and that among a people who used the precious metals only for the purposes of ornamentation. Nevertheless, P. possesses vast metallic riches. The Andes abound in mines of gold, silver, copper, lead, bismuth, &c.; and in the Montaña, gold is said to exist in abun-

dance in veins and in pools on the margins of rivers. The public revenue of P. is derived mainly from the sale of guano, and only to a small extent from customs. The total annual exports of P. are valued at about £7,500,000; and P. imports yearly about £1,000,000 worth of British goods. The actual revenue in 1875 was £6,263,320; the expenditure was £5,789,100. P. has a considerable public debt, divided into internal and external: the former, exclusive of a floating debt of unknown amount, is estimated at £2,500,000; the latter made up of sundry loans amounting to £49,010,000. The metric system of weights and measures was established by law in 1860, but has not yet come into general use. Besides the precious metals, P. possesses other most important mineral resources.

In addition to the guano, to which allusion has already been made, another important article of national wealth is nitrate of soda, which is found in immense quantities in the province of Tarapaca. This substance, which is a powerful fertilizer (see NITRE), is calculated to cover, in this province alone, an area of 50 square leagues, and the quantity has been estimated at 63,000,000 tons. Here also great quantities of borax are found. The working of this valuable substance, however, is interdicted by government, which has made a monopoly of it, as it has of the guano; but such small parcels of it as have been exported bring about £30 per ton in the English market. In 1878 there were in P. 1200 miles of railway completed, and several hundreds in course of construction, including a line across the summit of the Cordillera de los Andes, and presenting engineering difficulties even more extraordinary than those overcome in the Mont Cenis Tunnel.

The vegetable productions of P. are of every variety, embracing all the products both of temperate and tropical climes. The European cereals and vegetables are grown with perfect success, together with maize, rice, pumpkins, tobacco, coffee, sugar-cane, cotton, &c. Fruits of the most delicious flavor are grown in endless variety. Cotton, for which the soil and climate of P. are admirably adapted, is now produced here in gradually increasing quantity. The land suited to the cultivation of this plant is of immense extent, and the quality of the cotton grown is excellent. The animals comprise those of Europe, together with the Llama (q. v.) and its allied species. Although P. produces so much excellent wool, almost the whole of the woollen fabrics used as clothing by the Indians are manufactured in Yorkshire, England.

Ancient Civilization and History.—P., the origin of whose name is unknown, is now passing through its third historical era, and is manifesting its third phase of civilization. The present era may be said to date from the conquest of the country by the Spaniards in the early part of the 16th c.; the middle era embraces the rule of the Incas; and the earliest era, about which exceedingly little is known, is that Pre-Incarial period, of unknown duration, during which a nation or nations living in large cities, flourished in the country, and had a civilization, a language, and a religion different, and perhaps in some cases even more advanced than those of the Incas who succeeded them, and overran their territories. Whence these Pre-Incarial nations came, and to what branch of the human family they belonged, still remain unanswered questions. Their existence, however, is clearly attested by the architectural remains, sculptures, carvings, &c., which they have left behind them. Ruins of edifices constructed both before the advent of the Incas, and contemporary with, and independently of, them, are found everywhere throughout the country. On the shores of Lake Titicaca, for example, are the ruins of Tia-Huanacu, consisting of sculptured monolithic doorways, one of which is 10 feet high, and 13 feet wide; of pillars, 21 feet high, placed in lines at regular distances; and of immense masses of hewn stone, some 38 feet long by 18 broad. In 1846, several colossal idols were excavated, some being 30 feet long, 18 wide, and 6 thick. The idols are in the form of statues, and the ears are not enlarged by the insertion in the lobes of silver rings, as those of sculptured figures executed in Incarial times invariably are. The ancient fragments of buildings on these shores were beheld with astonishment by the earliest of the Incas, who, by their own confession, accepted them as models for their own architecture.

The name Tia-Huanacu is comparatively modern, having been conferred by one of the Incas; neither history nor tradition has handed down the original name. The ruins stand at a height of 12,930 feet above sea-level, and one of the many mysteries which have crowded around this ancient site is, that this spot, in the midst of what is now generally a frozen desert, and where the rarity of the air must be so great as to be hurtful, should have been chosen as the seat, as it is generally believed to have been, of an ancient government. Of the character and degree of the civilization of the Pre-Incarial races, almost nothing is known. It is worthy of note, however, that at Pachacamac, 25 miles south of Lima, where there are the remains of a now wholly deserted city, and of a great temple, the religion seems to have been a pure Theism; for when the Peruvians of Cuzco carried their victorious arms across the Cordilleras to this district, they beheld this temple (the doors of which are said to have been of gold inlaid with precious stones) with astonishment, not only because it rivalled if not surpassed in splendor the famous Temple of the Sun at Cuzco, but because it contained no image or visible symbol of a god. It was raised in honor of an invisible and mysterious deity, whom the inhabitants called Pachacamac, the Creator of the World (from two words of the ancient Peruvian language, *Pacha*, the earth; and *Camac*, participle of the verb *Camani*, to create). The Peruvians did not dare to destroy this temple, but contented themselves with building by its side a Temple of the Sun, to the worship of which they gradually won over the inhabitants.—See Bollaert's *South America* (1860); Squier's *Peru* (1876); Markham's *Peru* (1880); Gallenga's *South America* (1880); Reiss and Stübel, *Peruvian Antiquities* (1881).

Regarding the origin of the Incas, nothing definite can be said. We have no authorities on the subject save the traditions of the Indians, and these, besides being outrageously fabulous in character, are also conflicting. It appears, however, from all the traditions, that Manco, the first Inca, first appeared on the shores of Lake Titicaca, with his wife Mama Ocllo. He announced that he and his wife were children of the Sun, and were sent by the glorious Inti (the Sun) to instruct the simple tribes. He is said to have carried with him a golden wedge, or, as it is sometimes called, a wand. Wherever this wedge, on being struck upon the ground, should sink into the earth, and disappear for ever, there it was decreed Manco should build his capital. Marching northward, he came to the plain of Cuzco, where the wedge disappeared. Here he founded the city of Cuzco, became the first Inca (a name said to be derived from the Peruvian word for the Sun), and founded the Peruvian race, properly so called. Manco, or Manco Capac (i. e., Manco the Ruler), instructed the men in agriculture and the arts, gave them a comparatively pure religion, and a social and national organization; while his wife, Mama Ocllo, who is also represented as being his sister, taught the women to sew, to spin, and to weave. Thus. the Inca was not only ruler of his people, but also the father and the high-priest. The territory held by Manco Capac was small, extending about 90 miles from east to west, and about 80 miles from north to south. After introducing laws among his people, and bringing them into regularly organized communities, 'he ascended to his father, the Sun.' The year generally assigned as that of his death, after a reign, of forty years, is 1062 A.D. The progress of the Peruvians was at first so slow as to be almost imperceptible.

Gradually, however, by their wise and temperate policy, they won over the neighboring tribes, who readily appreciated the benefits of a powerful and fostering government. Little is clearly ascertained regarding the early history of the Peruvian kingdom, and the lists given of its early sovereigns are by no means to be trusted. They invented no alphabet, and therefore could keep no written record of their affairs, so that almost all we can know of their early history is derived from the traditions of the people, collected by the early Spaniards. Memoranda were indeed kept by the Peruvians, and, it is said, even full historical records, by means of the *quipu*, a twisted woollen cord, upon which other smaller cords of different colors were tied. Of these cross threads, the color, the length, the number of knots upon them, and the distance of one from another, all had their significance; but after the invasion of the Spaniards, when the whole Peruvian system of government and civilization underwent dislocation, the art of reading the quipus, seems either to have been lost, or was effectually concealed. Thus it is that we have no exact knowledge of Peruvian history further back than about one century before the coming of the Spaniards. In 1453, Tupac Inca Yupanqui, the eleventh Inca, according to the list given by Garcilasso de la Vega, greatly enlarged his already wide-spread dominions. He led his armies southward, crossed into Chili, marched over the terrible desert of Atacama, and penetrating as far south as the river Maule (lat. 36° S.), fixed there the southern boundary of Peru. Returning, he crossed the Chilian Andes by a pass of unequalled danger and difficulty, and at length regained his capital, which he entered in triumph. While thus engaged, his son, the young Huayna Capac, heir to the fame as well as the throne of his father, had marched northward to the Amazon, crossed that barrier, and conquered the kingdom of Quito.

In 1475, Huayna Capac ascended the throne, and under him the empire of the Incas attained to its greatest extent, and the height of its glory. His sway extended from the equatorial valleys of the Amazon to the temperate plains of Chili, and from the sandy shores of the Pacific to the marshy sources of the Paraguay. Of this immense territory, Cuzco, as its name implies (the word signifies navel), was the great center; great roads branched off from it to the north, south, east, and west, and ramified through every part of the kingdom. The greatest highway of the country was that which led from Quito through Cuzco into the Chilian dominions. In its construction, galleries were cut for leagues through the living rock; rivers were crossed by bridges of plaited osiers,

that swung in the air; precipices were ascended by staircases artificially cut, and valleys were filled up with solid masonry. It was from 1500 to 2000 miles long, was about 20 feet broad, and was built of heavy flags of freestone. Upon all the great routes were posts or small buildings, about five miles apart, attached to which were a number of runners, whose business it was to carry forward the dispatches of government. By means of these messengers, fresh fish caught on one day at Lurin, on the Pacific, is said to have been eaten the next day at Cuzco. The distance between these places is 300 miles, and the road traverses the wildest and most mountainous country in the world. Order and civilization accompanied conquest among the Peruvians, and each tribe that was vanquished found itself under a careful paternal government, which provided for it, and fostered it in every way.

The government of P. was a pure but a mild despotism. The Inca, as the representative of the Sun, was the head of the priesthood, and presided at the great religious festivals. He imposed taxes, made laws, and was the source of all dignity and power. He wore a peculiar head-dress, of which the tasselled fringe, with two feathers placed upright in it, were the proper insignia of royalty. Of the nobility, all those descended by the male line from the founder of the monarchy, shared, in common with the ruling monarch, the sacred name of Inca. They wore a peculiar dress, enjoyed special privileges, and lived at court; but none of them could enter the presence of the Inca except with bare feet, and bearing a burden on the shoulders, in token of allegiance and homage. They formed, however, the real strength of the empire, and, being superior to the other races in intellectual power, they were the fountain whence flowed that civilization and social organization which gave P. a position above every other state of South America. Prior to the arrival of the Spaniards, P. contained a population of 30,000,000—twelve times greater than it is at the present day. The empire was divided into four parts, into each of which one of the great roads branched from Cuzco. Each of the four provinces was administered by a viceroy or governor. The nation was further subdivided into departments of 10,000 inhabitants, each also administered by a governor; and there were other subdivisions into various numbers, the lowest of which was ten, and every one of which was ruled by head-men, who were responsible for offenders, and were required to see that those under them enjoyed the rights to which they were entitled. The governors and chief rulers were selected from the Inca aristocracy. The laws related almost wholly to criminal matters, and were few, and remarkably severe. Theft, adultery, murder, blasphemy against the Sun, and burning of bridges, were all capital crimes. The territory of the empire was divided into three portions, and from these portions were derived the revenue that supported the *Sun*, the *Inca*, and the *people* respectively.

The numerous priesthood, and the costly cermonial of the national worship, were supported by the first; the royal household and the government expenditure were defrayed out of the second; and the people, at so much per head, divided the third of these portions. There was a new division of the soil every year, and the extent of land apportioned to each householder was regulated by the numbers in his family. It might be supposed that this arrangement would be fatal to improvement of the soil, and to the pride in and love of home; but this was not the case; and it is probable that at each partition of the soil, the tenant was, as a rule, confirmed in his occupation. The three divisions were cultivated by the people, the territory apportioned to the Sun being attended to first, that belonging to the people themselves next, and lastly, the division belonging to the Inca. The labor on the Inca's share of the land was engaged in by the whole population at the same time, and the work was lightened by the national songs and ballads, and the scene made picturesque by the holiday attire of the workers. The manufactures of the country were managed in the same way, the people laboring first in making clothes for themselves, and afterwards giving their work to the Inca. The mines were worked by the people, but no one gave more than a certain amount of time to the government service (during which time he was maintained at the government expense), and after discharging the stipulated amount of duty, he was succeeded by another. Money was unknown among the Peruvians. They were a nation of workers, but they wrought as the members of one family, labor being enforced on all for the benefit of all.

The national policy of the Peruvians had its imperfections and drawbacks, and though capable of unlimited extension, it was not capable of advancement. It was in the last degree conservative, and was of such a nature that the introduction of reform in any vital particular must have overturned the whole constitution. Nevertheless, the wants of the people were few, and these were satisfied. Their labor was not more than they could easily perform, and it was pleasantly diversified with frequent holidays and festivals. They lived contentedly and securely under a government strong enough to protect them; and a sufficiency of the necessaries of life was obtained by every individual. Still, in the valleys of the Cordilleras and on the plain of Cuzco, may be heard numberless songs, in which the Peruvian mourns the happy days of peace, security, and comfort, enjoyed by his ancestors. Further, they revered and loved their monarch, and considered it a pleasure to serve him. With subjects of such a temper and inclination, the Incas might direct the entire energies of the nation as they chose; and it is thus that they were able to construct those gigantic public works which would have been wonderful even had they been performed with the assistance of European machinery and appliances.

The Peruvian system of agriculture was brought to its highest perfection only by the prodigious labor of several centuries. Not only was the fertile soil cultivated with the utmost care, but the sandy wastes of the coast, unvisited by any rains, and but scantily watered by brooks, were rendered productive by means of an artificial system of irrigation, the most stupendous, perhaps, that the world has ever seen. Water was collected in lakes among the mountains, led down the slopes and through the sands of the coast, apparently doomed to sterility, by canals and subterranean passages constructed on a vast scale, and the ruins of which, to be seen at the present day, attest the industry, ingenuity, and admirable patience of the Peruvians.

The aqueducts, which were sometimes between 400 and 500 miles in length, were in some cases tunnelled through massive rocks, and carried across rivers and marshes. They were constructed of large slabs of freestone, fitting so closely as to require no cement, and answering perfectly the purpose for which they were intended, for the sandy wastes were converted into productive fields and rich pasture-lands, and the coast teemed with industrious inhabitants. In the valley of Santa, there were once 700,000 inhabitants; there are now only 12,000: in that of Anculama, there were 30,000 individuals; there are now only 425. The fields on the coast were also enriched with the manure of seafowls, which has since come to be known as guano. Fragments of the aqueducts still remain, and are surveyed with astonishment by the traveler, who wonders that such works could have been constructed by a people who appear to have employed no machinery, had no beasts of burden, who did not know the secret of the true arch, and who did not use tools or instruments of iron. But the triumphs of industry were not more decided on the coast than they were in the *Sierra*. Here, at elevations visited now only by the eagle and the condor, the rocky heights, riven by innumerable chasms and deeply-cut precipices, were crowned with waving crops of wheat and maize. Where the mountain-slopes were too steep to admit of cultivation, terraces were cut, soil was accumulated on them, and the level surfaces converted into a species of hanging-gardens. Large flocks of lamas were grazed on the plateaux; while the more hardy vicuñas and alpacas roamed the upper heights in freedom, to be driven together, however, at stated periods, to be shorn or killed. The wool yielded by these animals, and the cotton grown in the plains and valleys, were woven into fabrics equally remarkable for fineness of texture and brilliancy of color.

The character of the architecture of the Peruvians has already been alluded to. The edifices of Incarial times are oblong in shape and cyclopean in construction. The materials used were granite, porphyry, and other varieties of stone; but in the more rainless regions, sun-dried bricks were also much used. The walls were most frequently built of stones of irregular size, but cut with such accuracy, and fitting into each other so closely at the sides, that neither knife nor needle can be inserted in the seams. Though the buildings were not, as a rule, more than from 12 to 14 feet high, they were characterized by simplicity, symmetry, and solidity. The Peruvian architects did not indulge much in external decoration; but the interior of all the great edifices was extremely rich in ornament. In the royal palaces and temples, the most ordinary utensils were of silver and gold; the walls were thickly studded with plates and bosses of the same metals; and exquisite imitations of human and other figures, and also of plants, fashioned with perfect accuracy in gold and silver, were always seen in the houses of the great. Hidden among the metallic foliage, or creeping among the roots, were many brilliantly-colored birds, serpents, lizards, &c., made chiefly of precious stones; while in the gardens, interspersed among the natural plants and flowers, were imitations of them, in gold and silver, of such truth and beauty as to rival nature. The Temple of the Sun at Cuzco, called *Coricancha*, or 'Place of Gold,' was the most magnificent edifice in the empire. On the western wall, and opposite the eastern portal, was a splendid representation of the Sun, the god of the nation. It consisted of a human face in gold, with innumerable golden rays emanating from it in every direction; and when the early beams of the morning sun fell upon this brilliant golden disc, they were reflected from it as from a mirror, and again reflected throughout the whole temple by the numberless plates, cornices, bands, and images of gold, until the temple seemed to glow with a sunshine more intense than that of nature.

The religion of the Peruvians, in the later ages of the empire, was far in advance of that of most barbarous nations. They believed in a Great Spirit, the Creator of the universe, who, being a spirit, could not be represented by any image or symbol, nor be made to dwell in a temple made with hands. They also believed in the existence of the soul hereafter, and in the resurrection of the body. The after-life, they considered to be a condition of ease and tranquillity for the good, and of continual wearisome labor, extending over ages, for the wicked. But while they believed in the Creator of the world, they also believed in other deities, who were of some subordinate rank to the Great Spirit. Of these secondary gods, the Sun was the chief. They reverenced the Sun as the source of their royal dynasty; and everywhere throughout the land, altars smoked with offerings burned in his worship.

About the year 1516, and ten years before the death of Huayna Capac, the first white man had landed on the western shores of South America; but it was not till the year 1532, that Pizarro (q. v.) at the head of a small band of Spanish adventurers, actually invaded Peru. On his death-bed, the great Inca expressed a wish that the kingdom of Quito should pass to Atahualpa, one of his sons by a princess of Quito whom he had received among his concubines, and that all his other territories should fall to his son Huascar, the heir to the crown, and who, according to the custom of the Incas, should have inherited all his dependencies. Between these two princes, quarrels, resulting in war, arose; and when Pizarro entered P., he found the country occupied by two rival factions, a circumstance of which he took full advantage. Atahualpa had completely defeated the forces of his brother, had taken Huascar prisoner, and was now stationed at Caxamalca, on the eastern side of the Andes, whither, with a force of 177 men, of whom 27 were cavalry, the dauntless Spanish leader, in September 1532, set out to meet him. For the capture of Atahaulpa by the Spaniards, his suqsequent life and violent death, see article ATAHUALPA.

Shortly after the execution of the Inca at Caxamalca, the adventurers set out for Cuzco. Their strength had been recently increased by reinforcements, and they now numbered nearly 500 men, of whom about a third were cavalry. They entered the Peruvian capital, 15th November 1533, having in the course of their progress toward the city of the Incas, had many sharp, and sometimes serious encounters with the Indians, in all of which, however, their armor, artillery, and cavalry gave them the advantage. At Cuzco they obtained a vast amount of gold, the one object for which the conquest of P. was undertaken. As at Caxamalca, the articles of gold were for the most part melted down into ingots, and divided among the band. Their sudden wealth, however, did many of them little good, as it afforded them the means of gambling, and many of them, rich at night, found themselves again penniless adventurers in the morning. One cavalier having obtained the splendid golden image of the Sun as his share of the booty, lost it in play in a single night. After stripping the palaces and temples of their treasures, Pizarro placed Manco, a son of the great Huayna Capac, on the throne of the Incas. Leaving a garrison in the capital, he then marched west to the sea-coast, with the intention of building a town, from which he could the more easily repel invasion from without, and which should be the future capital of the kingdom.

Choosing the banks of the river Rimac, he founded, about six miles from its mouth, the *Ciudad de los Reyes*, 'City of the Kings.' Subsequently, its name was changed into Lima, the modified form of the name of the river on which it was placed. But the progress of a higher civilization thus begun, was interrupted by an event which overturned the plans of the general, and entailed the severest sufferings on many of his followers. The Inca Manco, insulted on every hand, and in the most contemptuous manner, by the proud Castilian soldiers, effected his escape, and headed a formidable rising of the natives. Gathering round Cuzco in immense numbers, the natives laid siege to the city, and set it on fire. An Indian force also invested Xauxa, and another detachment threatened Lima. The siege of Cuzco was maintained for five months, after which time the Peruvians were commanded by their Inca to retire to their farms, and cultivate the soil, that the country might be saved from famine. The advantages, many, though unimportant, which the Inca gained in the course of this siege, were his last triumphs. He afterwards retired to the mountains, where he was massacred by a party of Spaniards. More formidable, however, to Pizarro than any rising of the natives, was the quarrel between himself and Almagro, a soldier of generous disposition, but of fiery temper, who, after Pizarro, held the highest rank among the conquerors. For the insurrection, trial, and execution of this chief, see article ALMAGRO. The condition of the country was now in every sense deplorable. The natives, astonished not more by the appearance of cavalry than by the flash, the sound, and the deadly execution of artillery, had succumbed to forces which they had no means of successfully encountering.

Meantime, the Almagro faction had not died out with the death of its leader, and they still cherished schemes of vengeance against the Pizarros. It was resolved to assassinate the General as he returned from mass on Sunday, 26th June 1541. Hearing of the conspiracy, but attaching little importance to the information, Pizarro nevertheless deemed it prudent not to go to mass that day. His house was assaulted by the conspirators, who, murdering his servants, broke in upon the great leader, overwhelmed him by numbers, and killed him (see PIZARRO). The son of Almagro then proclaimed himself governor, but was soon defeated in battle, and put to death. In 1542, a council was called at Valladolid, at the instigation of the ecclesiastic Las Casas, who felt shocked and humiliated at the excesses committed on the natives. The result of this council was, that a code of laws was framed for P., according to one clause of which, the Indians who had been enslaved by the Spaniards were virtually declared free men. It was also enacted that the Indians were not to be forced to labor in unhealthy localities, and that in whatever cases they were desired to work in any particular locality, they were to be fairly paid. These and similar clauses enraged the adventurers. Blasco Nuñez Vela, sent from Spain to enforce the new laws, rendered himself unpopular, and was seized, and thrown into prison. He had come from Spain, accompanied by an 'audience' of four, who now undertook the government. Gonzalo Pizarro (the last in this country of the family of that name), who had been elected captain-general of P., now marched threateningly upon Lima. He was too powerful to withstand, and the audience received him in a friendly manner, and after the administration of oaths, elected him governor as well as captain-general of the country. The career of this adventurer was cut short by Pedro de la Gasca, who, invested with the powers of the sovereign, arrived from Spain, collected a large army, and pursued Pizarro, who was eventually taken and executed.

A series of petty quarrels, and the tiresome story of the substitution of one ruling functionary for another, make up a great part of the subsequent history. The country became one of the four viceroyalties of Spanish America, and the Spanish authority was fully established and administered by successive viceroys. The province of Quito was separated from P. in 1718; and in 1788, considerable territories in the south were detached, and formed into the government of Buenos Ayres. At the outbreak of the War of Independence in South America, the Spanish government, besides having much declined in internal strength, was distracted with the dissensions of a regency, and torn by a civil war; nevertheless, in 1820, the Spanish viceroy had an army of 23,000 men in Peru, and all the large towns were completely in the hands of Spanish officials. P. was the last of the Spanish South American possessions to set up the standard of independence. In August 1820, a rebel army, under General San Martin, one of the liberators of Chili, sailed for P., and after a number of successes both on sea and land, in which the patriots were most effectively assisted by English volunteers, the independence of the country was proclaimed 28th July 1821, and San Martin assumed the protectorate of the young republic. From this date to the year 1860, 21 rulers, under various titles, have held sway. For the first 24 years of its existence as an independent republic, the country was distracted and devastated by wars and revolutions. In 1845, Don Ramon Castilla was elected president; and under his firm and sagacious guidance, the country enjoyed an unwonted measure of peace, and became regularly organized. Commerce began to be developed, and important public works were undertaken. The term of his presidency ended in 1851, in which year General Rufino José Echenique was elected president. The country, however, was discontented, and Castilla again found himself, in 1855, at the head of affairs.

Slavery, which, although abolished by the charter of independence, still existed, was put an end to by a decree dated October 1854. In August 1863, a quarrel had taken place at the estate of Talambo, in the north, between some Basque emigrants and the natives, in which several of the disputants were killed or wounded. Taking advantage of this occurrence, the Spanish government sent out a 'special commissioner' in the spring of 1864, to complain of injuries sustained by Spaniards. The 'commissioner' left Lima on the 12th April, and on the 14th, a Spanish squadron, under Admiral Pinzon, took forcible possession of the Chincha Islands. The European consuls protested loudly against this outrage, and the Peruvians were greatly excited. War was, however, averted, President Pezet being unwilling to risk hostilities with Spain; and, in January 1865, a treaty of peace was signed. This did not lead, however, to internal peace. The president was declared a traitor by the Assembly in the same month that saw the treaty of peace ratified in the Spanish capital. General Canesco, after a severe struggle, assumed the presidential authority, and retained it till November, when Colonel Prado was nominated temporary dictator. The obnoxious treaty was now rejected, and P. entered, January 1866, into a treaty, offensive and defensive, with Chili (q. v.), which country was then at war with Spain;

but this led to no serious consequences to P., an unsuccessful attack on Callao having vindicated Spanish honor. In October, General Prado was regularly elected president, and, in February 1867, he recommended a new constitution, according to which there is a senate of 44 members and a house of 110 representatives. Prado had to resign in 1868; his successor, Balta, was assassinated in 1872; Pardo, who was president till 1876, was succeeded by Prado. Under Pardo the country had been peaceful and prosperous, and education had been greatly extended. In 1879 P., as the ally of Bolivia, became involved in war with Chili. The war was carried on desultorily in 1879 and 1880: Arica was besieged and taken; the most powerful Peruvian iron-clads were sunk or captured; finally, in 1881, Callao and Lima were taken and occupied by the Chilians. The victors imposed severe terms upon the vanquished; and this and the anarchical condition in which P. was left, long postponed the settlement of a definitive peace.

PERU'GIA, a city of Central Italy, capital of the province of its own name, stands on a lofty elevation, 800 feet high, on the right bank of the Tiber, ten miles east of the lake of Perugia (ancient *Lacus Trasimenus*), and 84 miles north of Rome. It is surrounded with walls pierced with numerous gates, of which the *Arch of Augustus* (so called from the inscription *Augusta Perusia* over it, inscribed by Augustus) is the finest. It is the see of a bishop, and contains upwards of 45 churches, and many monastic establishments. Its streets are wide, and there are several squares lined with massive buildings. The broad Corso, which contains the finest edifices, unites two squares, one of which is occupied by the Duomo, or cathedral, dedicated to San Lorenzo, and dating from the end of the 15th century. It is in a fine bold Gothic style, and contains many excellent paintings, carvings, &c. Many of the churches and convents are noble Gothic structures, and all of them are more or less famous for their pictures, some of which are by Raphael, Perugino, and other great masters. In the vicinity of the city, a number of tombs, supposed to mark the site of the necropolis of ancient P., were discovered in 1840. The tombs contain numerous beautiful *cinerary urns*, in marble and travertine; and lamps, vases, bronze armor, ornaments, pateræ, &c., were also found, but have for the most part been removed to a neighboring villa. The university of P., founded in 1320, is not one of the 17 state universities, but is supported by the province. It has various museums, and a library of 80,000 vols., with some valuable manuscripts. The attendance is not numerous. Besides the picture-gallery of the Academy of Fine Arts, there are numerous private art-collections. P. contains also many interesting palaces, a beautiful fountain, an exchange, theaters, &c. Velvets, silk-stuffs, woollen goods, soap, brandy, and liqueurs are manufactured; and a considerable trade is carried on in corn, oil, wool, wine, and cattle. Pop. (1881) 17,395.

P., the ancient *Perusia*, was one of the twelve Etrurian republics. It became tributary to Rome 294 B.C. During the war between Mark Antony and Augustus, it was taken by the latter, and was burned down. It was captured by the Goths under Totila at the fall of the Western Empire. Under Pope Paul III., it was united to the Papal States. In 1860, it became a part of the Kingdom of Italy under Victor Emmanuel.

PERUGIA, LAKE OF. See TRASIMENUS LACUS.

PERUGINO, a celebrated Italian painter, whose real name was PIETRO VANNUCCI, was born at Citta della Pieve in Umbria, about 1446, but having afterwards established himself in the neighboring and more important city of Perugia, where he had the right of citizenship, he is commonly called Il Perugino. It is generally thought that he studied under Andrea Verocchio at Florence. He executed numerous excellent works in various cities, particularly in Florence, Siena, Pavia, Naples, Bologna, Rome, and Perugia. Sixtus IV. employed him in the Cappella Sistina; and his fresco of 'Christ giving the Keys to Peter' is by far the best of those painted on the side-walls of that chapel. He also, along with other contemporary painters, decorated the Stanze of the Vatican; and his works there are the only frescoes that were spared when Raphael was commissioned to substitute his works for those formerly painted on the walls and ceilings. The fact of his having had Raphael for his pupil, has no doubt in one way increased the reputation of P., but it has also in some degree tended to lessen it, as, in many of P.'s best productions, the work of Raphael is confidently pointed out by connoisseurs, and, indeed, many important pictures, at one time acknowledged as his, are now ascribed to his great pupil. His high standing as a painter, however, is established by many admirable works, in which no hand superior to his own could have operated; and, with the exception, perhaps, of Francia, who in some respects is esteemed his equal, he is now acknowledged as the ablest of the masters of that section of the early Italian school in which religious feeling is expressed with great tenderness, in pictures remarkable for delicate execution.

P.'s works are also distinguished by rich and warm coloring. An excellent example of this master's work may be studied in the collection of the National Gallery, London—'No. 288. The Virgin Adoring the Infant Christ.' P.'s reputation was high, when the introduction of the cinquecento style, by Leonardo and Michael Angelo, tended to throw into the shade the art of the earlier masters. Disputes ran high between the leaders of the old and new styles, and Michael Angelo is said to have spoken contemptuously of P.'s powers. This, of course, has biassed Vasari's opinion in his estimate of the opponent of his idol, but P.'s reputation now stands very high, and his works are greatly esteemed. Raphael was about twelve years of age when he was entered as a pupil with P., who was then (1495) engaged on the frescoes in the Sala del Cambia (the Exchange) at Perugia. P. died at Castello di Fontignano, near Perugia, in 1524.

PERU'VIAN ARCHITECTURE. Although the buildings of Peru were erected probably about the 12th c. A.D., they possess an extraordinary likeness to those of the Pelasgi in Europe. This resemblance in style must be accidental, arising probably from the circumstance, that both nations used bronze tools, and were unacquainted with iron. The Peruvian walls are built with large polygonal blocks of stone, exactly like what we call 'Cyclopean masonry.' The jambs of the doorways slope inwards, like those of Etruscan tombs, and have similar lintels. The walls of Cuzco are good examples of this style. It is further remarkable, that these walls are built with re-entering angles, like the fortifications which were adopted in Europe only after the invention of gunpowder.

PERUVIAN BARK. See CINCHONA. An important instance of commercial enterprise, directed to providing relief for human suffering, has been the introduction of cinchonas, or Peruvian Bark trees into British India. This had long been urged on the East India Company by Dr. Royle, but was not undertaken till after his death. The same thing had been attempted a year or two before by the Dutch in Java, on the urgent representations of the botanist Blume, but with very imperfect success, owing to their having procured chiefly plants of a species which produces bark of very inferior quality, and yields little quinine. But Mr. Markham, who was sent to South America by the East India Company to procure seeds and plants, was successful in introducing into British India, in the latter part of 1861, a number of the very best species, which were planted chiefly on the Neilgherry Hills, and partly also on the mountains of Ceylon and the Himalaya, and from these stations have been diffused throughout the Madras Presidency. There are now about 2,700,000 cinchona trees on the government plantations, and the harvest for 1875 amounted to 65,200 lbs., worth about £6700. The whole yield of the Madras Presidency is about double that, 204,000 lbs. having been brought into the London market in 1877–8. Thus an abundant supply of Peruvian bark, and consequently of quinine, has been secured at a moderate price, and yet with profit to the cultivator. In procuring the young trees and seeds which he conveyed to India, Mr. Markham experienced great difficulty from the jealousy of the South American governments, anxious to maintain a rigid monopoly in this precious commodity, and yet taking no effectual means to prevent the rapidly-extending waste of the trees in their native forests. Mr. Markham in all his travels saw only one Peruvian Bark tree which had been planted by the hand of man. (See Markham's *Travels in Peru and India*, 1862.)

PERUVIAN GOOSEBERRY. See PHYSALIS.

PE'RUWELS, a town of Belgium, in the province of Hainaut, with breweries, limekilns, and some linen manufactures. Pop. 8000.

PESA'RO (the ancient *Pisaurum*), a town of Central Italy, in the province of Pesaro and Urbino, on a rocky wooded hill, on the right bank of the Foglia, and one mile from the mouth of that river in the Adriatic—20 miles north-east of Urbino. Its streets are broad, and it is surrounded by walls and defended by a citadel. It is a bishop's seat, and contains a cathedral and other churches. The country in the vicinity is fruitful and beautiful; the figs of the district being esteemed the best in Italy. The port cannot now accommodate vessels of more than 70 tons burden; but is large enough to contain 200 vessels of light draught. Silks, pottery, glass, and leather are manufactured; and an active trade in silk, hemp, and woollen goods is carried on. Pop. 11,400.

PESCHIE'RA, a frontier town and fortress of the kingdom of Italy, and a member of the famous Quadrilateral (q. v.), stands partly on an island in the channel of the Mincio, and partly on the right bank of that river, at its outlet from the Lake of Garda. The town itself is a poor place of less than 2000 inhabitants. P. commands the right bank of the river, and in connection with it is the extensive work called the 'Salvi,' which covers the approaches of the river in that direction. During the French republican war, P. was a simple pentagon. Its fortifications, however, were greatly strengthened by the Austrians. It is defended by walls and by forts, lunettes, fosses, and a covered-way; and

the purpose which it is mainly intended to serve, besides that of forming an entrenched camp capable of accommodating a considerable number of troops, is to harass an army attempting to cross the Mincio by Goito or Valeggio. In the island portion of the town are extensive barracks, forming three sides of a square. P. is a station on the Milan and Venice Railway, and is also a station of the Austrian government steamers that ply on the Lake of Garda. P. was taken by the Piedmontese under King Charles Albert in 1848, and was again invested by them in June 1859, after the battle of Solferino. The conclusion of the treaty of Villafranca, however (July 11, 1859), relieved P. from a siege.

PESHAW'ER, or PESHAWUR, an important town, near the N.W. 'scientific' frontier of India, capital of a province of the same name, 18 miles east of the eastern extremity of Khyber Pass, and 150 miles E.S.E. of Cabul. It is defended by a bastioned wall, and commanded by a fort, the fear of which prevents internal disturbances. At the commencement of the present century, P. had 100,000 inhabitants. Under the stern rule of the Sikhs, however, its trade languished, and its splendid mosques, many of them in the richest style of oriental architecture, fell into decay. It is on the route from Hindustan to Cabul and Khorassan by the Khyber Pass, and is the seat of a British garrison, maintained here for the purpose of preserving the security of the route. Under British protection, the town has revived, trade has become more active, and the appearance of the suburbs and environs is improved. Pop. (1881) 79,982. The district of P., included in the Punjab, and formerly forming a portion of Afghanistan, is 1929 square miles in extent, and has 523,152 inhabitants. It is exceedingly fruitful. The *division* of P., which includes the district of P. and two others, has an area of 7767 miles, and a population of 1,035,785.

PESHI'TO, or rather PESHIT'TO (Syr., not, as generally supposed, 'simple,' 'faithful,' scil. Version, but the 'explained,' i. e., translated, Bible), is the name given to the authorized Syriac Version of the Old, and the greatest part of the New Testament. This version holds among the Syrian Christians the same place as the Vulgate in the Roman, and the 'Authorised Version' in the English Church. Many are the traditions about its origin. Thus, the translation of the Old Testament is supposed to date from the time of Solomon and Hiram; or to have been done by Asa, the priest; or, again, that it belongs to the time of the Apostle Thaddæus (Adæus), and Abgar, the king of Osrhœne, in the 1st c. after Christ. To the same period is also supposed to belong the translation of the New Testament, which is ascribed to Achæus, a disciple of Thaddæus, the first Edessian bishop and martyr. Recent investigation has not as yet come to any nearer result than to place the latter vaguely in the 2d, and the former in the 3d c., and to make Judaic-Christians the authors of both. Ephræm Syrus (q. v.), who wrote in the 4th c., certainly speaks of the P. as *Our* Version, and finds it already necessary to explain some of its terms, which had become obsolete. Five books of the New Testament (the Apocalypse and four of the Epistles) are wanting in all the MSS., having probably not yet formed part of the canon when the translation was made. The version of the Old Testament was made direct from the Hebrew, and by men imbued with the Palestinian mode of explanation. It is extremely faithful, and astonishingly free from any of those paraphrastic tendencies which pervade more or less all the Targums or Aramaic versions. Its renderings are mostly very happy, and coincide in many places with those of the Septuagint, a circumstance which has given rise to the erroneous supposition, that the latter itself had been drawn upon. Its use for the Old Testament is more of an exegetical, for the New Testament, more of a critical, nature. Anything like an edition of the P. worthy of its name, is still as much a desideratum as is a critical edition of the Septuagint or the Targums, and consequently investigators have as yet been unable to come to anything but very hazy conclusions respecting some very important questions connected with it.

The *edito princeps* of the New Testament part dates Vienna 1555, that of the Old Testament is contained in the Paris Polyglot of 1645. Several portions of the P. have been translated again into Arabic. The Syriac translation of those parts of the New Testament which are not to be found in the P., but are now incorporated into our Syriac Bibles, are of late and uncertain date.

PESTALOZZI, JOHANN-HEINRICH, was born at Zürich, 12th January 1745. His family belonged to the middle-class gentry. He was destined for the Christian ministry, but turned aside, however, from this profession, and betook himself to the study of law. To this pursuit he did not long remain constant. The perusal of Rousseau's *Emile*, and the unsatisfactory political condition in which he found Europe, united to disgust him with the artificial life of cities, and he accordingly removed to the country, to devote his life to farming. Purchasing some waste land (after he had acquired the necessary experience), he applied himself successfully to its cultivation, marrying about the same time the daughter of a wealthy merchant. His mind continuing to be afflicted by the contemplation of the unhappy condition of the masses of the people, he devoted himself, during the intervals of his work, to the consideration of the means best suited to promote their elevation. He was convinced that, by means of a sound education, a remedy might be found for the many evils by which he was surrounded, and by which society was infected.

To give effect to his theories, he converted his own house into an orphan asylum, and endeavored, by a judicious blending of industrial, intellectual, and moral training, to afford a specimen of sound education, and one so contrived as to be practicable as a national scheme. Meanwhile, the pursuit of his benevolent enterprises involved him, after the lapse of fifteen years (1775—1790), in bankruptcy. The failure of his plans, and the democratic tendency of his opinions, brought upon him a good deal of contempt and opposition. His only consolation was having saved from degradation and neglect upwards of 100 children, and having issued several volumes on education, containing the results of his experience, and his hopes for the future of the masses. Many subsequent attempts to found schools and to give a specimen of rational scholastic training, were made by P., with varying educational success, but with invariable pecuniary embarrassment. His writings, meanwhile, increased in number and importance. The great idea which lay at the basis of his method of intellectual instruction was, that nothing should be treated of except in a concrete way. *Objects themselves* became in his hands the subject of lessons tending to the development of the observing and reasoning powers—not lessons about objects. In arithmetic, he began with the concrete, and proceeded to the abstract; and into the teaching of writing, he for the first time introduced graduation. His special attention, however, was directed to the moral and religious *training* of children, as distinct from their mere *instruction;* and here, too, graduation and a regard to the nature and susceptibilities of children, were conspicuous features of his system. Almost all P.'s methods are now substantially adopted by the instructors of elementary teachers in the Normal Schools of Europe, and to no man perhaps has primary instruction been so largely indebted. He died in 1827 at Brugg, in the canton of Basel, overwhelmed with mortifications and disappointments.

PESTH, the most populous and important commercial city of Hungary, on the left bank of the Danube, opposite Buda (q. v.), and 171 miles east-south-east of Vienna by railway. It occupies a low and level site, and contrasts strongly with the antique, picturesque, and rock-built Buda, on the other side of the river. The two cities are connected by a magnificent suspension-bridge, erected in 1849, and which spans a water-way of about 1500 feet. The official name of the united cities is, since 1872, compounded of the two, in the form *Budapest*. Along the P. side of the river runs a wide quay, paved and terraced, and backed by a handsome row of buildings, 1½ mile long. The city consists of five divisions —the Inner, Leopold, Theresa, Joseph, and Francis towns. The Inner town, on the bank of the Danube, is the oldest, and the other divisions surround it in the form of a semicircle. P. is the seat of the chief judicial courts of Hungary. Its university, founded at Tyrnau, was transferred to Buda in 1780, and thence was removed hither in 1784. It is richly endowed, and is attended by upwards of 2000 students, while the professors and other teachers number 140. Attached to it are a museum, a botanic garden, an observatory, and a library containing over 100,000 volumes, with 1600 MSS. besides. A handsome new chemical laboratory was opened in 1872; and in the same year a decree was passed that a new military academy should be opened, of which the teaching staff counts 24. Of the chief buildings and institutions, the principal are the synagogue, a large and beautiful structure, completed in 1857; the New Buildings (*Neugebäude*)—an immense edifice, now used as barracks and as an artillery dépôt; the gymnasium; military school; academy of arts; national museum, with a library of 200,000 volumes, and valuable collections of coins, medals, and antiquities; veterinary school; the national and other theaters; and the Hungarian scientific society.

The town contains several important silk-spinning factories, and the principal articles of manufacture are silk, cotton, leather, jewelry, and musical instruments. The distilling of brandy, and the grinding of grain into meal and flour, are among the most important branches of industry. Four great fairs take place here annually, which draw together a concourse of more than 30,000 strangers, and at which exchanges, amounting in value to upwards of 32,000,000 florins, are made. The trade is chiefly in wines, raw hides, honey, wax, and an inferior spirit made from plums. After Vienna, P. has the greatest trade of any city on the Danube. Pop. of Budapest, (1880) 360,551.

P. is mentioned for the first time in the 12th c.; but although one of the oldest towns in Hungary, its importance dates only from the reigns of Maria Theresa and Joseph II. It was desolated by the Mongols in the 13th c., and after the battle of Mohacs (q. v.) it fell into the hands of the Turks, who held it till 1686. At the beginning of the 18th c., it was an inconsiderable town,

and has only risen to importance within the last 150 years. It has suffered much from inundations of the Danube on several occasions, on one of which, in 1838, 2280 houses were destroyed. In May 1849, while Görgei, with an army of 40,000 Hungarians, occupied the heights above Buda, and bombarded the fortress, which was held for the imperial government by General Hentzi, the latter general retaliated by bombarding P.; but on the night of the 20th May, the Hungarians stormed and took the fortress; and on the following morning, raised above its battlements the standard of revolt. On the field of Rákos, in the vicinity, where the great national assemblies of the Magyars used to be held, horse-races, on the English model, now take place annually.

PE'STILENCE. The terms Plague and Pestilence, corresponding to the Greek *Loimos* and the Latin *Pestis*, have, until recent times, been used indiscriminately to denote any diseases of an epidemic character which affected large masses of the community, and were remarkable for their fatality, such as the oriental plague, the sweating sickness, cholera, certain virulent forms of fever, &c. 'Thus,' says Dr. Craigie, in his learned work on *The Practice of Physic* (vol. i. p. 349), 'the term *Loimos* was applied by the Greeks to designate a species of epidemic remittent fever; and the plague of Athens described by Thucydides is manifestly an epidemic form of the same disease, which has been at all times in the summer season endemial on the coasts and islands of the Mediterranean and Archipelago. The instances of *Loimos*, so frequently mentioned by Dionysius of Halicarnassus, and of *Pestis*, so often mentioned by Livy and other Roman historians in the early history of Rome, are manifestly the remittent or remittent-continuous fever, which has been at all times the native product of that district, and which acquired, after inundations of the Tiber, or a certain train of weather, the characters of a very generally diffused, a very malignant, and a very mortal distemper. Numerous instances of a similar inaccurate mode of expression occur in designating the remittent fevers of the middle ages and of modern times; and we find, even in the early history of the colonization of the West Indian Islands and the United States, frequent examples of the term plague being applied to the remittent fever of these regions, and especially to epidemic attacks of yellow fever.' During the middle ages, we find the term *Pestis* applied to numerous disorders, such as syphilis, small-pox, erysipelas, epidemic sore throat, petechial fever, the sweating sickness, gangrenous pneumonia, ergotism, &c.

Several Hebrew words are translated *pestilence* or *plague*, in the authorized version of the Old Testament. Some of these pestilences were sent as special judgments, and are beyond the reach of inquiry; others have the characteristics of modern epidemics, in so far as their action was not unnaturally rapid, and they were general in their attacks. Sufficient data are not in our possession to enable us to identify with certainty any of these epidemics. It has been supposed by some critics that in some of these cases (as in Deuteronomy, xxviii. 27; Amos, iv. 10; and Zachariah, xiv. 18; and in the case of Hezekiah) the oriental plague is referred to; but Mr. Poole (Smith's *Dictionary of the Bible*, vol. ii. p. 883) is of opinion that there is not any distinct notice of this disease in the Bible.

PE'STO. See PAESTUM.

PE'TAL. See COROLLA.

PETA'RD, an instrument for blowing open gates, demolishing palisades, &c. It consists of a half-cone of thick iron filled with powder and ball; this is firmly fastened to a plank, and the latter is provided with hooks, to allow of its being attached securely to a gate, &e. The engineers attached the petard, lighted the slow-match by which it was to be fired, and fled. When the explosion took effect, a supporting column charged through the breach, while the defenders were yet in consternation. The petard has been almost universally superseded by the use of powder-bags. Large petards contained as much as 13 lbs. of powder.

PE'TCHARY, the popular name of a number of species of the genus *Tyrannus*, sometimes ranked with the Shrikes (*Laniadæ*), and sometimes with the Fly-catchers (*Muscicapidæ*). The name seems to be derived from the cry of the GRAY P. (*T. Dominicensis*), a bird very common in the warm parts of America and in some of the islands of the West Indies, gregarious and migratory, spending the spring and summer in the islands, and retiring to the hottest parts of the mainland from the end of September to the beginning of January. Its cry is a kind of shriek, consisting of three or four shrill notes, incessantly repeated. The entire length of the Gray P. is about 9½ inches. It is a very bold and strong bird, and in defence of its young, will maintain the battle against any hawk. It feeds partly on insects, sometimes on humming-birds, and partly on berries. When fat, it is much esteemed for the table, and great numbers are shot on this account.—The COMMON P. (*T. caudifasciatus*) is one of the most common birds of the West Indies. At certain seasons of the year, when very fat, it is in great request for the table. This bird has been observed to play with a large beetle, as a cat does with a mouse, letting it drop, and catching it before it can reach the ground. It is a very bold bird, and does not scruple to attack a dog passing near its nest.

PETCHO'RA, a large river in the north of European Russia, rises on the western slope of the Ural Mountains, flows north through the eastern parts of the governments of Vologda and Archangel to about 66° 25′ N., then south-east for about 150 miles, and finally sweeping toward the north, and expanding into an estuary 30 miles wide and full of islands, falls into the Arctic Ocean, after a course of 940 miles. It is said to be navigable for large river-boats for upwards of 700 miles. The estuary, which is open from the middle of June till the middle of September, has a depth of from 20 to 30 feet. The country through which this river flows is still quite uncultivated; dense forests extend on both sides, and the character of the scenery is wild, sombre, and melancholy. The forests abound in larchwood, now largely used in the construction of iron-clad vessels. Within recent years, a colony has settled at the mouth of the P., for the purpose of felling, dressing, and exporting timber. See Seebohm's *Siberia in Europe* (1881).

PETE'CHIÆ. This term is given to spots of a dusky crimson or purple color, quite flat, with a well-defined margin, and unaffected by pressure, which closely resemble flea-bites. These spots result from a minute extravasation of blood beneath the cuticle. They occur most frequently on the back, at the bend of the elbow, and in the groin. They indicate an altered state of the blood, and are often symptoms of very serious diseases, as of typhus fever, plague, scurvy, &c. They likewise occur in very severe cases of small-pox, measles, and scarlet fever, when their presence must be regarded as indicative of extreme danger.

PETER, ST., apostle, named originally SIMON, was a native of Bethsaida, on the Lake of Gennesaret. His father was called Jonas; and the name by which P. is known in Christian history was given to him by our Lord, who changed his name of origin (Bar-Jona) into *Cephas*, a Syro-Chaldaic word, which means 'rock' or stone, and for which *Petra*, or, in the masculine form, *Petros*, is the Greek equivalent. He was a fisherman by occupation, and, together with his brother Andrew, was actually engaged in this occupation on the Sea of Galilee when our Lord called both to be his disciples, promising to 'make them fishers of men.' For this invitation they had been prepared by the preaching of John the Baptist, and they accepted it without hesitation. For the incidents recorded of P.'s life as a disciple, we must refer to the gospel narrative. These incidents all chiefly evince a warm and impulsive character, even down to the hour of weakness in which he denied his Master. It is plain from the gospel narrative that he was regarded by our Lord with special favor and affection, and the events which followed the ascension of our Lord fall in with this inference from that narrative. He was the first mover of the election of a new apostle in the room of Judas Iscariot; he was the spokesman of the rest on the day of Pentecost; he it was who answered to the charges when they were brought before the council; he is the chief actor in the tragic scene of the death of Ananias and Sapphira; he was the first to break down the wall of the prejudice of race by receiving a Gentile convert into the church; he was the first to propound in the council of Jerusalem the question to be discussed as to the obligation of the Mosaic observances.

The last incident of P.'s life supplied by the Scripture narrative is his presence in the council of Jerusalem, 49 A.D. Of his subsequent career, our only knowledge is derived from tradition. His special mission was to the Hebrew race, as Paul's to the Gentile; and he is supposed to have preached through Pontus, Galatia, Cappadocia, Asia, and Bithynia, chiefly to those of his own nation dispersed in these countries, all which are named in the address of the first of the two Epistles which he has left. Another tradition which, until the 16th c., met general acceptance, reports that he preached at Rome, that he took up his residence there as bishop, and that he there suffered martyrdom. This tradition is the main foundation of the Roman claim to supremacy in the church. It early encountered the opposition of the reformers; its first antagonist being a writer named Velerius, whose work was published in 1520, and who was followed by Flacius, Salamasius, and, above all, Spanheim. This view has found supporters in Baur and the Tübingen School; but the main current of scholarship, Protestant as well as Catholic—from Scaliger, Casaubon, Usher, Pearson, Cave, &c., down to Neander, Gieseler, Bertholdt, Olshausen, and others in our own country—has accepted the Roman tradition without hesitation. The time of his going to Rome has also been the subject of much discussion. By some, he is alleged not to have gone to Rome till the year 63, or, at all events, a short time before his martyrdom; others date his first visit as early as 42 or 43, without, however, supposing his residence after this date to have been continuous. In his first Epistle, it is implied that at the time of writing it he was at Babylon; and the name Babylon is by many critics held to be employed as a mystic designation of Rome, in accordance with a practice not

unusual with the Hebrews and other orientals; but there is nothing to fix very conclusively the date of this Epistle.

He is held by Roman Catholic writers to have fixed his see at Antioch before his coming to Rome; but of this supposed event also, the date is uncertain. His martyrdom is fixed in, with much probability, the year 66, and is supposed to have been at the same time and place with that of St. Paul. P. was sentenced to be crucified, and according to the tradition (preserved by Eusebius from Origen), prayed that he might be crucified with his head downwards, in order that his death might exceed in ignominy that of his Divine Master.

PETER, EPISTLES GENERAL OF, the name given to two Epistles contained in the canon of the New Testament. They are called *general*, because they are not addressed to particular churches or persons, like those of St. Paul; but (as in the case of the 1st Epistle) to all the Christians scattered throughout Asia Minor, or (as in the case of the 2d) to the entire body of Christians without exception. The objects of the 1st Epistle are to strengthen believers under trials;—to exhort them to the earnest performance of all duties—personal, social, and domestic; and to demonstrate how thoroughly that performance depends on a spiritual recognition of Christ and his work. There is a strong eschatological tendency in the Epistle; the apostle seems to grow more intensely serious, under the conviction that 'the end of all things is at hand' (chap. iv. 7). That the Epistle is the composition of Peter is very generally admitted. The external evidence is singularly strong; while the internal, derived from a consideration of style, sentiment, and doctrine, is equally so. We see in every sentence the ardent, impassioned, practical, unspeculative character of Peter, who held with a fine Hebraic vehemence of faith the great facts and principles of Christianity, but could not like the more subtle and logical Paul, give them a systematic representation. Many critics have warmly praised the beauty and strength of the language.—The *Second Epistle* stands in a very different position from the first. So far as external authority is concerned, it has hardly any.

The most critical and competent of the Fathers were suspicious of its authenticity; it was rarely if ever quoted, and was not formally admitted into the canon till the Council of Hippo, 393 A.D. The internal evidence is just as unsatisfactory. The great difference of style between it and the 1st Epistle is universally admitted. Bunsen, Ullmann, and Lange hold indeed that the second chapter is an interpolation, but consider the first and third genuine. Many of the ablest critics, however, regard the whole Epistle as a fabrication, and believe that its contents prove it was meant as an attack on the Gnosticism of the 2d century. [See the remarks on the Second Epistle of Peter in Neander's *Geschichte der Pflanzung und Leitung der Kirche durch die Apostel.*] The principal arguments adduced for maintaining its apostolic character are—1, that its rejection would endanger the authority of the canon; 2, that it is inexplicable how the church should have received it if it had not thought that Peter was the author.

PE'TERHOF, a palace of the emperor of Russia, on the southern shore of the Gulf of Finland, 15 miles west of St. Petersburg. The palace was built by Peter the Great in 1711, contains a fine collection of paintings, and is surrounded by a beautiful park. The town of P. has 15,000 inhabitants.

PETER LOMBARD. See LOMBARD, PETER.

PETER-PENCE, the name given to a tribute which was collected in several of the western kingdoms, and offered to the Roman pontiff, in reverence to the memory of St. Peter, whose successor that bishop is believed by Catholics to be. From an early period, the Roman see had been richly endowed; and although its first endowments were chiefly local, yet as early as the days of Gregory the Great, large estates were held by the Roman bishops in Campania, in Calabria, and even in the island of Sicily. The first idea, however, of an annual tribute appears to have come from England. It is ascribed by some to Ina (721 A.D.), king of the West Saxons, who went as a pilgrim to Rome, and there founded a hospice for Anglo-Saxon pilgrims, to be maintained by an annual contribution from England; by others, to Offa and Ethelwulf, at least in the sense of their having extended it to the entire of the Saxon territory. But this seems very uncertain; and although the usage was certainly anterior to the Norman conquest, Dr. Lingard is disposed not to place it higher than the time of Alfred. The tribute consisted in the payment of a silver penny by every family possessing land or cattle of the yearly value of 30 pence, and it was collected during the five weeks between St. Peter's and St. Paul's Day and August 1. In the time of King John, the total annual payment was £199, 8*s.*, contributed by the several dioceses, in various proportions, which will be found in Lingard's *History of England*, vol. ii. p. 330. The tax, called Romescot, with some variation, continued to be paid till the reign of Henry VIII., when it was abolished. By Gregory VII., it was sought to establish it for France; and it appears also in Denmark, Sweden, Norway, and Poland. This tribute differs from the payments of the feudatory kingdoms, such as Naples, Aragon, and England under the reign of John.

The pope having suffered a considerable diminution of his own revenue since the revolution of 1848, an effort has been made in several parts of Europe to revive this tribute. In some countries, it has been very successful, and the proceeds have been among the chief of the resources by which Pius IX. was so long enabled to meet the pressure of pecuniary embarrassments caused by his diminished territorial possessions. Since the total annexation of the Papal States to the kingdom of Italy, the tribute has been largely increased in France, Belgium, England, and Ireland.

PETER THE HERMIT, the first mover of the great medieval drama of the CRUSADES (q. v.), was of gentle birth, and a native of Amiens, where he was born about the middle of the 11th century. Having been educated at Paris, and afterwards in Italy, he became a soldier. After serving in Flanders without much distinction, he retired from the army, married, and had several children; but on the death of his wife, he became a monk, and ultimately a hermit. In a pilgrimage to the Holy Land about 1093, he was moved by seeing the Holy Sepulchre in the hands of the Infidel, and by the oppressed condition of the Christian residents or pilgrims; and on his return, spoke so earnestly to Pope Urban II., that he adopted his views, and commissioned him to preach throughout the West an armed confederation of Christians for the deliverance of the Holy City. (Hagenmeyer in his monograph *Peter der Eremita*, 1880, denies that P. was ever in Palestine till he went with the crusaders, and asserts that the scheme of a crusade originated with the pope, not with the hermit.)

Though P. was mean in figure, his enthusiasm lent him power. From province to province, from city to city he wandered. 'He rode,' writes Milman, 'on a mule, with a crucifix in his hand, his head and feet bare; his dress was a long robe, girt with a cord, and a hermit's cloak of the coarsest stuff. He preached in the pulpits, on the roads, in the market-places. His eloquence was that which stirs the heart of the people, for it came from his own—brief, figurative, full of bold apostrophes; it was mingled with his own tears, with his own groans; he beat his breast: the contagion spread throughout his audience. His preaching appealed to every passion—to valor and shame, to indignation and pity, to the pride of the warrior, to the compassion of the man, the religion of the Christian, to the love of the brethren, to the hatred of the unbeliever aggravated by his insulting tyranny, to reverence for the Redeemer and the saints, to the desire of expiating sin, to the hope of eternal life. The results are well known, as among those moral marvels of enthusiasm of which history presents occasional examples. All France, especially, was stirred from its very depths; and just at the time when the enthusiasm of that country had been already kindled to its full fervor, it received a sacredness and an authority from the decree of a council held at Clermont, in which Urban himself was present, and in which his celebrated harangue was but the signal for the outpouring, through all Western Christendom, of the same chivalrous emotions by which France had been borne away under the rude eloquence of the Hermit. For the details of the expedition, we must refer to the article CRUSADES; our sole present concern being with the personal history of Peter. Of the enormous but undisciplined army which assembled from all parts of Europe, one portion was committed to his conduct; the other being under the command of a far more skilful leader, Walter the Pennyless. P. placed himself at their head, mounted upon his ass, with his coarse woollen mantle and his rude sandals.

On the march through Hungary, they became involved in hostilities with the Hungarians, and suffered a severe defeat at Semlin, whence they proceeded with much difficulty to Constantinople. There the Emperor Alexis, filled with dismay at the want of disipline which they exhibited, was but too happy to give them supplies for their onward march; and near Nice, they encountered the army of the Sultan Solyman, from whom they suffered a terrible defeat. P. accompanied the subsequent expedition under Godfrey; but worn out by the delays and difficulties of the siege of Antioch, he was about to withdraw from the expedition, and was only retained in it by the influence of the other leaders, who foresaw the worst results from his departure. Accordingly, he had a share, although not marked by any signal distinction, in the siege and capture of the Holy City in 1099, and the closing incident of his history as a crusader was an address to the victorious army delivered on the Mount of Olives. He returned to Europe, and founded a monastery at Huy, in the diocese of Liege. In this monastery, he died, July 7, 1115.

PETER (DON PEDRO) THE CRUEL, King of Castile, and Leon, was the son of Alfonso XI. and Maria of Portugal, and was born at Burgos, 30th August 1334. On his father's death (1350), P. succeeded to the throne without opposition, but left the whole exercise of power to his mother, Donna Maria, and Albuerque, his father's prime minister and chancellor. But by the instigation of his mistress (afterwards his queen), Marie de

Padilla, P. emancipated himself (1353) from the guidance of the queen-mother and her coadjutor Albuerque, taking the reins of government in his own hands. His rule being much more impartial than that of the regency, obtained exceeding popularity, which was increased by his affable manner towards the mass of his subjects; but the strict justice with which he decided all causes between the rich and poor, the clergy and the laity, combined with a haughty and imperious carriage towards them, alienated from him the nobles and clergy.

The plottings of Albuerque, who had fled to Portugal, having culminated (1354) in an outbreak in the province of Estremadura, P. marched against the rebels, but was betrayed by his brother, Henry of Trastamare, and taken prisoner (December 1354). Popular opinion now declared loudly in his favor; and having escaped from prison, he found himself speedily at the head of a powerful army, with which, despite the excommunication of the pope, he speedily reduced his opponents to submission. But this episode in his career had a disastrous influence on his character for the rest of his life. Betrayed by his relatives, and even by his mother, he became suspicious of every one; and having experienced to the full the power of his enemies, he scrupled not as to the weapons to be employed against them. The rest of his reign was devoted to the destruction of the power of the great vassals, the establishment of his own authority on the ruins of their feudal tyranny, and long continued and bloody wars with the kingdoms of Aragon and Granada. As the people, however, were in general well and justly governed, it is not improbable that he might have retained his throne in spite of his numerous enemies, had not the heavy taxes which were imposed to maintain the cost of his long wars with Aragon and Granada dissipated his popularity. Henry, who had fled to France, now seizing the favorable opportunity, returned (1366) at the head of a body of exiles, backed by Bertrand du Guesclin (q. v.) with an army of mercenaries, and aided by Aragon, France, and the pope. P., however, by promising to England the sea-board of Biscay, with the provinces of Guipuzcoa and Logrono, and supplying a contribution of 56,000 florins, prevailed upon Edward the Black Prince to espouse his cause.

Edward invaded Castile in the spring of 1367, totally defeated Henry and Du Guesclin at Navarette (April), taking the latter prisoner, releasing him almost immediately after), and speedily restoring P. to the throne. But the king disgusted his chivalrous ally by his cruelty to the vanquished, and paid no heed to his remonstrances; Edward accordingly repassed the Pyrenees, and left the misguided monarch to his fate. The whole kingdom groaned under his cruelties; rebellions broke out everywhere; and, in autumn 1367, Henry returned with 400 lances, the people immediately flocking to his standard. P.'s scanty and ill-disciplined forces were routed at Montiel (14th March 1369), and himself compelled to retire for safety within the town, whence he was treacherously decoyed and captured by Du Guesclin. He was carried to a tent, where a single combat took place between him and Henry, in which the latter would have been slain, had not some of his followers come to his aid, and slain the unfortunate P., 23d March 1369.

PETER I., ALEXIEVITCH, Czar of Russia, generally denominated PETER THE GREAT, was the son of the Czar Alexei Mikailovitch by his second wife, Natalia Naryskine, and was born at Moscow, 9th June 1672. His father, Alexei, died in 1676, leaving the throne to his eldest son, Feodor, P.'s half-brother. This prince, however, died in 1682 without issue, after naming P. as his successor, to the exclusion of his own full brother, Ivan. This step immediately provoked an insurrection, fomented by the children of the Czar Alexei's first marriage, the most prominent among whom was the grand-duchess Sophia, a woman of great ability and energy, but of unbounded ambition. Disdaining the seclusion customary among the females of the royal family, she showed herself to the *Strelitz* (q. v.), excited them to fury by an ingenious story of the assassination of her brother Ivan, and then let them loose on the supporters of P.'s claims. After a carnage of three days, during which more than sixty members of the most noble families of Russia were massacred, she succeeded in obtaining the coronation (July 1682) of Ivan and P. as joint rulers, and her own appointment as regent.

Up to P.'s coronation his education had been greatly neglected, but after this time he became acquainted with Lieutenant Franz Timmerman, a native of Strasburg, who gave him lessons in the military art and in mathematics; after which he had the good fortune to fall under the guidance of Lefort (q. v.), a Genoese, who initiated him into the sciences and arts of civilization, and by showing him how much Muscovy was in these respects behind the rest of Europe, influenced the whole of his future career. Lefort also formed a small military company out of the young men of noble family who attended P., and caused P. himself to pass, by regular steps, from the lowest (that of drummer) to the highest grade in it, rendering him all the while amenable to strict discipline. This course of training, in all probability, saved P. from becoming the mere savage despot, which his brutal and passionate disposition, and indomitable energy inclined him to be; it also protected him from the jealousy of his half-sister, the regent Sophia, who, seeing him absorbed in military exercises and other studies, imagined that he had wholly given himself up to amusement. She, however, soon discovered her error, for P., contrary to her wishes, married (February 1689), by his mother's advice, Eudoxia Feodorowna, of the family of Lapoukin; and in October of the same year called upon his sister to resign the government. In the ensuing contest, P. was at first worsted, and compelled to flee for his life; but he was speedily joined by the foreigners in the Russian service, with a Scotchman named Patrick Gordon (q. v.) and the Swiss Lefort at their head; and the Strelitz, who were his antagonist's mainstay, flocking to his standard, she resigned the contest, and was shut up in a convent, whence, till her death, in 1704, she did not cease to annoy him by her intrigues. On October 11, 1689, P. made his public entry into Moscow, where he was met by Ivan, to whom he gave the nominal supremacy and precedence, reserving the sole exercise of power for himself. Ivan only enjoyed his puppet sovereignty till 1696. Though P. was all his life under the dominion of ungovernable passions and sensual habits, yet during great part of his reign he was so exclusively engaged in projecting and carrying out his schemes for the regeneration of Russia, that his gross animal nature had little opportunity of displaying itself.

His first care, on assuming the government, was to form an army disciplined according to European tactics, in which labor he was greatly aided by the valuable instructions of Gordon and Lefort, both of whom were military men, and had served in some of the best disciplined armies of Western Europe. He also labored to create a navy, both armed and mercantile; but at this period Russia presented few facilities for such an attempt, for she was shut out from the Baltic by Sweden and Poland (the former of whom possessed Finland, St. Petersburg (then called Ingria), and the Baltic provinces), and from the Black Sea by Turkey, which, extending along the whole of the north coast, had reduced that sea to the rank of an inland lake; leaving only the White Sea and the Arctic Ocean, with the solitary port of Archangel, available for the Russian navy. P. thinking the possessions of a portion of the Black Sea would best supply the required facilities of accessible sea-board and port, declared war against Turkey, and took (1696) the city of Azof at the mouth of the Don, after a long siege, which the ineffective condition of his newly-disciplined army compelled him to convert into a blockade. Skilled engineers, architects, and artillerymen were now invited from Austria, Venice, Prussia, and Holland; ships were constructed; the army further improved both in arms and discipline; and many of the young nobility ordered to travel in foreign countries, chiefly in Holland and Italy, for the purpose of acquiring such information as might be useful in the modernization and civilization of their country. They were ordered to take special notice of all matters in connection with ship-building and naval equipments. Others were sent to Germany to study the military art.

Not quite satisfied with this arrangement, P. was eager to see for himself the countries for which civilization had done so much, and which had so highly developed the military art, science, trade, and industrial pursuits; so after repressing a revolt of the Strelitz (February 1697), and dispersing them among the various provinces, he intrusted the reins of government to Prince Romanadofski, assisted by a council of three, and left Russia in April 1697, in the train of an embassy of which Lefort was the head. In the guise of an inferior official of the embassy, he visited the three Baltic provinces, Prussia, and Hanover, reaching Amsterdam, where, and subsequently at Saardam, he worked for some time as a common shipwright. His curiosity was excessive; he demanded explanations of everything which he did not understand, and to his practice of ship-building and kindred trades, he added the study of astronomy, natural philosophy, geography, and even anatomy and surgery. On receipt of an invitation from William III., king of England, he visited that country, and for three months, spent partly in London and partly in Deptford, labored to amass all sorts of useful information. While in England he received the honorary degree of D.C.L. from the university of Oxford! He left England in April 1698, carrying with him English engineers, artificers, surgeons, artisans, artillerymen, &c., to the number of 500, and next visited Vienna, for the purpose of inspecting the emperor of Austria's army, then the best in Europe. He was about to visit Venice also, when the news of a formidable rebellion of the Strelitz recalled him to Russia, which he reached by way of Poland, arriving at Moscow 4th September 1698.

General Gordon had already crushed the revolt, but these turbulent soldiers had so enraged P. against them by their frequent outbreaks, that he ordered the whole of them to be executed, even occasionally assisting in person on the scaffold. A few, however, were pardoned, and sent to settle at Astrakhan. The Cza-

rina Eudoxia ,who was suspected of complicity in the conspiracy, which had been the work of the old Russian or anti-reform party, was divorced, and shut up in a convent; the czar's own sister, Martha, was likewise compelled to take the veil. To show his gratitude to his faithful adherents, P. conferred upon the chief of them the Order of St. Andrew, now first instituted. He put the press on a proper footing, caused translations of the most celebrated works of foreign authors to be made and published, and established naval and other schools. At this period, the ordinary arithmetic was first introduced for the management of accounts, these having been previously kept by means of balls strung on a wire (the Tartar-method). P. also introduced the mode of raising revenue by taxation of commodities in common use. Trade with foreign countries, which was formerly punished as a capital crime, was now permitted, or rather, in the case of the principal merchants, insisted upon. Many improvements in dress, manners, and etiquette were introduced authoritatively among the public functionaries, and recommended to the people at large. Even the organization of the national church could not escape P.'s reforming zeal.

In 1700, P., desirous of gaining possession of Carelia and Ingria, provinces of Sweden, which had formerly belonged to Russia, entered into an alliance with the kings of Poland and Denmark to make a combined attack on Sweden, taking advantage of the tender age of its monarch, Charles XII.; but he was shamefully defeated at Narva, his raw troops being wholly unable to cope with the Swedish veterans. P. was by no means disheartened, for, taking advantage of the Swedes being employed elsewhere, he quietly appropriated a portion of Ingria, in which he laid the foundation of the new capital, St. Petersburg, 27th May 1703. Great inducements were held out to those who would reside in it, and in a few years it became the Russian commercial dépôt for the Baltic. In the long contest with Sweden, the Russians were almost always defeated, but P. rather rejoiced at this, as he saw that these reverses were administering to his troops a more lasting and effective discipline than he could have hoped to give them in any other way. He had his revenge at last, in totally routing the Swedish king at Poltava (q. v.), 8th July 1709, and in seizing the whole of the Baltic provinces and a portion of Finland in the following year. His success against Sweden helped much to consolidate his empire, and to render his subjects more favorably disposed towards the new order of things. After re-organizing his army, he prepared for strife with the Turks, who, at the instigation of Charles XII. (then residing at Bender), had declared war against him. See OTTOMAN EMPIRE. In this contest, P. was reduced to such straits that he despaired of escape, and, looking forward to death or captivity, wrote a letter to his chief nobles, cautioning them against obeying any orders he might give them while a captive, and advising them regarding a successor to the throne in case of his death. But the finesse and ability of his mistress, Catharine, afterwards his wife and successor (see CATHARINE I.), extricated him from his difficulties; and a treaty was concluded (23d July 1711) by which Peter lost only his previous conquest—the port of Azof and the territory belonging to it. Shut out from the Black Sea, the possession of a good sea-board on the Baltic became the more necessary to him, and the war against Sweden in Pomerania was accordingly pushed on with the utmost vigor.

On 2d March 1712, his marriage with his mistress, Catharine, was celebrated at St. Petersburg; and two months afterwards, the offices of the central government were transferred to the new capital. His arms in Pomerania and Finland were crowned with success, and in 1713 the latter province was completely subdued. P. neglected nothing to develop the naval power of the empire, and the strictness with which he enforced the discharge of their duties on his ministers and officers, appears from the refusal, by the court of admiralty, of the czar's own application for the grade of vice-admiral, until by defeating the Swedish fleet at Hangoend, and taking the Aland Isles, and several coast forts in Finland, he had merited the honor. In the end of 1716, and beginning of 1717, in company with the czarina, he made another tour of Europe, this time visiting Paris, where he was received with great empressement, and returned to Russia in October 1717, carrying with him books, paintings, statues, &c., to a large amount. It was soon after this time that he ordered his son Alexei (q. v.) to be executed, and many of the nobles who had been implicated in his treasonable plans were punished with savage barbarity. In 1721 peace was made with Sweden, and on condition of that power giving up the Baltic provinces, Ingria (now government of St. Petersburg), Viborg, and Kexholm, and a small portion of Finland, with all the islands along the coast from Courland to Viborg, she received back the rest of Finland, with a sum of £400,000. In 1722 P. commenced a war with Persia, in order to open up the Caspian Sea to Russian commerce (see PERSIA). The internal troubles of Persia compelled the shah to yield to the demands of his formidable opponent, and to hand over the three Caspian provinces along with the towns of Derbend and Baku.

On P.'s return to his capital, he inquired into the conduct of his finance ministers, and punished with fines, imprisonment, and even death, those whom he detected in fraudulent acts. To save the empire which he had established and constituted from being abandoned to the weak government of a minor, he, in February 1722, promulgated his celebrated law of succession (see PETER II.). For the last years of his life he was chiefly engaged in beautifying and improving his new capital, and carrying out plans for the more general diffusion of knowledge and education among his subjects. In the autumn of 1724 he was seized with a serious illness, the result of his imprudence and now habitual excesses; and after enduring much agony, he expired, 8th February 1725, in the arms of the empress.

PETER II., ALEXEIVITCH, Czar of Russia, was the sole male representative of Peter the Great, being the son of the unfortunate Alexei (see Peter I.) by his wife the Princess Charlotte of Brunswick-Wolfenbuttel, and was born 23d October 1715 at St. Petersburg. On the death of the Czarina Catharine I., he ascended the throne, May 17, 1727, in accordance with a decree of Peter the Great, which enjoined that each czar should name his successor; and the ambitious Menchikoff, who hoped to govern more easily in the name of a minor, prompted the empress to choose P. In order to secure himself in his high position, Menchikoff affianced one of his daughters to the youthful czar, and compelled his relative, Anna Petrowna, and her husband, the Duke of Holstein, to retire to their own estates. But, notwithstanding these and other precautions, his power was overturned by a mere child, a playfellow of the boy-ruler, who was of the powerful family of Dolgorouki. Instigated by his friends, this boy, Ivan Dolgorouki, opened the eyes of his sovereign to the humiliating dependence in which he was held by Menchikoff, and inspired him with a strong desire to free himself. The plan succeeded, and the minister and his family were exiled to Siberia, the Dolgorouki family taking their place as favorites. The marriage of a lady of this family with P. had been arranged, and was almost on the point of being celebrated, when he was seized with small-pox, and died at St. Petersburg, January 29, 1730. During his reign, the three Caspian provinces, Asterabad, Ghilan, and Mazanderan, which had been seized by Peter the Great, were recovered by Persia.

PETER III. FEODOROVITCH, Czar of Russia, grandson of Peter the Great (being the son of his eldest daughter Anna Petrowna, wife of Carl Friedrich, Duke of Holstein-Gottorp), was born at Kiel, March 4, 1728, and on November 18, 1742, was declared by the czarina Elizabeth (q. v,), her successor to the throne of Russia. From the time of his being publicly proclaimed heir, he lived at the Russian court; and, in obedience to the wishes of the czarina, married Sophia-Augusta, a princess of Anhalt-Zerbst, who, on entering the Greek Church (a necessary condition of marriage of a foreigner with the czar present or presumptive), assumed the name of Catharina Alexiowna. P. succeeded Elizabeth on her death, June 5, 1762; and his first act of authority was to withdraw from the confederate league of France, Austria, and Russia against Prussia, restoring to the heroic monarch of the latter kingdom, Frederic II., the provinces of Prussia Proper, which had been conquered during the Seven Years' War, and sending to his aid a force of 15,000 men; a line of conduct which seems to have been prompted solely by his admiration for the Prussian sovereign. He also recalled many of the political exiles from Siberia, among whom were L'Estocq, Munnich, and the Duke of Courland; abolished the sanguinary law which proscribed any one who should utter a word against the Greek church, the czar, or the government; and then attempted the realization of his favorite project, which was to recover from Denmark that portion of Slesvig which had been ceded to her in 1713, and to avenge the tyranny and annoyances to which his family—that of Holstein-Gottorp—had been subjected. But before the army he had dispatched could reach its destination, a formidable conspiracy, headed by his wife, and supported by the principal nobles, had broken out against him.

This conspiracy originated in the general discontent which was felt at the czar's conduct and government: for the nobility were offended at his liberal innovations, and the preference he showed for Germans; the people and clergy, at his indifference to the national religion, and his ill-concealed contempt for Russian manners and customs; while the whole nation murmured at his servility to Frederic II. of Prussia. His wife had still deeper cause for dislike, for though he was himself addicted to drunkenness and debauchery, he never ceased to reproach her with her infidelities, and had even planned to divorce her, disinherit her son Paul (q. v.), and elevate his mistress Elizabeth Woronzof to the conjugal throne. The revolution broke out on the night of the 8th July 1762; P. was declared to have forfeited his crown, and his wife Catherine was proclaimed czarina as Catherine II. (q. v.) by the Guards, the clergy, and the nobility. P., who was then at Oranienbaum, neglecting the counsels of Field-marshal

Munnich, who proposed to march at once on the capital at the head of the regiments which were still faithful, or at anyrate to take secure possession of Cronstadt and the fleet, soon found even the opportunity of flight cut off, and was compelled to submit. He abdicated the crown on 10th July, and on the 14th of the same month was put to death by Orlof (q. v.), to secure the safety of the conspirators.

PE'TERBOROUGH, an episcopal city and parliamentary borough of Northamptonshire, stands on the left bank of the Nen —which is thus far navigable for boats—37 miles north-east of Northampton, and 76 miles north-north-west of London by railway. The Great Northern, the Eastern Counties', the Northampton and Peterborough, and the Midland Counties' railways pass the city, and have stations there. P. is regularly laid out, has an excellent grammar-school with an endowment, a corn-exchange in the Italian style, a jail and house of correction, a handsome parish church, and a number of meeting-houses, schools, and charitable institutions.

But the great edifice of P. is the famous cathedral, which holds a high, if not the highest rank among English cathedrals of the second class. The choir and eastern aisles of the transept (built 1118—1133) are early Norman; the transept (1155—1177) is middle Norman; the nave (1177—1193) is late Norman; the western transept (dating from the same period), is transition Norman; the west front, which, as a portico (using that term in its classical sense), is said to be the grandest and finest in Europe, is early English; and the eastern aisle (begun in 1438, but not completed till 1528), is Perpendicular. The beautiful western front consists of three arches 81 feet in height, supported by triangular piers detached from the west wall. Each arch is surmounted by a beautiful pediment and cross. The front is flanked on each side with turrets 156 feet high, and crowned with pinnacles. The roof of the nave is painted in lozenge-shaped divisions, containing figures of kings, bishops, grotesques, &c., in colors. A central tower, lantern-shaped, rises at the intersection of the nave and transept. In the north-choir aisle, a slab of blue stone still covers the remains of Catharine of Aragon. On the stone is carved the simple inscription, 'Queen Catharine, A.D. 1536.' In July 1587, the remains of Mary, Queen of Scots, were brought here from Fotheringay for interment, and here they rested until, twenty-five years after, they were removed to Westminster Abbey. The entire length of the cathedral is 476 feet 5 inches; the breadth of nave and aisles, 78 feet; height of the ceiling of the church, 78 feet; breadth of the church at the great transepts, 203 feet; height of lantern, 135 feet; length of western front, 156 feet; height of central tower from the ground, 150 feet.

P. carries on an active trade in corn, coal, timber, lime, bricks, and stone. Two newspapers are published weekly. P. returns two members to the House of Commons. Pop. (1871) 17,434; (1881) 22,394.

The city had its origin in a great Benedictine monastery, founded in 655 by Oswy, king of Northumbria, and Peada, son of Penda, king of Mercia. This monastery, which became one of the wealthiest and most important in England, was reared in honor of St. Peter; but it was not until after being destroyed by the Danes in 807, and rebuilt about 966, that the town was called Peterborough. On the dissolution of the monasteries, this magnificent edifice was spared, owing, it is supposed, to its containing the remains of Queen Catharine of Aragon.—Murray's *Handbook to the English Cathedrals.*

PETERBOROUGH, Lord. See Mordaunt.

PETERHEA'D, a seaport and municipal and parliamentary burgh, in the district of Buchan, Aberdeenshire, on a peninsula, the eastmost point of land in Scotland, 44 miles north-north-east of Aberdeen, by railway. It is irregularly built, clean, and much paved with the reddish granite, called after the town, and used for polishing. The Earls Marischal, before their attainder, 1715, owned much of the parish, and were superiors of the town of P. The property was bought by the Merchant Maiden Hospital of Edinburgh, the governors of which have greatly improved the town and port. P. has no very striking edifices. The parish church has a granite spire, 118 feet high, and a granite Tuscan pillar stands on the market-cross. P. has Episcopal, Free, Roman Catholic, and other churches; an academy and other schools, and two libraries. P. has cloth and wincey manufactures, and considerable ship-building. The chief exports are herrings, cod-fish, butter, grain, and granite; and imports, lime, wool, and general merchandise. P. was long the chief British depot of the seal and whale fishing, but the interest has declined.

In 1873, 12 vessels brought home 900 tons of oil, seal-skins, and whalebone, worth £50,000. In 1880, 1073 ships, of 91,687 tons burden, entered the port; and in 1880 it owned 716 fishing-boats, manned by 4296 persons, and cured 171,896 barrels of herrings, beside large quantities of cod and other fish. P. has a harbor on the north, another on the south side of the isthmus of the peninsula on which it is built, and they are connected by a passage cut across the isthmus, thus allowing vessels to leave the harbor in different winds. On the south side of the bay of P., and about 2¼ miles from the town, are the Buchanness and its lighthouse, and Boddam Castle ruins. The Ugie enters the sea a mile north-west of P.; and on its banks, 3 or or 4 miles north-west of the town, are the ruined castles of Inverugie and Ravenscraig. The walls of the former are still standing, and access is obtained to the roof by means of a winding staircase in one of the towers, whence a magnificent view may be had of the valley of the Ugie. Ravenscraig stands on the opposite side of the river; it is built upon a rock, and is considered a good specimen of the ancient Scottish baronial style, in the square form so common in the beginning of the 13th century. Its walls are so strong as to have been deemed impregnable previous to the use of artillery. P. unites with Elgin, Kinore, Cullen, Banff, and Inverury in sending a member to parliament; constituency, (1877–8) 1103. Pop. (1841) 4762; (1871) 8535; (1881) 10,992. Annual value of real property, £38,134.

PETERLOO MASSACRE, the name popularly given to the dispersal of a large meeting by armed force in St. Peter's Field, Manchester, Monday, July 16, 1819. The assemblage, consisting chiefly of bodies of operatives from different parts of Lancashire, was called to consider the question of parliamentary reform, and the chair, on open hustings, was occupied by Mr. Henry Hunt. The dispersal took place by order of the magistrates; several troops of horse, including the Manchester Yeomanry, being concerned in the affair, of which an account will be found in *History of the Peace*, by Harriet Martineau, edition of 1858, p. 107. Five or six persons were killed and many wounded. St. Peter's Field is now covered by buildings. Peterloo was a fanciful term, suggested by Waterloo.

PETER'S, St., CHURCH, at Rome, is the largest cathedral in Christendom. It stands on the site of a much older basilica, founded by Constantine, A.D. 306, over the reputed grave of St. Peter, and near the spot where he is said to have suffered martyrdom. This basilica was of great size and magnificence; but had fallen into decay, when Pope Nicholas V., in 1450, resolved to erect a new cathedral, worthy of the dignity and importance of the Roman pontificate, then in the zenith of its power. A design was accordingly prepared by Rosselini on a very grand scale, and the tribune was begun, when the pope died. The new building remained neglected for about half a century, when Julius II. resolved to carry out the building, and employed Bramanté, then celebrated as an architect, to make a new design. This design still exists. The foundation stone was laid, in 1506; and the works carried on with great activity till the death of the pope in 1513. Bramanté who died the following year, was succeeded by Baldussare Peruzzi.

Almost every architect who was employed during the long course of time required for the erection of this great edifice, proposed a new design. That of San Gallo, who succeeded Peruzzi, is one of the best, and is still preserved. It was not till his death in 1546, when the superintendence devolved on Michael Angelo, then seventy-two years of age, that much progress was made. He designed the dome; and had the satisfaction, before his death in his ninetieth year (1564), of seeing the most arduous part of the task completed; and he left such complete models of the remainder that it was carried out exactly in conformity with his design by his successors, Vignola and Giacomo della Porta, and successfully terminated by the latter in 1590 in the pontificate of Sixtus V. The design of Michael Angelo was in the form of a Greek cross, but the building was actually completed as originally designed by Bramanté as a Latin cross, under Paul V., by the architect Carlo Maderno. The portico and façade were also by him. He is much blamed for altering Michael Angelo's plan, because the result is that the projecting nave prevents the dome (the *great* part of the work) from being well seen. The façade is considered paltry, and too much cut up into small pieces. It is observable that this entrance façade is at the *east* end of the church, not the west, as it would certainly have been north of the Alps. But in Italy the principle of orientation was little regarded.

Maderno's nave was finished in 1612, and the façade in 1614, and the church dedicated by Urban VIII. in 1626. In the front of the portico, is a magnificent atrium in the form of a piazza, enclosed on two sides by grand semicircular colonnades. This was erected under Alexander VII. by the architect Bernini.

The façade of the cathedral is 368 feet long and 145 feet high. As already mentioned, the design is not generally approved, but some allowance must be made for the necessities of the case. The balconies in the front were required, as the pope, at Easter, always bestows his blessing on the people from them. Five open arches lead into a magnificent vestibule, 439 feet long, 47 feet wide, and 65 feet high, and adorned with statues and mosaics. Here is preserved a celebrated mosaic of St. Peter walking on the sea, called the Navicella, designed by Giotto in 1298, and preserved from the old basilica. The central bronze doors are also relics saved from the old church. On entering the interior of the cathedral,

its enormous size does not produce the impression its grandeur of proportions should do on the spectator. This arises from the details being all of an excessive size. The pilasters of the nave, the niches, statues, mouldings, &c., are all such as they might have been in a much smaller church, magnified. There is nothing to mark the scale, and give expression to the magnitude of the building. The figures supporting the holy water fountain, for example, appear to be those of cherubs of a natural size, but when more closely approached, turn out to be six feet in height, and the figures in the niches are on a still more colossal scale. The cathedral is 613 feet long, and 450 feet across the transepts. The arch of the nave is 90 feet wide, and 152 feet high. The diameter of the dome is 195½ feet. From the pavement to the base of the lantern is 405 feet, and to the top of the cross 434¾ feet. The dome is thus 50 feet wider and 64 feet higher than that of St. Paul's (q. v.) in London.

The walls of the interior are adorned with plates of the richest marbles, and copies of the most celebrated paintings executed in mosaic. The arch piers have two stories of niches with statues of saints, but these unfortunately, are in a debased style of art. The pavement is all in marbles of different colors, arranged in beautiful patterns designed by Giacomo della Porta. The dome is, however, the finest part of the cathedral; it is supported on four great arches. Immediately under the dome stands the high altar over the grave of St. Peter. It is surmounted by a magnificent baldacchino or canopy, in bronze, which was designed by Bernini in 1633, and executed with bronze stripped from the Pantheon by Pope Urban VIII. Beneath the high altar is the shrine, in which 112 lamps burn day and night. The building is adorned with many remarkable monuments and statues, some of them by Michael Angelo, Canova and Thorwaldsen. The most of the monuments are erected in memory of the popes, but there is one to 'James III., Charles III., and Henry IX., kings of England,' the remains of the exiled Stuarts being buried in the vaults beneath. The 'Grotte Vaticane,' or crypt, has been most carefully and religiously preserved during all the changes and works of the cathedral; so much so, that the ancient pavement remains undisturbed.

As a work of architectural art, St. Peter's is the greatest opportunity which has occurred in modern times; but, notwithstanding the great names of the men who were engaged upon the work, it is universally admitted to be a grand and lamentable failure.

PETER'S, ST., COLLEGE, Cambridge, commonly called Peter-House, was founded before any other college now existing in England—viz., in 1257, by Hugh de Balsham, Bishop of Ely, and was endowed by him in 1282, with a maintenance for a master and 14 fellows. In addition to the 14 original foundation-fellows, there are two bye-fellows on different foundations, and 23 scholars. The master is elected by the society.

PE'TERSBURG, a city and port of entry of Virginia, U.S., on the south bank of the Appomatox River, 12 miles above its junction with James River, at City Point. It is 23 miles south of Richmond. Five railways contribute to make it the third city in the state in respect of population, and connect it with Baltimore, Wilmington (N. C)., Norfolk, Richmond, Mobile, &c. P. is well built. It contains churches of the Presbyterians, Methodists, Episcopalians, Baptists, and Catholics. There are here several cotton and woollen factories, forges, and numerous mills to which the falls in the river furnish extensive power. In the campaign of 1864, Lieutenant-General Grant, commander of the Federal army, failing to take Richmond, besieged P., and was repulsed in several attacks by General Beauregard, with heavy loss. Pop. (1880) 21,656.

PETERSBURG, ST. See ST. PETERSBURG.

PE'TERSFIELD, a parliamentary borough and market-town in Hampshire, 23 miles east-north-east of Southampton, and 55 south-west of London by railway. It is a pleasant country-town, and contains a Norman parish chapel of the 12th c., and an educational institution, called Churcher's College. An equestrian statue of William III., once richly gilt, stands in the market-place. P. returns a member to the House of Commons. Pop. (1871) 6104; (1881) 6546.

PETERWA'RDEIN, a town in the Austrian province of Croatia and Slavonia, and one of the strongest fortresses in the Austrian dominions, is situated in a marshy, unhealthy locality on the right bank of the Danube, 50 miles north-west of Belgrade. The ordinary garrison is a very strong one, and besides it, the town and suburbs contain a population of (1869) 4022, mostly Germans. The most ancient part of the fortifications, the Upper Fortress, is situated on a rock of serpentine, which on three sides rises abruptly from the plain. P., situated on a narrow peninsula formed by a loop of the Danube, occupies the site of the Roman Acumincum (*acumen*, point), and is said to have been named in honor of Peter the Hermit, who marshalled here the soldiers of the first crusade. In 1688, the fortifications were blown up by the imperialists, and the town was soon after burned to the ground by the Turks; but at the Peace of Passarowitz, on 21st July 1718, it remained in the possession of the emperor. It was here that, on 5th August, 1716, Prince Eugene obtained a great victory over the Grand Vizier Ali.

PE'TIOLE. See LEAVES.

PÉTION DE VILLENEUVE, JÉROME, noted for the part he played in the first French Revolution, was the son of a procurator at Chartres, and was born there in 1753. He was practising as an advocate in his native city, when he was elected in 1789 a deputy of the *Tiers Etat* to the States-General. His out-and-out republican principles, and his facile oratory, sonorous rather than eloquent, quickly made him popular, though he had an essentially mediocre understanding, and was altogether a windy, verbose personage. He was a prominent member of the Jacobin Club, and a great ally of Robespierre; the latter was called the 'Incorruptible,' and P. the 'Virtous.' He was sent along with Barnave and Latour-Maubourg to bring back the fugitive royal family from Varennes, and in the execution of this commission he acted in an extremely unfeeling manner.

He afterwards advocated the deposition of the king, and the appointment of a popularly elected regency, and along with Robespierre received, 30th September 1791, the honors of a public triumph. On the 18th of November he was elected *Maire de Paris* in Bailly's stead, the court favoring his election, to prevent that of Lafayette. In this capacity he encouraged the demonstrations of the lowest classes, and the arming of the populace. But as the catastrophe drew near, he awoke to a sense of the terrible nature, and sought in vain to arrest the torrent. On the triumph of the Terrorists, P.'s popularity declined, and he joined the Girondists. On the king's trial, he voted for death, but with delay of execution and appeal to the people, upon which he became suspected of being a royalist, and of partaking in the treason of Dumouriez. He was thrown into prison, 2d June 1793, on the fall of the Gironde, but escaped from prison, and joined the other Girondists at Caen. Upon the defeat of their army by that of the Convention, he fled, in July 1793, into Bretagne, and in company with Buzot reached the neighborhood of Bordeaux, which, however, had already submitted. A short time after, P.'s and Buzot's corpses were found in a corn-field near St. Emilion, partly devoured by wolves. They were supposed to have died by their own hands. P.'s character has been defended by Madame de Genlis and Madame Roland. It appears that he was extremely virtuous in all his domestic relations; but, on the other hand, his public career shows him to have been weak, shallow, ostentatious, and vain. *Les Œuvres de Pétion*, containing his speeches, and some small political treatises, were published in 1793.

PETI'TIO PRINCI'PII ('a begging of the principle or question') is the name given in Logic to that species of vicious reasoning in which the proposition to be proved is assumed in the premises of the syllogism.

PETI'TION (Lat. *peto*, I ask), a supplication preferred to one capable of granting it. The right of the British subject to petition the sovereign or either House of Parliament for the redress of grievances is a fundamental principle of the British constitution, and has been exercised from very early times. The earliest petitions were generally for the redress of private wrongs, and the mode of trying them was judicial rather than legislative. Receivers and triers of petitions were appointed, and proclamation was made inviting all persons to resort to the receivers. The receivers, who were clerks or masters in Chancery, transmitted the petitions to the triers, who were committees of prelates, peers, and judges, who examined into the alleged wrong, sometimes leaving the matter to the remedy of the ordinary courts, and sometimes transmitting the petition to the chancellor or the judges, or, if the common law afforded no redress, to parliament. Receivers and triers of petitions are still appointed by the House of Lords at the opening of every parliament, though their functions have long since been transferred to parliament itself. The earlier petitions were generally addressed to the House of Lords; the practice of petitioning the House of Commons first became frequent in the reign of Henry IV.

Since the Revolution of 1688, the practice has been gradually introduced of petitioning parliament, not so much for the redress of specific grievances, as regarding general questions of public policy. Petitions must be in proper form and respectful in language; and there are cases where petitions to the House of Commons will only be received if recommended by the crown, as where an advance of public money, the relinquishment of debts due to the crown, the remission of duties payable by any person, or a charge on the revenues of India have been prayed for. The same is the case with petitions praying for compensation for losses out of the public funds. A petition must, in ordinary cases, be presented by a member of the House to which it is addressed; but petitions from the corporation of London may be presented by the sheriffs or lord mayor. Petitions from the cor-

poration of Dublin have also been allowed to be presented by the lord mayor of that city, and it is believed that a similar privilege would be acceeded to the lord provost of Edinburgh.

The practice of the House of Lords is to allow a petition to be made the subject of a debate when it is presented; and unless a debate has arisen on it, no public record is kept of its substance, or the parties by whom it is signed. In the House of Commons, petitions not relating to matters of urgency are referred to the Committee on Public Petitions, and in certain cases ordered to be printed.

In the five years ending 1842, the number of petitions presented to the House of Commons was 70,072; in the five years ending 1872, 101,573.

PETITION OF RIGHTS, a declaration of certain rights and privileges of the subject obtained from King Charles I. in his third parliament. It was so called because the Commons stated their grievances in the form of a petition, refusing to accord the supplies till its prayer was granted. The petition professes to be a mere corroboration and explanation of the ancient constitution of the kingdom; and after reciting various statutes, recognizing the rights contended for, prays 'that no man be compelled to make or yield any gift, loan, benevolence, tax, or such like charge, without common consent by act of parliament; that none be called upon to make answer for refusal so to do; that freemen be imprisoned or detained only by the law of the land, or by due process of law, and not by the king's special command, without any charge; that persons be not compelled to receive soldiers and mariners into their houses against the laws and customs of the realm; that commissions for proceeding by martial law be revoked.' The king at first eluded the petition, expressing in general terms his wish that right should be done according to the laws, and that his subjects should have no reason to complain of wrongs or oppressions; but at length, on both Houses of Parliament insisting on a fuller answer, he gave an unqualified assent on the 26th of June 1628.

PETÖFI, SANDOR (ALEXANDER), who may fairly be described as the national poet of Hungary, was born at Little Körös, in the county of Pesth, in 1822. His father was a butcher, and a small landowner in Little Kumania, and bore the name of Petrovich (son of Peter)—a name indicating a Slavonic origin, which the poet, when he came to manhood, exchanged for the Magyar equivalent, Petöfi. In 1838, his father was reduced to poverty by an overflowing of the Danube, which destroyed his little estate; and it was by the help of relatives that he was able to carry out his design of educating his son for a profession. P. was sent to the lyceum of the town of Schemnitz. It was while there that he began to write verses, and first displayed the extravagant fondness for theatricals which characterized him throughout life. From the first, he neglected his studies; ultimately, he ran away with a band of German strollers. His father after some time found him out, and brought him home, and he remained for a period in quasi-custody among his relatives. When at length he was again sent to school at Oedenburg, he almost immediately ran away, and enlisted as a common soldier. After he had been about two years in the army, a physician, who had taken pity upon him, procured his discharge, and he went back to his relations. He afterwards went to Pápá, to complete his education. His passion for the stage, however, drew him away from Pápá, as it had formerly done from Schemnitz; in 1842, he left it to join a troop of comedians. His stage-attempts were utter failures, and he soon parted from the comedians, if, indeed, he was not dismissed by them. He made his way to Presburg, and afterwards to Pesth, where he got some employment as a translator from the English and the French.

Among other works, he translated a novel by Mr. G. P. R. James. As soon as his literary labor supplied him with the means of traveling, his passion for the stage returned upon him; he went to Debreczin, and made another venture as an actor—playing the part of Othello—but failed even more completely than before. At last he had the good fortune to be invited to contribute to a newspaper at Pesth—the *Devallap*—and he immediately closed with the proposal. He made his way on foot from Debreczin to Pesth—a distance of nearly 200 miles—wearing shoes padded with straw, and carrying in his bosom a MS. volume of verses, his whole provision for the journey consisting of two florins, which he got from an old school-fellow. It was on his arrival at Pesth that he exchanged the name of Petrovich for Petöfi Within a few weeks of his arrival, he had troops of friends and a reputation.

He introduced himself to Vörösmarti, then the most popular poet of Hungary, who received the shabbily-dressed stranger coldly, and did not readily consent to listen to his verses. But when he had listened, he expressed his admiration warmly. 'Hungary,' he exclaimed, 'never had such lyrics: you must be cared for.' And from that time, he treated P. as a son, and never rested until his merits were fully acknowledged by his countrymen. P. was almost at once received into the Literary National Circle, at the expense of which was published his *Versek*, which appeared in 1844. This was soon followed by other volumes, which succeeded each other with amazing rapidity; all of them, though regarded as vulgar by some of the critics, obtaining an unbounded popularity; so that it was said of P. that 'he never went to bed at night, he never arose in the morning, without hearing his songs from the multitudinous passengers in the public streets.' He sprang almost at a bound into a position in Hungary similar to that which Burns holds in Scotland—that at once of the greatest poet and the representative man of his country.

In 1848, when the revolutionary movement which spread over Europe, began to affect the Hungarians, his energies and enthusiasm found a more useful direction; he became, by speech and pen, the advocates of the independence of Hungary. He was for some time a member of the Diet, but in October 1848, he became a captain in the Hungarian army; and in the beginning of 1849, he was appointed adjutant and secretary to General Bem. He was present at the battle of Segesvár, fought on July 31, 1849, in which Bem's army was defeated with great slaughter; and he was never heard of after that battle. It is believed that he was trampled to death in the flight, and that his body, so defaced as to escape recognition, was buried with the multitude of Magyar dead left upon the field. His countrymen long believed that he was not dead, but a prisoner in an Austrian dungeon; and it is said that among the peasantry this belief is cherished still. Several false Petöfis have made their appearance since his death, and much spurious poetry has been published under his name. Lately, however, his countrymen have subscribed for the erection of a monument to his memory, and have purchased, with a view to its preservation, the house in which he was born at Little Körös. He left a widow—who married again—and one son. His brother, STEPHEN, has gained some reputation as a poet.

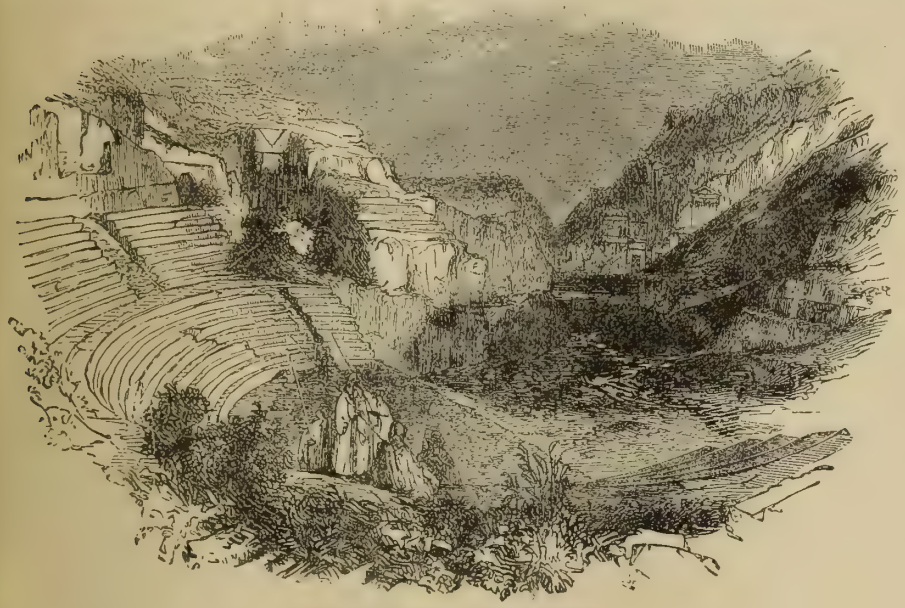
His poems, 1775 in number, were published in ten volumes. Most of them are lyrics, of which he published several collections, under the titles, *Cypress Leaves on Etelka's Grave; Pearls of Love; Starless Nights; Clouds.* The most celebrated of his narrative poems—also the longest—are, *Janos, the Hero;* and *Istok, the Fool.* His earliest work was *The Village Hammer*, published in 1843; his latest, *The Assessor of the Judgment-seat*, which appeared in 1849. A volume, containing a poem entitled *The Apostle*, was suppressed by the Austrian government after the pacification of Hungary. P. published a novel, *The Hangman's Rope*, which was by no means successful, and several volumes of tales, criticisms, and sketches of travels; and he translated largely from English and French into the Magyar.

A selection from his earlier pieces, translated into German, was published in 1845; and several volumes of translations from his writings have since appeared in Germany. They have also been translated into French, Flemish, Polish, Danish, and Italian; and an English version, comprising his finest poems, was published in 1866 by Sir John Bowring. The quality of his poetry has been as fully recognized among foreigners as among his countrymen: thus, Grimm declared that 'Petöfi will rank among the very greatest poets of all times and tongues;' Henry Heine spoke rapturously of his 'rustic song, sweeter than that of the nightingale;' and Uhland avowed that only old age could prevent his learning Magyar, that he might enjoy P. in his native dress.

PE'TRA (Heb. SELA, both names signify 'Rock') was anciently the capital of the Nabathæans, and was situated in the 'desert of Edom' in Northern Arabia, about 72 miles north-east of Akabah—a town at the head of the Gulf of Akabah, an arm of the Red Sea. It occupied a narrow rocky valley overhung by mountains, the highest and most celebrated of which is Mount Hor, where Aaron, the first Hebrew high-priest, died, and was thus in the very heart of the region hallowed by the forty years' wanderings of the Israelites. The aboriginal inhabitants were called *Horim* ('dwellers in caves'). It was then conquered by the Edomites or Idumeans (but it never became their capital); and, in the 3d or 4th c. B.C., it fell into the hands of the Nabathæans, an Arab tribe, who carried on a great transit-trade between the eastern and western parts of the world. It was finally subdued by the Romans in 105 A.D., and afterwards became the seat of a metropolitan; but was destroyed by the Mohammedans, and for 1200 years its very site remained unknown to Europeans. In 1812, Burckhardt first entered the valley of ruins, and suggested that they were the remains of ancient Petra. Six years later, it was visited by Messrs. Irby, Mangles, Banks, and Leigh, and in 1828 by M.M. Laborde and Linant, and since then by numerous travelers and tourists to the East, as Bartlett, Porter, and Dean Stanley.

Laborde's drawings give us a more vivid impression of the ruins of P. than any descriptions, however picturesque. These ruins stand in a small open irregular basin, about half a mile square, through which runs a brook, and are best approached by

an extraordinary chasm or ravine, called the Sîk, narrowing as it proceeds till in some places the width is only 12 feet, while the rocky walls of red-sandstone tower to the height of 300 feet. Hardly a ray of light can pierce this gloomy gorge, yet it was once the highway to P., and the remains of an ancient pavement can be traced beneath the brilliant oleanders that now cover the pathway. All along the face of the rocky walls are rows of cave-tombs, hewn out of the solid stone, and ornamented with façades. These are also numerous elsewhere. Originally, they were probably dwellings of the living, not of the dead—a supposition justified by an examination of their interior; but when the Nebathæans built the city proper in a little basin of the hills, they were in all likelihood abandoned, and then set apart as the family-sepulchres of those who had formerly been 'dwellers in the clefts of the rocks.' The principal ruins are—1. *El-Khuzneh* ('the Treasure-house'), believed by the natives to contain, buried somewhere in its sacred enclosure, the treasures of Pharaoh. It directly faces the mouth of the gorge we have described, and was the great temple of the Petræans. 2. *The Theatre*, a magnificent building, capable of containing from 3000 to 4000 spectators. 3. *The Tomb with the Triple Range of Columns*. 4. *The Tomb with Latin Inscription*. 5. *The deer* or *Convent*, a huge monolithic temple hewn out of the side of a cliff, and facing Mount Hor. 6. *The Arcopolis*. 7. *Kusr Farôn*, or Pharaoh's palace, the least incomplete ruin of Petra. Most of the architecture is Greek, but there are also examples of the influence of Egypt, pyramidal forms being not unknown.



Petra—Mount Seir —From Laborde.

PETRARCA, Francesco, the first and greatest lyric poet of Italy, was the son of a Florentine notary named Petracco, who belonged to the same political faction as the poet Dante, and went into exile along with him and others in 1302. Petracco took up his residence at Arezzo, and here the future poet was born in the month of July 1304. His original name was Francesco di Petracco, which he subsequently changed to that by which he is now known. When P. was about eight years of age, his father removed to Avignon, where the papal court was then held; and here, and at the neighboring town of Carpentras, the youth studied grammar, rhetoric, and dialectics. Contrary to his own inclination, but in compliance with the wish of his father, he spent seven years in the study of law at Montpellier and Bologna; but in 1326 his father died, and P. now devoted himself partly to the gaieties of Avignon, and partly to classical studies, or rather to the study of the Latin classics, as it was only towards the end of his life that he attempted to master Greek. At this time, he ranked among his friends, the jurist Soranzo, John of Florence, the apostolic secretary, Jacopo Colonna, Bishop of Lombes in Gascony, and his brother, the Cardinal Giovanni, Azzo da Corregio, lord of Parma, and many other noble and learned personages. His illustrious admirers—among whom were emperors, popes, doges, kings, and sovereign-dukes—obviously thought themselves honored by their intimacy with the son of a poor notary, and some were even forward in proffering him their favor. But the great event in P.'s life (viewed in the light of its literary consequences) was his tenderly romantic and ultimately pure passion for Laura—the golden-haired, beautiful Frenchwoman. Some slight obscurity still hangs over his relation to this lady, but it is almost certain that she was no less a paragon of virtue than of loveliness. He met her on the 6th of April 1327 in the church of St. Clara in Avignon, and at once and for ever fell deeply in love with her. The lady was then 19, and had been married for two years to a gentleman of Avignon, named Hugues de Sade.

For ten years, P. lived near her in the papal city, and frequently met her at church, in society, at festivities, &c. He sung her beauty and his love in those sonnets whose mellifluous conceits ravished the ears of his contemporaries, and have not yet ceased to charm. Laura was not insensible to a worship, which made an emperor (Charles IV.) beg to be introduced to her, and to be allowed to kiss her forehead; but she seems to have kept the too-passionate poet at a proper distance. Only once did he dare to make an avowal of his love in her presence, and then he was sternly reproved. In 1338, P. withdrew from Avignon to the romantic valley of Vaucluse, where he lived for some years, spending his time almost solely in literary pursuits. A most brilliant honor awaited him at Rome, in 1341, where, on Easter-day, he was crowned in the Capitol with the laurel-wreath of the poet. The ceremonies which marked this coronation were a grotesque medley of pagan and Christian representations. P. was, however, as ardent a scholar as he was a poet; and throughout his whole life, he was occupied in the collection of Latin MSS., even copying some with his own hand. To obtain these, he traveled frequently throughout France, Germany, Italy, and Spain. His own Latin works were the first in modern times in which the language was classically written. The principal are his *Epistolæ*, consisting of letters to his numerous friends and acquaintances, and which rank as the best of his prose works; *De Vitis Virorum Illustrium; De Remediis utriusque Fortunæ; De Vita Solitaria; Rerum Memorandarum Libri IV.; De Contemptu Mundi*, &c. Besides his prose-epistles, P. wrote numerous epistles in Latin verse, eclogues, and an epic poem called *Africa*, on the subject of the second Punic War. It was this last production which obtained for him the laurel-wreath at Rome.

P., it may be mentioned, displayed little solicitude about the fate of his beautiful Italian verse, but built his hope of his name being remembered on his Latin poems, which, it has been said, are now only remembered by his name. In 1353 he finally left Avignon, and passed the remainder of his life in Italy—partly at Milan, where he spent nearly ten years, and partly at Parma, Mantua, Padua, Verona, Venice, and Rome. At last, in 1370, he removed to Arquà, a little village prettily situated among the Euganean Hills, where he spent his closing years in hard scholarly work, much annoyed by visitors, troubled with epileptic fits, not overly rich, but serene in heart, and displaying in his life and correspondence a rational and beautiful piety. He was found dead in his library on the morning of the 18th July 1374, his head dropped on a book!—P. was not only far beyond his age in learning, but had risen above many of its prejudices and superstitions. He despised astrology, and the childish medicine of his times; but, on the other hand, he had no liking for the conceited scepticism of the medieval *savants;* and, in his *De sui Ipsius et multorum aliorum Ignorantia*, he sharply attacked the irreligious speculations of those who had acquired a shallow free-thinking habit from the study of the Arabico-Aristotelian school of writers, such as Averrhoes. P. became an ecclesiastic, but was contented with one or two inconsiderable benefices, and refused all offers of higher ecclesiastical appointment.—The Italian lyrics of P.—the chief of which are the *Rime* or *Canzoniere*, in honor of Laura—have done far more to perpetuate his fame than all his other works. Of Italian prose, he has not left a line.

The *Rime*, consisting of sonnets, canzonets, madrigals, were composed during a period of more than forty years; and the later ones—in which P.'s love for Laura, long since laid in her grave, appears purified from all earthly taint, and beautiful with something of a beatific grace—have done as much to refine the Italian language as the *Divina Commedia* of Dante. Of his *Rime*, there have been probably more than 300 editions; the first that of Venice, 1470; the most accurate, that by Marsand (Padua, 1819; Eng. trans. by Macgregor, (1851). Collective editions of his works have been published (Basel, 1495, 1554, and 1581 *et seq.*). Of numerous lives of him the principal are those of Bellutello, De Sades, Tiraboschi, Ugo Foscolo, and Geiger (1874); in Eng. Campbell (1841); Reeve in *Modern Classics for Eng. Readers* (1878).

PE'TREL (*Procellaria*), a genus of birds, sometimes ranked among *Laridæ* (q. v.), and sometimes constituted into a separate family, *Procellaridæ*, which is now subdivided into several genera, and distinguished by having the bill hooked at the tip, the extremity of the upper mandible being a hard nail, which appears as if it were articulated to the rest, the nostrils united into a tube which lies along the back of the upper mandible, and the hind-toe merely rudimentary. They possess great power of wing, and are among the most strictly oceanic of birds, being often seen at great distances from land. Among the *Procellaridæ* are reckoned the Fulmars (q. v.), Shearwaters (q. v.), &c., and the small birds designated PETRELS, of which the Stormy Petrel is a familiar example. These form the genus *Thalassidroma* of recent ornithological systems, the name (Gr. sea-runner) being given to them in allusion to their apparent running along the surface of the waves, which they do in a remarkable manner, and with great rapidity, particularly when the sea is stormy, and the molluscs and other animals forming their food are brought in abundance to the surface—now descending into the very depth of the hollow between two waves, now touching their highest foamy crests, and flitting about with perfect safety and apparent delight. Hence also their name Petrel, a diminutive of Peter, from the apostle Peter's walking on the water.

From the frequency with which flocks of these birds are seen in stormy weather, or as heralds of a storm, they are very unfavorably regarded by sailors. They have very long and pointed wings, passing beyond the point of the tail; and the tail is square in some, slightly forked in others. Their flight much resembles that of a swallow. They are to be seen in the seas of all parts of the world, but are more abundant in the southern than in the northern hemisphere. The names Stormy P. and Mother Carey's Chicken are sometimes more particularly appropriated to *Thalassidroma pelagica*, a bird scarcely larger than a lark, and the smallest web-footed bird known, of a sooty black color, with a little white on the wings and some near the tail. Two or three other species are occasionally found on the British shores; one of which, the Fulmar P., breeds on the rocks of the Scilly Isles, St. Kilda, the Orkneys, Shetland Isles, &c. Like many others of the family, it generally has a quantity of oil in its stomach, which, when wounded or seized, it discharges by the mouth or nostrils; and of this the people of St. Kilda take advantage, by seizing the birds during incubation, when they sit so closely as to allow themselves to be taken with the hand, and collecting the oil in a vessel.

PETRIFA'CTION, a name given to organic remains found in the strata of the earth, because they are generally more or less mineralized or made into stone. The word has fallen very much into disuse, having given place to the terms Fossil (q. v.) and Organic Remains.

PETROI'CA, a genus of birds of the family *Sylviadæ*, natives of Australia, nearly allied to the Redbreast, and to which its familiar name *Robin* has been given by the colonists. The song, call-note, and manners of *P. multicolor*, a species abundant in all the southern parts of Australia, very much resemble those of the European bird, but its plumage is very different: the male having the head, throat, and back jet-black, the forehead snowy-white, one longitudinal and two oblique bands of white on the wings, and the breast bright scarlet; the female is brown, with red breast. There are several other species, birds of beautiful plumage.

PETRO'LEUM. See NAPHTHA. In consequence of the danger attending the storing and keeping of petroleum, an act of parliament was passed in 1861 (25 and 26 Vict. c. 66) to regulate the subject, putting it on a similar footing to gunpowder. A license is required to keep large quantities, which is obtained in England from the aldermen of the city of London, the metropolitan board, the mayor and aldermen of boroughs, or the harbor commissioners, according to the locality where it is proposed to be kept; and in other places, in England and Scotland, from two justices of the peace. If the license is refused, the party may appeal to the Home Secretary. Not more than forty gallons must be kept within fifty yards of a dwelling-house or a warehouse for goods, except in pursuance of a license, under a penalty of £20 per day. One moiety of the penalty is given to the informer. A search-warrant may be obtained from justices, in case it is suspected that the act is violated.

PETRO'LOGY (Gr. science of rocks), a term recently introduced into geology to designate particular aspects of the study of rocks, apart from their organic contents. By some, it is confined to an examination of their structure and composition; by others, it is extended to the study of rock-masses, their planes of division, their forms, their position and mutual relations, and other characters not bearing on the question of the geological time of their production.

PETROMY'ZON. See LAMPREY.

PE'TRONEL, an ancient and clumsy description of pistol.

PETRO'NIUS, C., a Roman voluptuary at the court of Nero, whose profligacy is said to have been of the most superb and elegant description. We know, however, very little about him. He was at one time proconsul of Bithynia, was subsequently appointed consul, and is certified as having performed his official duties with energy and prudence. But his grand ambition was to shine as a court-exquisite. He was a kind of Roman *Brummell*, and Nero thought as highly of him as did the Prince Regent of the famous Beau. He was entrusted by his imperial master and companion with the charge of the royal entertainments, and thus obtained (according to Tacitus) the title of *Arbiter Elegantiæ*. Nero would not venture to pronounce anything *comme il faut*, until it had received the approval of the oracle of Roman fashion. The influence which he thus acquired was the cause of his ruin. Tigellinus, another favorite of Nero, conceived a hatred of P., brought false accusations against him, and succeeded in getting his whole household arrested.

P. saw that his destruction was inevitable, and committed suicide (66 B.C.), but in a languid and graceful style, such, he thought, as became his life. He opened some veins, but every now and then applied bandages to them, and thus stopped the flow of blood, so that he was for a while enabled to gossip gaily with his friends, and even to appear in the streets of Cumæ before he died. We are told that he wrote, sealed, and despatched to Nero, a few hours before his death, a paper containing an account of the tyrant's crimes and flagititious deeds. It has been generally supposed that P. is the author of a well-known work entitled, in the oldest MSS., *Petronii Arbitri Satyricon*, a series of fragments belonging apparently to a very extensive comic novel or romance (see NOVELS), the greater portion of which has perished, but there is really no satisfactory evidence to show whether or not he was so. It is probable, however, that the work belongs to the 1st c. A. D. The fragments exhibit a horrible picture of the depravity of the times; but there is no indication that the author disapproves of what he describes. The *editio princeps* of the fragments appeared at Venice in 1499; later editions are those of Burmann (Traj. ad. Rhen. 1709; 2d. edit. Amst. 1743), and of Antonius (Leip. 1781).

PETROPAVLO'VSK, a town of Asiatic Russia, in the province of Akmollinsk, on the river Ishim, 175 m. W.N.W. of Omsk. Pop. (1867) 8220. It is an important military station, and has a cannon-foundry. A large trade is carried on.—P. is also the name of a small port of Russian Siberia, near the mouth of the river Avatcha. Pop. (1867) 479.

PETRO'VSK, a town of Russia, in the province of Saratov, 55 miles north-west of Saratov, situated on the Medvieditza, a tributary of the Don. Pop. (1880) 11,000.

PETROZAVO'DSK, an important mining-town in the north of European Russia, capital of the government of Olonetz, stands on the western shore of Lake Onega, 300 miles by water north-east of St. Petersburg. A cannon-foundry was erected here in 1701 by Peter the Great, who himself had discovered the rich resources of this northern region in iron and copper ores. The town itself dates from the year 1703; and from that to the present time it has been the great center of the mining industry of the government. The Alexandrovsky arms-factory is specially deserving of notice. It was founded in 1773, and, besides other arms, it has produced many thousand pieces of cast-iron ordnance. Works are also fitted up for the preparation of steel. Wood abounds in the vicinity, and there is easy communication by water with St. Petersburg. Pop. (1867) 10,910.

PETSH, or IPEK (i. e., silk), a town of European Turkey, in Albania, stands on the Bistritza, or White Drin, 70 miles north-east of Scutari. It is a pleasant town; the houses are large and handsome, and, as a rule, have gardens attached, in which fruit and mulberry-trees are cultivated. Water, from the river, is led up into all the houses. Silk is extensively made, tobacco and fruits are largely cultivated, and arms manufactured. P. was formerly the residence of the Servian patriarchs. Pop. upwards of 16,000.

PETTY BAG OFFICE, one of the branches of the Court of Chancery, was abolished in 1874, and its duties were transferred. The clerk of the petty bag, an officer appointed by the Master of the Rolls, drew up writs of summons to parliament, *Congés d'élire* for bishops, writs of *Scire facias*, and all original writs. A great deal of miscellaneous business was also transacted in the petty bag office, which the Lord Chancellor and Master of the Rolls were empowered to regulate and transfer from time to time. By the Act of 37 and 38 Vict. c. 81, these various duties have devolved on the Clerk of the Crown in Chancery, and on officers of the Supreme Court.

PETTY OFFICERS, in the royal navy, are an upper class of seamen, analogous to the non-commissioned officers in the army. They comprise the men responsible for the proper care of the several portions of the ship, the foremen of artificers, the signal-

men, and many others. They are divided into three classes: chief petty officers, at 2*s*. 5*d*. to 6*s*. a day; first-class working petty officers, at 2*s*. 2*d*. a day; and second-class working petty officers at 2*s*. a day. Petty officers are appointed and can be degraded by the captain of the ship. Her efficiency much depends on this useful class of sailors.

PETTY SESSIONS is the court constituted by two or more justices of the peace in England, when sitting in the administration of their ordinary jurisdiction. Though for many purposes statutes enable one justice to do acts auxiliary to the hearing and adjudication of a matter, yet the jurisdiction to adjudicate is generally conferred upon the justices in petty sessions, in which case there must be at least two justices present, and this is called a petty sessions, as distinguished from quarter sessions, which generally may entertain an appeal from petty sessions. For the purpose of securing always sufficient justices, the whole of the counties of England are subdivided into what are called petty sessional divisions, those justices who live in the immediate neighborhood being the members who form the court of such division. This subdivison of counties is confirmed by statute, and the justices at quarter sessions have power from time to time to alter it. Each petty sessions is held in some town or village which gives it a name, and a police-court or place is appropriated for the purpose of the sittings of the court. There is a clerk of each petty sessions, usually a local attorney, who advises the justices, and issues the summons and receives the fees made payable for steps of the process. The justices in petty sessions have a multifarious jurisdiction, which they exercise chiefly by imposing penalties authorized by various acts of parliament, as penalties against poachers, vagrants, absconding workmen and apprentices, &c. They also have jurisdiction to hear charges for all indictable offences, to take depositions of witnesses, and, if they think a case of suspicion is made out, to commit the party for trial at the quarter sessions or assizes, and to bind over the witnesses to attend. See also JUSTICE OF THE PEACE.

PETU'NIA, a genus of plants of the natural order *Solanaceæ*, natives of the warmer parts of America. They are herbaceous plants, very nearly allied to Tobacco, and with a certain similarity to it in the general appearance of the foliage, which has also a slight viscidity, and emits when handled a disagreeable smell, but the flowers are very beautiful, and varieties improved by cultivation are amongst the favorite ornaments of our greenhouses and flower-borders. The petunias, although perennial, are very often treated as annuals, sown on a hot-bed in spring, and planted out in summer, in which way they succeed very well even in Scotland. They are tall plants, with branching weak stems, and may readily be made to cover a trellis. Although, when treated as greenhouse plants, they become half-shrubby, they do not live more than two or three years. The name P. is from the Brazilian *Petun*. The first P. was introduced into Britain in 1825.

PETU'NTZE, a white earth used by the Chinese in the manufacture of porcelain, and said to consist of comminuted but undecomposed felspar. It is fusible, and is used for glazing porçelain.

PE'TWORTH, or SUSSEX MARBLE, is a thin layer of limestone, composed of the shells of fresh-water Paludinæ. It has been long, but not extensively used for ornamental purposes. A polished slab of it was found in a Roman building at Chichester, and pillars formed of it exist in the cathedrals of Chichester and Canterbury.

PEUTINGERIAN TABLE, the name given to a most interesting ancient document, which exhibits the military roads of the Roman Empire, and indeed of the world known to the Romans. It is not, properly speaking, a map; no regard being paid to geographic position, or the extent of countries. The great lines of road are laid down in a narrow strip, as if nearly parallel, all proceeding from Rome as a center; and as to rivers, it only appears whether they cross the road from left to right or from right to left of the traveler proceeding from Rome. The Mediterranean and other seas are represented by mere narrow channels. A small house is the mark for a town; important towns and military stations are distinguished by walls and towers. Rome, Constantinople, and Antioch are each represented by a circle, within which is a human figure seated; in the case of Rome, the figure is crowned. Until very recently, a portion of the only copy of this valuable relic of antiquity known to exist was evidently wanting, as it terminated abruptly on the west at the confines of Spain, and included only the eastern parts of Britain. In the east, it traces roads through India to a number of places of trade as far as the mouth of the Ganges. It is on parchment, and as described in all the publications devoted to it, twenty-one feet in length, and about one foot wide. It was found in the library of the Benedictine monastery at Tegernsee, in Upper Bavaria, in the 15th c., by Conrad Celtes, who bequeathed it to Conrad Peutinger of Augsburg, a zealous antiquary, and one of the earliest authors on the Roman and other antiquities of Germany. Peutinger began to prepare a copy of it for publication, but died before he could accomplish his purpose, which, however, was partially executed by Mark Welser, in his *Fragmenta Tabulæ Antiquæ ex Peutingerorium Bibliotheca* (Venice 1591).

The ancient document itself remained in the hands of the Peutinger family and attracted no further notice, till it was offered for sale in 1714, and purchased by Prince Eugene, who presented it to the Imperial Library of Vienna, in which it still remains. An exact copy of it was published at Vienna in 1753, with an introduction and index by F. C. von Scheyb. It was again published as an appendix to Katancsich's *Orbis Antiquus* (Ofen. 1825); and at the request of the Academy of Munich, a revised edition, with an introduction, was published by Conrad Mannert (Leip. 1824). Since that time, a leaf detached from the rest has been found in the Imperial Library at Vienna, but we are not aware that any particular account of it or its contents has yet been given to the public.

The Peutingerian Table does not always agree with the Antonine Itinerary (see ITINERARY); some stations and towns being marked in the one which are not in the other, the distances marked being also sometimes different. But the two together throw great light on ancient geography. It appears almost certain from internal evidence that the Peutingerian Table belongs to the third century of the Christian era, or the beginning of the fourth, although the existing copy seems to belong to a later date. The general character of the work seems to show that its authorship is to be referred to times of prevalent paganism; whilst a few things appear, probably alterations or insertions of a copyist, which refer to Christianity.

PEWS (anciently *pues;* Old Fr. *puys;* Dutch *puyes;* Lat. *podium*, 'anything on which to lean;' *s'appuyer*), enclosed seats in churches. Church-seats were in use in England some time before the Reformation, as is proved by numerous examples still extant, the carving on some of which is as early as the Decorated Period, i. e., before 1400 A.D.; and records as old as 1450, speak of such seats by the name of *pues*. They were originally plain fixed benches, all facing east, with partitions of wainscoting about three feet high, and sides of the width of the seat, panelled or carved; the sides sometimes rising above the wainscoting, and ending in finials or poppies, or else ranging with it and finished with a moulding. After the Reformation, probably under the influence of the Puritans, who, objecting to some parts of the service which they were compelled to attend, sought means to conceal their nonconformity, pews grew into large and high enclosures, containing two or four seats, lined with baize, and fitted with doors, desks, and cushions. Pews were early assigned to particular owners, but at first only to the patrons of churches. A canon made at Exeter in 1287, rebukes quarrelling for a seat in church, and decrees that none shall claim a seat as his own except noblemen and the patrons. Gradually, however, the system of appropriation was extended to other inhabitants of the parish, to the injury of the poor, and the multiplication of disputes.

The law of pews in England is briefly this. All church-seats are at the disposal of the bishop, and may be assigned by him, either (1) directly by faculty to the holders of any property in the parish; or (2) through the churchwardens, whose duty it is, as officers under the bishop, to 'seat the parishioners according to their degree.' In the former case, the right descends with the property, if the faculty can be shown, or immemorial occupation proved. In the latter, the right can at any time be recalled, and lapses on the party ceasing to be a regular occupant of the seat. It appears that by common law every parishioner has a right to a seat in the church, and the churchwardens are bound to place each one as best as they can. The practice of *letting* pews, except under the church-building acts, or special local acts of parliament, and, much more, of *selling* them, has been declared illegal.

In Scotland, pews in the parish churches are assigned by the heritors (q. v.) to the parishioners, who have accordingly the preferable claim on them; in towns the practice is to let them annually. As is well known, pews in dissenting churches are rented as a means of revenue to sustain general charges. In some parts of the United States, pews in churches are a matter of annual competition, and bring large sums. Latterly, in England, there has been some discussion as to the injuriously exclusive character of the 'pew system,' and a disposition has been manifested to abolish pews altogether, and substitute movable seats available by all indiscriminately. Several pamphlets have appeared on the subject. In the Roman Catholic churches on the Continent pews are seldom to be seen.

PEW'TER, a common and very useful alloy of the metals, tin and lead. Two other kinds of pewter have a more compound character. Common, or *ley-pewter*, consists of 4 parts of tin and 1 part of lead; *plate-pewter* is made of 100 parts of tin, 8 parts of

antimony, 2 parts each of bismuth and copper; another kind, called *trifle*, is composed of 83 parts of tin and 17 parts of antimony. Although these are the standard formulas, each kind is often much varied to suit the purposes of the manufacturer; the chief alteration being the addition of a large proportion of lead to the last, and a large increase of the same metal in the other two.

PÉZÉNAS, a manufacturing town of France, in the department of Herault, on the left bank of the river of that name, 25 miles west-south-west of Montpellier. It stands in a district remarkable for its beauty, and so well cultivated as to have received the name of the Garden of Herault. It is famous for its healthy climate and clear sky. The vicinity produces excellent wine, and woollen and linen goods are manufactured. The trade, however, is chiefly in liquors, and P. is known as one of the principal brandy-markets of Europe. Pop. (1876) 7570.

PFE'FFERS an extraordinary and much-visited locality in the Canton of St. Gall, Switzerland, five miles south-east of Sargans. It has been famous since the middle of the 11th c. for its hot baths, situated 2180 feet above sea-level, and 520 feet above the village of Ragatz. The old baths of P. are built on a ledge of rock a few feet above the roaring torrent of the Tamina, and are hemmed in by walls of rock towering above them to the height of 600 feet, and so far burying the baths within the gorge, that even in the height of summer sunlight appears above them only from ten to four. Above the old baths the walls of the ravine of the Tamina contract until they meet, covering up the river, which is there seen from a cavernous gap. The hot-springs are reached from the baths by means of a railed platform. This platform, leading to the hot spring, is secured to the rocks, and the Tamina churns its way through the cleft 30 or 40 feet below. The waters of the hot spring are now conveyed to Ragatz (about two miles below P.) by wooden pipes, 12,500 feet long. The waters, as they issue from the spring, have a temperature of 100° Fahr. A pint of the water, which is used both for drinking and bathing, contains only about three grains of saline particles.

PFEIFFER, IDA (*née* REYER), a celebrated female traveler, was born at Vienna, October 15, 1797, and from her earliest years showed a resolute and fearless, but not unfeminine disposition. In 1820, she married an advocate, named Pfeiffer, from whom she was obliged to obtain a separation, after she had borne him two sons, Oscar and Alfred, whose education devolved on herself. When she had settled them in life, and was free to act as she pleased, she at once proceeded to gratify, at the age of 45, her long-cherished inclination for a life of travel and adventure. Her first expedition was to the Holy Land. She left Vienna in March 1842, and returned in December of the same year, having traversed, alone and without guide, European and Asiatic Turkey, Palestine, and Egypt. She published an account of her eastern rambles in the following year (*Reise einer Wienerinn in das Heilige Land*), which, like all her other works, has gone through many editions, and been translated into French and English. In 1845, she visited Northern Europe—Sweden, Norway, Lapland, and Iceland—and recorded her impressions in her *Reise nach dem Skandinawisch, Norden und der Insel Island* (2 vols. 1846). But these journeys, which would have satisfied most women, were but little excursions in the eyes of this insatiable nomade, and only served to whet her appetite for something vaster. She resolved on a voyage round the world; and on the 28th of June 1846, sailed from Hamburg in a Danish brig for Brazil. Her descriptions of the scenery of that country and of the inhabitants—both native Indians and Brazilians—are exceedingly interesting. She then sailed round Cape Horn to Chile, and thence, after some time, across the Pacific to Otaheite, China, and Calcutta; crossed the Indian peninsula to Bombay, whence she took ship for the Persian Gulf, landed at Bassora, traversed a great part of Western Asia, Southern Russia, and Greece, and re-entered Vienna, November 4, 1848.

Two years later, she published a narrative of her travels and adventures, entitled *Eine Frauenfahrt um die Welt* (Vienna, 1850, 3 vols.). As a small recognition of her services, and of the singular energy, fortitude, and perseverance of her character, the Austrian government granted Madame P. a sum of £100. She now determined to go round the world again, but by a different route. Proceeding to England, she in May 1851, took ship for Sarawak, rounding the Cape of Good Hope, penetrated alone to the heart of Borneo, visited Java and Sumatra, lived for a time with some cannibal tribes, and sailed from the Moluccas to California, thence to Peru, scaled the peaks of Chimborazo and Cotopaxi, made a run through the principal of the United States, and returned to London in 1854. The second voyage, signalized by several scientific observations, is described in *Meine Zweite Weltreise* (Vien. 1856). But the more she traveled, the fiercer became her hunger for movement. In September 1856, she set out on what was to be her last expedition—namely, to Madagascar. After enduring terrible hardships, she got away, and came home to Vienna—to die. Her death took place October 28, 1858.

PFO'RZHEIM, an important manufacturing town of the Grand Duchy of Baden, on the northern border of the Black Forest, stands on the Enz, at its confluence with the Nagold and Wurm, 55 miles S.S.E. of Mannheim, and on a recently constructed branch of the Mannheim and Basel Railway. Its trade has been greatly advanced by its position at the intersection of several minor lines of railway. P. contains the remains of an ancient castle, formerly the residence of the Markgrafs of Baden-Durlach; several churches, one of which, the *Schlosskirche*, on a height contains a number of monuments, with marble statues of the princes of Baden; a convent for noble ladies; industrial and other schools; chemical and iron-works; machine-shops, tanneries, and cloth and other factories. The principal articles of manufacture are gold and silver wares and trinkets, the chief markets for which are Germany and America. An important trade is carried on in timber, which is cut in the neighboring forests, and is floated down to Holland by the Neckar and Rhine. Pop. (1871) 19,801; (1875) 23,537.

PHÆ'DRUS, a Latin poet, whose works consist of fables. He was probably a Thracian or Macedonian, carried to Rome as a slave in his childhood, and brought up at the court of Augustus, who emancipated him. Under Tiberius, he was exposed to great danger from the hostility of Sejanus, but lived to see that general's overthrow, and died at an advanced age, probably in the reign of Claudius. Five books of fables, after the manner of Æsop, and called *Fabulæ Æsopiæ*, have been usually ascribed to him. The faults of the style have led, however, to the suspicion, not merely of alterations at a later date, but of later, and even much later, composition. The dry 'morals' have been supposed to indicate the Middle Ages as the period to which the work should probably be referred; but its authenticity is generally admitted. The first edition was published at Troyes in 1596. The text has subsequently occupied the attention of some of the greatest scholars and critics, from the days of Burmann and Bentley to the present time. A sixth book, containing 32 fables, has recently been discovered and published, of the authenticity of which, however, there are greater doubts than of that of the other books. The best edition is that of J. C. Orelli (Zürich, 1831).

PHÆNO'GAMOUS PLANTS. See PHANEROGAMOUS PLANTS.

PHAËTHON (i. e., the shining), in the writings of Homer and Hesiod, a frequent title of Helios the sun-god, and subsequently employed as his name.—P., in Greek mythology, is also the name of a son of Helios, famous for his unfortunate attempt to drive his father's chariot. Scarcely had the presumptuous youth seized the reins, when the horses, perceiving his weakness, ran off, and approaching too near the Earth, almost set it on fire. Whereupon the Earth cried to Jupiter for help, and Jupiter struck down P. with a thunderbolt into the Eridanus or Po. His sisters, the Heliades, who had harnessed the horses of the Sun, were changed into poplars, and their tears into amber.

PHAGEDÆ'NA (Gr., from *phagein*, to eat or corrode), designates a variety of ulceration in which there is much infiltration, and at the same time rapid destruction of the affected part. The sore presents an irregular outline, and a yellowish surface; it gives off a profuse bloody or ichorish discharge, and is extremely painful. It usually attacks persons whose constitutions are vitiated by scrofula, by the syphilitic virus, by the abuse of mercury, by intemperance, &c. It not very unfrequently appears in the throat after scarlatina in a severe form. If relief is not afforded by the internal administration of opium (to allay the pain), and of quinia, or some other preparation of bark, wine, beef-tea, &c. to improve the tone of the constitution, together with astringent and sedative local applications, recourse must be had to the destruction of the part by strong nitric acid, or some other caustic.

The terrible disease known in civil practice as SLOUGHING PHAGEDÆNA, and in military and naval practice as HOSPITAL GANGRENE, is merely, according to some of our highest surgical authorities, a state of phagedæna in its fullest development. This disorder requires for its development the influence of some of those undefined causes which regulate the outbreak of epidemics, and is peculiarly characterized by its contagious and infectious nature. It is usually engendered by the overcrowding of sick and wounded men, and some idea of its virulence may be formed from the fact that on the return of the French fleet from the Crimean war, no less than 60 deaths from it occurred in one ship in the course of 38 hours. It is not of frequent occurrence in the London Hospitals; but it broke out in the Middlesex Hospital in 1835, in University College Hospital in 1844, and in St. Bartholomew's and St. George's Hospitals in 1847 (Druitt's *Surgeon's Vade-mecum*, 8th ed., p. 72, *note*). For details respecting this disorder the reader is referred to Hennen's *Principles of Military Surgery*, Boggie *On Hospital Gangrene*, and the article on 'Gangrene,' by Mr. Holmes Coote in Holmes's *System of Surgery*, vol. i.

PHALACRO'CORAX. See CORMORANT.

PHALÆ'NA. See MOTH.

PHA'LANGER or PHALANGIST (*Phalangista*), a genus of marsupial quadrupeds, having a rather short head, short ears, short woolly fur, a long prehensile tail, sometimes completely covered with hair, and sometimes only at the base, and scaly towards the extremity; the dentition somewhat various as to the number of premolars, the incisors always six in the upper jaw and two in the lower, the true molars eight in each jaw, the canines of the lower jaw very small, and close to the incisors. The fore-paws are strong, and capable of much use in grasping food and bringing it to the mouth. A number of species inhabit Australia and the islands to the north of it. They live chiefly in trees, and feed on insects, small animals of various kinds, eggs, and fruits. The SOOTY P. or TAPOA (*P. fuliginosa*) is pretty common in Van Diemen's Land, and is much sought after on account of its fur, which is of a uniform smoky-black color, or tinged with chestnut, warm and beautiful. The tail is very bushy. It is nocturnal in its habits.—The VULPINE P. (*P. vulpina*), also called the VULPINE OPOSSUM, is very plentiful and widely diffused in Australia. The length of the animal from the point of the muzzle to the root of the tail is about 26 inches;



Vulpine Phalanger (*P. vulpina*).

the tail is about 15 inches long, and is bushy; the color is grayish-yellow on the upper parts, and tawny-buff below. The fur is not so much valued as that of the last species, but is used for various purposes. The flesh, although it has a strong peculiar flavor, is a favorite food of the Australian aborigines.—Nearly allied to this genus, is the genus *Cuscus*, of which one species, whitish-gray, spotted with brown, is plentiful in the Molucca and Papuan Islands.—Allied to the phalangers also are the Flying Phalangers (q. v.).

PHALA'NGIDÆ, a family of Trachearian Arachnida, popularly called *Harvest-men*, some of the species appearing in great numbers in fields during the hay and corn harvests. They resemble spiders in their general form, although their organs of respiration are very different. Their legs are extremely long and slender. Most of the species are very agile.

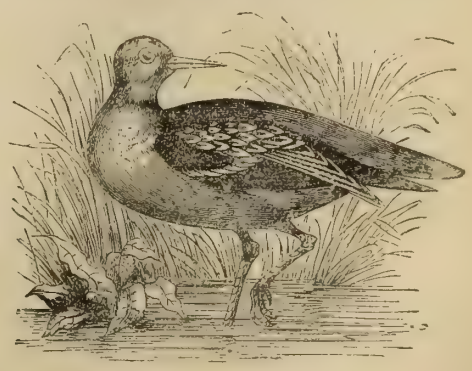
PHALANSTE'RIANISM (from Gr. signifying phalanx and solid), the system of living in communities called phalansteries, as suggested by Fourier, the French socialist. See FOURIERISM.

PHA'LANX, the ancient Greek formation for heavy infantry, which won for itself a reputation of invincibility, may be described as a line of parallel columns, rendered by its depth and solidity capable of penetrating any line of troops. The oldest phalanx was the Lacadæmonian or Spartan, in which the soldiers stood eight deep, the Athenian phalanx had been the same, until, at the battle of Marathon (480 B. C.), Miltiades reduced the depth to four men in order to increase his front. When Epaminondas organized the Theban army against Sparta, he felt that the Spartan line of battle would be impregnable to troops organized in their own manner. He therefore increased the depth and lessened the front of his phalanx, which enabled him to burst through the Spartan line, inflicting the sanguinary defeat of Leuctra (371 B. C.). Philip of Macedon had learned the art of war under Epaminondas, and when he resolved to make his state a military power, he formed the celebrated Macedonian phalanx (359 B. C.), which enabled him to conquer Greece, and with which his son Alexander subdued the eastern world. The Macedonian phalanx, as the latest form that organization assumed, and as the shape in which the phalanx encountered the military skill of the west, is deserving of description.

The line was 16 deep: a grand phalanx comprising 16,384 *hoplites*, or heavy-armed soldiers, subdivided as follows: the grand-phalanx was composed of four phalanxes or divisions, each under a general officer, called a *phalangarch;* his command was divided into two brigades or *merarchies* (sometimes called *telarchies*), each of these comprising two regiments, or *chiliarchies*, of four battalions or *syntagmata* each. A *syntagma* answered accurately to a modern battalion, except that it was smaller. It was a perfect square, with 16 men each way, was commanded by a *syntagmatarch* or *xenagos;* and had an adjutant, with one or two other staff-officers who stood behind. Eight files united were under a *taxiarch*, four under a *tetrarch*, corresponding probably to a modern captain, two files were under a *dilochite* or subaltern. A single file of 16 men was called a *lochos*, and the best man was placed at its head; a picked man, the *ouragos*, also marching in the rear. The arms of all these phalanx-men were pikes or spears, 24 feet long, of which 6 feet were behind and 18 feet held in front of the combatant. As each man occupied with his shield three feet, the phalanx, when it advanced, had six tiers of spear-point, a wall of steel which no troops could withstand, especially as the bearers of the spears were pressed on by the ten ranks in their rear. By rapid movements the phalanx could change front, form in close column of syntagmata, and execute other critical manœuvres.—The heavy-armed phalanx was ordinarily flanked by *peltastes* or light infantry, similarly formed, but only eight deep, while the cavalry were but four deep. The phalanx, as representative of the heavy formation, came in contact with the lighter legion of Rome during the wars of Pyrrhus in Italy.—At the great battle of Heraclea (279 B.C.), the phalanx won the day; but the victory was attributable to other causes as much as to any superiority of formation.

PHA'LARIS, a tyrant of Agrigentum in Sicily, who flourished about the middle of the 6th c. B.C. According to the prevalent tradition, he was infamous for his cruelty. He maintained his power for 16 years by the aid of foreign hirelings, and, it is said, by putting to death all persons of eminence in his dominions; but at last he fell a victim to popular indignation. He gratified, we are told, his love of cruelty by causing persons to be roasted alive in a brazen bull, which was made for that purpose—the first victim being the maker, Perillus. Cicero calls him the 'most cruel of all tyrants' (*crudelissimus omnium tyrannorum*). But some doubt attaches to this view of his character, partly because many of the crimes laid to his charge are intrinsically improbable, and partly because later traditions represent him as fond of literature and philosophy, and a patron of learned men. Lucian affirms that he was naturally a man of a mild and humane disposition. How far the later view should be allowed to modify the earlier, it is—in the absence of all reliable knowledge—impossible to say. It is under the later aspect that he is shown to us in the famous but spurious *Epistles of Phalaris*. See BENTLEY.

PHA'LAROPE (*Phalaropus*), a genus of birds of the family *Lobipedidæ* (q. v.); having a rather long, slender, weak, straight bill, resembling that of the sandpipers, which, indeed, they otherwise much resemble, although differing in their aquatic habits; the greater part of their time being passed in swimming on the sea, where they seek molluscs and other small marine animals for their food. The GRAY P. (*P. lobatus*), although formerly so rare a bird in Britain that Pennant says he only knew of two instances of its occurrence in his time, is now not unfrequently seen in its autumn migration from its northern abode to its southern winter-quarters. It breeds in the Arctic regions both of the old and new



Gray Phalarope (*P. lobatus*).

world, migrating southward in both on the approach of winter. Its entire length is rather more than eight inches. The tail is short. It is a beautiful bird, and remarkable for the great difference of its summer and winter plumage, the prevailing tint in winter being a delicate gray, whilst in summer the upper parts exhibit a fine mixture of black, white, and yellow, and the breast and under parts are reddish chesnut.—The RED-NECKED P. (*P. hyperboreus*, or *Lobipes hyperboreus*, a generic distinction being made by Cuvier and others, on account of the sharper and more

slender bill), breeds in some of the northern Scottish islands, although it is more common in more northern regions, and, like the former, is found in all the northern parts of the world. It is rather smaller than the Gray P., and is, like it, very graceful in form and movements, and finely colored. The phalaropes are very fearless of man, and very easily tamed. Their flesh is oily and unpalatable.

PHA'LLUS, a representation of the male generative organs, used at certain Dionysian festivals in ancient Greece, as a symbol of the powers of procreation. It was an object of common worship throughout the nature-religion of the East, and was called by manifold names, such as Linga (q. v.), Joni, Pollear, &c. Originally, it had no other meaning than the allegorical one of that mysterious union between the male and female, which throughout nature seems to be the sole condition of the continuation of the existence of animated beings, but at a later period, more particularly when ancient Rome had become the hot-bed of all natural and unnatural vices, its worship became an intolerable nuisance, and was put down by the senate on account of the more than usual immorality to which it gave rise. Its origin has given rise to much speculation, but no certainty has been arrived at by investigators. The Phœnicians traced its introduction into their worship to Adonis, the Egyptians to Osiris, the Phrygians to Attys, the Greeks to Dionysus. The common myth concerning it was the story of some god deprived of his powers of generation—an allusion to the sun, which in autumn loses its fructifying influence. The procession in which it was carried about was called Phallagogia, or Periphallia, and a certain hymn was sung on that occasion, called the Phallikon Melos. The bearers of the phallus, which generally consisted of red leather, and was attached to an enormous pole, were the Phallophoroi. Phalli were on those occasions worn as ornaments round the neck, or attached to the body. Aristotle traces the origin of comedy to the ribaldry and the improvised jokes customary on those festivals. Phalli were often attached to statues, and of a prodigious size; sometimes they were even movable. At a procession of Ptolemy Philadelphus, a phallus was carried about made of gold, and 120 yards long. Before the temple of Venus at Hierapolis there stood two phalli, 180 feet high, upon which a priest mounted annually, and remained there in prayer for seven days. The phallus was an attribute of Pan, Pirapus, and to a certain extent also of Hermes.

PHALLUS, a genus of fungi of the division *Gasteromycetes*, egg-shaped, the outer covering at length bursting to permit the growth of a stem, the receptacle which produces the spores, and which is surmounted by a rudimentary *pileus*. The most common British species, *P. Impudicus* or *fœtidus*, popularly called *Stinkhorn*, is as large as a hen's egg, growing underground in thickets, and finally sending up a stem 4—6 inches high, the fetid smell of which is felt for many yards around. The egg is full of a jelly-like substance. The growth of the stem is very rapid, and it soon decays.

PHANERO'GAMOUS (Gr. *phaneros*, manifest; *game*, marriage) PLANTS, or PHÆNOGAMOUS (Gr. *phaino*, to show) PLANTS, are those plants which have true flowers, and in which the sexual organs (stamens and pistils) are distinctly notable. They are also called FLOWERING PLANTS, being by all these names contradistinguished to Cryptogamous Plants (q. v.). The seeds of P. P. originate from Ovules (q. v.), and already contain the young plant, more or less perfectly formed, which is called the *embryo*. P. P. are about three-fourths of all known plants. Among them are included all the larger plants, and all plants of great importance in an economic point of view. They are generally divided into *Monocotyledonous* or *Endogenous Plants*, and *Dicotyledonous* or *Exogenous Plants*.

PHA'RAOH. The name given by the Hebrews to the monarch ruling in Egypt at the time, in the same manner as Cæsar was applied to the Roman emperors, and as Khan is to the Tartar and Shah to the Persian rulers. The word is of uncertain etymology, being capable of two derivations—viz., either *Pa ra*, 'the Sun,' which is the leading or first title of all Egyptian monarchs, or the popular expression, *Pi ouro*, or *Phouro*, 'the King.' It is even possible to derive it from *Pa har*, 'the Horus,' another title of Egyptian monarchs. The greatest difficulties have been encountered in attempting to determine the particular monarchs who pass under this name in the Scriptures. The first-mentioned P. is the one in whose reign Abraham visited Egypt, who is supposed by some chronologists to have been one of the Shepherd Monarchs, but nothing can be offered beyond mere conjecture in support of this theory. Another P. is the one in whose reign Joseph was brought to Egypt, and who was supposed by Eusebius to be Apophis, one of the later Shepherd Kings of the seventeenth dynasty, who are known from the monuments to have immediately preceded the eighteenth. Bunsen indeed places the arrival of Joseph in the reign of Usertesen, or, as he reads his name, Sesertesen I. of the 12th dynasty, in which indeed a famine is stated in the hieroglyphical texts to have happened, and in which it appears numerous officers were established to take charge of the grain. Arguments, however, may be adduced for Joseph having arrived in the time of the 12th dynasty, from the fact of the establishment of the family of Jacob in the land of Goshen, the importance to which Joseph had risen, and the omission of the name of any of the principal Egyptian cities in the narrative, and the fact of Joseph having married Asenath, the daughter of Potipherah, priest of Heliopolis, a city evidently the seat of the court under the 12th dynasty, as Ouar or Ovaris was under the Shepherds.

Equal difficulty is experienced in determining the P. who reduced the Israelites to bondage, employed them in the labors of the brick-field, and compelled them to build the treasure-cities of Pithom and Rameses. He appears to have meditated the total absorption of the Hebrews into the Egyptian race. All that is clear from the narrative is that the city of Rameses was called after his name, in the same manner as modern forts have been by contemporary rulers. Now frequent mention occurs in the Papyri and other texts of the *Makatalu en Ramessu*, or Tower of Rameses II., which is represented on the walls of Medinat-Abu; and this has induced Lepsius and Bunsen to depress the date of the Exodus from 1491 B.C. to the close of the nineteenth dynasty, or after Rameses II., a point controverted by other chronologists, who wish to elevate it to the middle of the 18th dynasty, or 1732 B.C. To synchronize the former date, Lepsius takes the rabbinical date of 1314 B.C. for the Exodus, or 1340 B.C. for the birth of Moses. The P. of the Exodus is supposed to be the Merienptah or Menephthes, the son and successor of Rameses II. Philologically, this explanation is preferable, as the fixed point in the inquiry is the name of the Migdol of Rameses found both in the Scriptures and on the monuments of Egypt. Other Pharaohs are mentioned; as the father of Tahpenes, wife of Hadad and mother of Genuboth; the P. whose daughter Solomon married; P. Nechao, or Necho II., who gave battle to Josiah, king of Judah, whom he slew at Megiddo, and who made war against the Syrians, defeated them at Magdolus, and took Cadytus or *Katsh*, on the *Arunata* or Orontes. He was subsequently defeated by Nebuchadnezzar at Carchemish, 607 B.C. P. Hophra, was the Uaphris or Apries of the Greeks, whose destruction was prophesied by Jeremiah, and who was strangled 570 B.C.—Bunsen, *Ægyptens Stelle*, iii. p. 109; Lepsius, *Einleit.* p. 317; Nash, *The Pharaoh of the Exodus* (8vo, Lond. 1862).

PHA'RISEES (*Perishin* or *Perushim*, Separatists), a so-called 'Jewish sect,' more correctly, however, a certain Jewish school, which probably dates as a distinct body or party from the time of the Syrian troubles, and whose chief tendency it was to resist all foreign, chiefly Greek, influences that threatened to undermine the sacred religion of their fathers. They most emphatically took their stand upon the Law, together with those inferences drawn from its written letter which had, partly from time immemorial, been current as a sacred tradition among the people. Out of the small band of the Chasidim (q. v.), the P. had taken their rise originally as *Chaberim*, Friends, Colleagues, Scholars—in contradistinction to the *Am-Haarez*, or common-people—and their chief object in life was the Divine Law, its study and further development. Principally distinguished by their most scrupulous observance of certain ordinances relating to things clean and unclean, they further adopted among themselves various degrees of purity, the highest of which, however, was scarcely ever reached by any member of their community. For every degree, a special course of instruction, a solemn initiation, and a novitiate was necessary; all of which, together with a certain distinction in dress, seems to have been imitated from them by the Essenes (q. v.). The name of P. or Perushim was probably at first bestowed upon them in derision by the Sadducees or Zadokites, the priestly aristocracy and their party, the Patricians, who differed from them politically, and to some extent also in religious matters. The P. had no special 'Confession of Faith,' or articles of creed different from the whole body of Jews.

The Bible, as interpreted by the traditional Law, was their only code. Obedience to this Law, strictest observance of all religious and moral duties, submission to the Divine will, full confidence in the wisdom and justice of Providence, firm belief in future reward and punishment, chastity, meekness, and forbearance—these were the doctrines inculcated in their schools. They were, in fact, nothing more or less than the educated part of the people, who saw in the rigid adherence to the ancient religion, such as it had developed itself in the course of centuries, the only means of saving and preserving the commonwealth, notwithstanding all its internal and external troubles. Hence, they wished the public affairs, the state and all its political doings, to be directed and measured by the standard of this same Divine Law; without any regard for those aristocratic families who ruled, or at all events greatly influenced the commonwealth. These consisted of the priestly families, the Zadokites (Sadducees, q. v.), and of the val-

tant heroes and sagacious statesmen, who had brought the Syrian wars to a successful issue, and had, by prudent negotiations with other courts, restored the nation to its former greatness, and, on their own part, had acquired wealth and fame, and freer and wider views of life and religion. The latter held the modern doctrine, that religion and state were two totally different things; that God had given man the power of taking his matters into his own hands; and that it was foolish to wait for a supernatural interference, where energy and will were all that was required.

Naturally enough, the political difference between the two parties by degrees grew into a religious one, since the Jewish State was one still completely pervaded by the religious element—as indeed it had begun as a theocracy, and could still, to a certain extent, be called by that name. And the more the Sadducees lost their influence—the people siding with the P.—the more the religious gulf must have widened between them; although the divergence between them, as far as our authorities—Josephus, the New Testament, and the Talmud—go, does not seem to have been of a very grave nature. Thus, the P. assumed the dogma of immortality, chiefly with a view to a future reward of good and evil deeds in this world; while the Sadducees, without rejecting—as we are erroneously informed by Josephus—this dogma in the least, yet held that there was nothing in the Scripture to warrant it, and, above all, that there was no need of any future reward; at any rate, that a pious life with a view to this was not meritorious. While the P. held all the traditional ordinances in equal reverence with the Mosaic ones, tracing, in fact, most of the former to Sinai itself, the Sadducees rejected, or rather varied some of these according to the traditions of their own families: these ordinances chiefly relating to priestly and sacrificial observances, certain laws of purity, and some parts of the civil law. It may perhaps even be assumed, with the most recent investigators (chiefly Geiger), that the P. were the representatives of a newer Halacha, dictated by an oppositional and religious and national zeal which carried them far beyond the original boundaries.

Certain other legal differences between the two parties, such as the application of the laws of inheritance to daughters, or of the responsibility of the master for his servants, are nothing more than political party-views in a religious mask, which were meant to meet certain special isolated cases only. In general, the P. handled justice in a much milder manner than their antagonists, who took their stand upon the rigid letter, and would hear of no mercy where a violation of the code was clearly made out. Out of the midst of the P. rose the great doctors and masters of the Law (*Soferim*, Scribes, *Nomodidaskaloi*, teachers of the Law), and to them were intrusted by the later rulers the most important offices.

Until recently the greatest misconception has prevailed even among scholars respecting this self-sacrificing, patriotic, pious, learned, and national party of progress. That there were among them those who were a disgrace to any party, and still more, to their strict one, no one knew better than the P. themselves, and in bitterer words than were ever used by Christ and the apostles, the Talmud castigates certain hyperpious members of their own community as the 'plague of Pharisaism.' These hypocrites were characteristically styled *Zebuim* [dyed, painted ones], 'who do evil deeds like Zimri, and require a godly reward like Phinehas.' Seven kinds of P. are enumerated in the Talmud, six of whom were not to be counted as real Pharisees—viz. (1) they who did the will of God for earthly motives; (2) those who made very small steps, or said: Wait for me—I have still some good deed to do; (3) those who knocked their heads against walls, lest they might look at a woman; (4) *ex-officio* Saints; (5) those who say: tell me of another duty; (6) those who are pious, because they fear God. The only genuine Pharisee was he 'who did the will of his Father in Heaven, because he loved Him.'

Josephus's accounts, distortions in themselves, have, to add to the confusion, been misunderstood (thus, for example, the word which he uses to designate the three parties, never meant 'sect,' as it has invariably been interpreted); and the position of Christ, in relation to the P., can never be understood properly without a full acquaintance with the circumstances of the time, to which there is no other way than a knowledge of that literature (the Talmud and Midrash) which has so long been neglected. Christ found the influence of the P. predominant among the people, although the Sadducees (and the Boëthusians) were in reality the ruling classes and allies of the reigning dynasty. He naturally sided with the democratic party of the P. against that of the proud opposite camp. As for the religious tendencies of the latter, the Sadducees (q. v.)—the people had decided that point already practically, by siding with the Pharisees. Once only an allusion is made also to the leaven of Herod = the Sadducees (Mark viii. 15, cf. Matt. xvi. 6). But it was, above all things, necessary to combat the ever-growing tendency to choke up, as it were, all real piety and genuine virtue of heart under external ceremonies and observances, which, unless guarded against, will appear, instead of a mere symbol and memento, the essence of religion itself, and thus become in time a delusion and bondage, and end in that vile hypocrisy, against which the Talmud fights with all its powers of derision, and Christ inveighs in much more vehement terms than is his wont. It was not in themselves that these 'oral laws' were held up to scorn. They were a necessary and natural growth, and acted, in the main, beneficially; as is now fully recognized by scholars of eminence. (For some further remarks on the subject, see TALMUD.)

Pharisaism—from which gradually branched off the wild democratical party of *Zealots* (Kannaim), and which for the last time represented political opinions in the revolution of Bar Cochba—has, from the downfall of the sanctuary, and the final destruction of the commonwealth of this day, remained the principal representative of Judaism as a creed only, Sadduceeism dying out, or, at all events, producing only one such sterile plant as Karaism. See JEWISH SECTS, SADDUCEES.

PHARMACOPŒ'IA. This term has been applied to various works, consisting for the most part of (1) a list of the articles of the Materia Medica, whether simple or compound, with their characters, and the tests for the determination of their purity; and (2) a collection of approved receipts or prescriptions, together with the processes for articles in the Materia Medica, obtained by chemical operations. Almost every civilized country of importance has its national pharmacopœia, amongst which those of the United States, France, and Prussia deserve specially honorable notice. The first pharmacopœia published under authority appears to have been that of Nuremberg in the year 1542. A student named Valerius Cordus, who was staying for a short time at Nuremberg, showed a collection of medical receipts, which he had selected from the works of the most eminent writers, to the physicians of that city, who were so struck with its value that they urged him to print it for the benefit of the apothecaries, and obtained for his work the sanction of the senatus. Before this time, the books chiefly in use amongst apothecaries were the treatises: *On Simples* by Avicenna and Serapion; the *Liber Servitoris* of Balchasim ben Aberazerim; the *Antidotarium* of Johannes Damascenus or Mezue, arranged in classes; and the *Antidotarium* of Nicolaus de Salerno, which was arranged alphabetically. This work was commonly called *Nicolaus Magnus*, to distinguish it from an abridgment known as *Nicolaus Parvus*.

Confining our remarks to the British Pharmacopœias, we may notice that the first edition of the London Pharmacopœia (or, more correctly speaking, of the Pharmacopœia of the London College of Physicians) appeared in 1618, and was chiefly founded on the works of Mezue and Nicolaus de Salerno. Successive editions appeared in 1627, 1635, 1650, 1697, 1721, 1746, 1787, 1809, 1824, 1836, and 1851; and form an important contribution to the history of the progress of pharmacy and therapeutics during the last two centuries and a half. The nature and the number of the ingredients that entered into the composition of many of the pharmaceutical preparations of the 17th and 18th centuries, would equally astonish most of the practitioners and patients of the present day. In the earlier editions we find enumerated earth-worms, snails, wood-lice, frogs, toads, puppy dogs, foxes ('a fat fox of middle age, if you can get such a one'), the skull of a man who had been hanged, the blood of the cat, the urine and excrements of various animals, &c.; and electuaries were ordered, containing 50, 62, and in one instance—Mathiolus, his Great Antidote against Poison and Pestilence—124 different ingredients.

The Edinburgh Pharmacopœia is more modern than the London, the first edition having appeared in 1699; while the Dublin Pharmacopœia does not date further back than 1807. The latest edition of these works appeared in the years 1841 and 1850 respectively.

Until the Medical Act passed in 1858, the right of publishing the pharmacopœias for England, Scotland, and Ireland was vested in the Colleges of Physicians of London, Edinburgh, and Dublin respectively; and as these three pharmacopœias contained many important preparations, similar in name but totally different in strength (as, for example, dilute hydrocyanic acid, solution of hydrochlorate of morphia, &c.), dangerous complications arose from a London prescription being made up in Edinburgh or Dublin, or *vice versâ*. By that act it is ordained that 'the General [Medical] Council shall cause to be published, under their direction, a book containing a list of medicines and compounds, and the manner of preparing them, together with the true weights and measures by which they are to be prepared and mixed; and containing such other matter and things relating thereto as the General Council shall think fit, to be called *British Pharmacopœia*, which shall for all purposes be deemed to be substituted throughout *Great Britain* and *Ireland*, for the several above-mentioned pharmacopœias.' The *British Pharmacopœia*, published in 1864, had the merit of amalgamating the London, Edinburgh, and Dublin Pharmacopœias; but it unfortunately contained so many defects, that, in accordance with the universal wishes both of the medical profession and of the chemists, the Medical Council or-

dered a new edition to be as speedily as possible prepared. This new edition has met with general favor from the profession; and it is to be hoped that as we have now succeeded in incorporating three distinct works into one, we may hope by and by to have a universal Pharmacopœia, or, at all events, one of so general a nature that the most important medicines of the American, British, and chief continental Pharmacopœias shall all be of the same strength.

PHA'RMACY (from the Gr. *pharmacon*, a medicine) is that department of *Materia Medica* (q. v.) which treats of the collection, preparation, preservation, and dispensing of medicines. It is synonymous with *Pharmaceutical Chemistry*.

PHA'ROS, a rocky islet off the coast of Egypt, which Alexander the Great connected with Alexandria by the Heptastadium, or Seven Furlong Mole. The light-house at its N.E. point, commenced by Ptolemy I. and finished about 280 B.C., was looked upon as one of the wonders of the world. It seems to have been 400 feet high, and lasted 1600 years. The fire, constantly kept lighted on its summit, was said to be visible for 40 miles. The island of P. became ultimately a suburb of Alexandria by means of a street extending along the mole. After the time of Julius Cæsar, it relapsed into the condition of a mere fishing station.

PHARSA'LUS, now FERSALA, a town of Thessaly, to the south of Larissa, on a branch of the Salambria, and accordingly in the part of Thessaly restored to Greece in 1881. It is historically notable mainly for the great battle fought here between Cæsar and Pompey, August 9, 48 B.C. Pompey had about 45,000 legionaries, 7000 cavalry, and a great number of light-armed auxiliaries. Cæsar had 22 000 legionaries and 1000 German and Gallic cavalry. The battle, which commenced with an attack on Pompey's left wing, ended in a complete victory for Cæsar, and determined the fate of the Roman world.

PHARYNGOBRA'NCHII, a sub-order of Dermopterous (q. v.) fishes, characterized by respiratory processes projecting from above the pharynx into the large cavity of the mouth. The P. have no heart, and are the lowest in organization of all fishes. The species are very few. See LANCELET.

PHARYNGOGNA'THI, an order of fishes, in the system of Müller and Owen; partly *Acanthopterous* and partly *Malacopterous*, in the system of Cuvier; some of them also *Cycloid*, and some *Ctenoid*. Their common characteristic is the union of the lower pharyngeals into one bone.

PHA'RYNX (Gr.) is the name of that part of the alimentary canal which lies behind the nose, mouth and larynx. It is a musculo-membranous sac, situated upon the cervical portion of the vertebral column, and extending from the base of the skull to the level of the fifth cervical vertebra, where it becomes continuous with the Œsophagus (q. v.). Its length is about four inches and a half, it is broader in its transverse than in its antero-posterior diameter, and its narrowest point is at its termination in the œsophagus. Seven *foramina* or openings communicate with it—

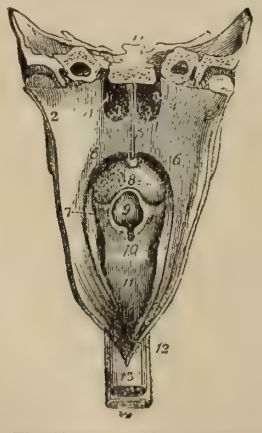


Fig. 1.—The Pharynx laid open from behind:

1, a section of the base of the skull; 2, 2, the walls of the pharynx drawn to either side; 3, 3, the posterior nares, separated by the vomer; 4, 4, the extremities of the Eustachian tubes; 5, the soft palate; 6, 6, 7, 7, its posterior and anterior pillars; 8, the root of the tongue; 9, the epiglottis overhanging; 10, the opening of the larynx; 11, the posterior part of the larynx; 12, the opening into the œsophagus, whose external surface is seen at 13; 14, the trachea.—(From Wilson.)

viz., the two *posterior nares* or nostrils, at the upper and front part of the P.; the two *Eustachian tubes*, opening on the outer surface of the preceding orifices; the *mouth;* the *larynx;* and the *œsophagus*.

The P. is composed of an external *muscular* coat; a middle *fibrous* coat called the *pharyngeal aponeurosis*, thick above where the muscular coat is absent, and gradually thinning as it descends; and a *mucous* coat, continuous with the mucous membrane of the mouth and nostrils. The muscular coat requires special notice. It is composed of a *superior*, *middle*, and *inferior constrictor* muscle on either side, together with two less important muscles, termed the *stylo-pharyngeal* and *palato-pharyngeal* muscles. When the food, after being sufficiently masticated and mixed with saliva, is thrown, by the action of the tongue, into the P., the latter is drawn upwards and dilated in different directions; the elevator muscles (the stylo-pharyngeal and palato-pharyngeal) then relax, and the P. descends; and as soon as the morsel is fairly within the sphere of action of the constrictor muscles, they successively contract upon it, and gradually pass it onwards to the œsophagus. Independently of its importance in the act of swallowing, the P. exerts an influence on the modulation of the voice, especially in the production of the higher notes.

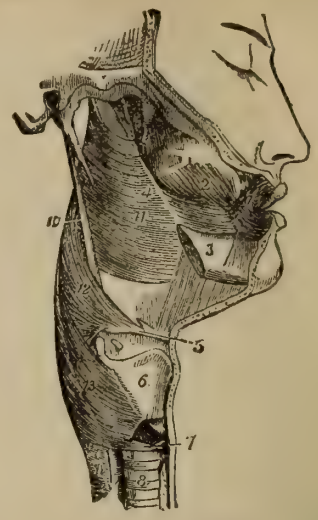


Fig. 2.—External View of the Muscles of Pharynx:

1.—the orbicularis oris muscle; 2, the Buccinator muscle; 3, portion of lower jaw, part of which is cut away; 4, pterygo maxillary ligament; 5, the hyoid bone; 6, the thyroid cartilage; 7, the bicoid cartilage; 8, the trachea; 9, the œsophagus, with the recurrent laryngeal nerve lying between it and the trachea; 10, the stylo-pharyngeus muscle; 11, 12, 13, the superior, middle, and inferior constrictor muscles.

The P. is not so frequent a seat of disease as many other parts of the intestinal tube. In cases of Diphtheria (q. v.) it is usually the chief seat of the disease. It is liable to ordinary inflammation or *pharyngitis*—an affection characterized by pain, especially in swallowing, without redness in the fauces or change of voice. Little in the way of treatment, except low diet and attention to the bowels, is required; and the inflammation usually terminates in resolution. Sometimes, however, it proceeds to suppuration, and abscesses—dangerous partly from inanition consequent on inability to take food, but chiefly from suffocation due to pressure on the larynx are formed. These abscesses are more dangerous in the lower than in the upper part of the P., and are more common in young children than in adults. The treatment consists in opening the abscess, which gives immediate relief; but the operation must be conducted with great care, and the incision made as near ly as possible to the mesial line, in consequence of the large adjacent blood-vessels.

PHASCO'GALE, a genus of marsupial quadrupeds, of which one species, *P. penicillata*, about the size of a rat, gray, with long soft hair, and a long tufted tail, is common in most parts of Australia, lives chiefly in the hollows of decayed trees, and preys on small animals of every kind. It is much disliked by the colonists, to whom it is known as the *Tapoa Tafa*, on account of its depredations in poultry-yards and larders. It is very agile and audacious.

PHASE'OLUS. See KIDNEY-BEAN.

PHA'SES (Gr. *phasis*, appearance), the different luminous appearances presented by the moon and several of the planets, sometimes the whole, a part, or none, of the luminous surface being seen from the earth. The various phases of the moon, and the reasons of them, are mentioned under the article MOON. Mercury and Venus, being inferior planets, present to an observer on the earth exactly similar phases to those of the moon; but the former require, instead of a month, periods of 116 and 584 days respectively to pass through a complete series of phases. The superior planets, to a certain extent, exhibit phases, but the luminous surface, as seen from the earth, only varies from the full illumination seen when they are in conjunction with the earth to a slightly gibbous

appearance when they attain their greatest elongation; and their distance from the sun is so great in comparison with that of the earth, as to render the variation in the form of their luminous surface not observable, except in the case of Mars and occasionally of Jupiter. Galileo was the first to observe the phases of Venus, and he considered them as one of the most satisfactory proofs of the truth of the Copernican system. The great brilliancy of Mercury, and its nearness to the sun, prevented its phases from being so easily noticed, but they were at last observed by Masius, and since by many other astronomers. The term phases is frequently applied to designate the successive stages of an eclipse, lunar or solar.

PHASIA'NIDÆ, a family of gallinaceous birds, including pheasants, argus, Macartney cock, fowls, impeyans, tragopans, &c.; its limits, however, being extended by some ornithologists to include peacocks and turkeys (*pavonidæ*), which differ from it by no very considerable character. The hind-toe is placed higher on the tarsus than the front toes, so that only the tip touches the ground. The wings are short.

PHA'SIS, a river in Colchis, now called the RION. It rises in the mountains of Caucasus, flows in a generally western direction, and enters the Euxine near the ancient city of Phasis.

PHA'SMIDÆ (Gr. *phasma*, a spectre), a family of orthopterous insects, allied to *Mantidæ*, but differing in having the fore-legs similar to the other legs, and used like them for locomotion, not for combat and prehension, in the want of stemmatic eyes, and in the similarity of the first joint of the thorax to the other joints. They are insects of very extraordinary appearance, inhabiting tropical countries, and spending their lives upon trees and shrubs, the tender shoots of which they devour. Some of them resemble green leaves; some resemble brown and withered leaves; whilst others, wingless, or nearly so, and with much elongated bodies—one species nine inches in length—resemble dry twigs. To these peculiarities they owe their safety from enemies, eluding observation, for their motions are sluggish. Some are known as Leaf Insects, Spectre Insects, Walking-sticks, &c. The larvæ of the P. much resemble the perfect insect.

PHEA'SANT (*Phasianus*), a genus of gallinaceous birds of the family *Phasianidæ;* having a rather short strong bill, a little curved; the cheeks and skin surrounding the eyes destitute of feathers, and warty; the wings short; the tail long, its feathers so placed as to slope down, roof-like, on either side, the middle feathers longest; the tarsus of the male furnished with a spur. The males of all the species are birds of splendid plumage; the females have shorter tails and dull or somber colors. There are numerous species, natives of the warm and temperate parts of Asia. The COMMON P. (*P. Colchicus*) is said to have been brought from the banks of the Phasis, in Colchis, to the south of Europe, at a very remote period, its introduction being ascribed in classic legend to the Argonauts. From the Phasis it derived its Greek name *Phasianos*, the origin of its name in English and other modern languages. It was soon naturalized in Europe, and is now diffused over almost all the temperate parts of it. The date of its introduction into Britain is not known, but was certainly before the end of the 13th c.: it has long been plentiful in plantations and game-preserves, and has been introduced into almost every part of the country suitable to its habits. The abundance of pheasants in Britain, however, is to be ascribed chiefly to careful game-preservation, without which the race would in all probability soon be extirpated. No kind of game falls so easy a prey to the poacher.

A minute description of the Common P. is unnecessary. The head and neck of the male are steel-blue, reflecting brown, green, and purple in different lights; the back and wings exhibit a fine mixture of orange-red, black, brown, and light yellow; the breast and belly are golden-red, each feather margined with black, and reflecting tints of gold and purple. The whole length of a male P. is about three feet, of which the tail often measures two feet. The entire length of the female is about two feet. The general color of the female is pale yellowish-brown, varied with darker brown, the sides of the neck tinged with red and green. The ordinary weight of a P. is about two pounds and a half; but when pheasants are abundantly supplied with food, and kept undisturbed, they are sometimes four pounds or four pounds and a half in weight. The P., unlike the partridge, is polygamous.

The nest of the P. is on the ground, and is a rude heap of leaves and grasses, in which eleven or twelve olive-brown eggs are laid. But in the half-domesticated state in which it exists in many English preserves, the P. does not pay that attention to its eggs and young which it does when more wild, and not unfrequently continues to lay eggs for a considerable time, like the domestic fowl; the eggs being removed by the gamekeeper, and hatched by hens, along with eggs from nests found among clover and hay in the season of mowing. Very young pheasants must be carefully supplied with ants' eggs, maggots, &c., and the whole difficulty of rearing them is in their earliest stage.

Pheasants feed very indiscriminately on berries, seeds, roots, young shoots of plants, worms, insects, &c. Beans, pease, corn, and buckwheat are frequently thrown for them in open places in woods; and they scrape up bulbous and tuberous roots in winter. They roost in trees at no great height from the ground, and poachers sometimes capture them by burning sulphur below them. During the moulting season, they do not ascend trees to roost, but spend the night on the ground, when they fall a ready prey to foxes. They are fond of woods with a thick undergrowth, in which, when disturbed, they naturally seek shelter, running whilst it is possible, rather than taking flight. The male P. takes flight much more readily than the female, which, apparently trusting to her brown color to escape observation, often remains still until the sportsman is almost upon her. The males and females do not associate together except during the breeding season, but small numbers of one sex are often found in company. The 'short crow' of the males begins to be heard in March. In England and Scotland pheasant-shooting legally begins on the 1st of October, and ends on the 3d of February. The pheasants turned out from the gamekeeper's breeding-yard into a preserve, are in general supplied with abundance of food during winter, and come to the accustomed call as readily as any kind of poultry, so that the sportsmanship of a *battue*, in which they are killed by scores or hundreds, is of the lowest kind. It is scarcely necessary to mention that the flesh of the P. is in very high esteem for the table.

The female P., in old age, or when from any cause incapable of the functions of reproduction, sometimes assumes the plumage of the male. The P. exhibits a remarkable readiness to hybridize with other gallinaceous birds. A hybrid between it and the common fowl is not unfrequent, and is called a *Pero*. Hybrids between the P. and Black Grouse have also occurred; and hybrids are supposed to have been produced between the P. and Guinea-fowl, and the P. and turkey. None of these hybrids, however, have ever been known to be fertile, except with one of the original species. On the contrary, the offspring of the Common P. and the RING-NECKED P. (*P. torquatus*) is perfectly fertile, a circumstance which is urged in argument by those who regard them as mere varieties of one species. The Ring-necked P. is now almost as plentiful in Britain as the Common P.: it is a native of the forests of India and China, and is said not to breed with the Common P. in a truly wild state, but in Britain they readily intermix. It is distinguished by a white ring almost surrounding the neck, and is of smaller size than the Common P., somewhat different in markings, and has a shorter tail.—The BOHEMIAN P. is another variety of a silvery-gray color.—White pheasants are of not very unfrequent occurrence.—Of other species of P. may be mentioned DIARD'S P. (*P. versicolor*), a native of Java, in which the prevailing color is green; and REEVES'S P. (*P. Reevesii*), a native of the north of China, in which white is the prevailing color, and the tail is of extraordinary length, so that a bird not larger than the Common P. measures eight feet in entire length.

Of somewhat different type, and more nearly approaching to the common fowl, are the GOLDEN P. (*P. pictus*, or *Thaumalia picta*) and the SILVER P. (*P.* or *Gallophasis nycthemerus*), both natives of China, and both hardy birds, the introduction of which into British preserves has been attempted with good prospect of success. Both have long been kept in a state of domestication by the Chinese. The Golden P. is one of the most splendid of the tribe. It has a fine crest, and a ruff of orange and black, capable of being erected at pleasure. The tail is very long. The crest and ruff are held in great estimation by anglers for making artificial flies.—LADY AMHERST'S P. (*P.* or *Thaumalia Amherstiæ*) is a native of China, resembling the Golden P., and with an extremely long tail.—The Silver P. is one of the largest and most powerful of the tribe, and very combative, driving the Common P. from preserves into which it is introduced. The prevailing color of the upper parts and tail of the male is white, finely pencilled with black, the breast and belly purplish-black.—The name P. is sometimes extended to gallinaceous birds of allied genera.

PHEASANT-SHELL (*Phasianella*), a genus of gasteropodous molluscs of the family *Turbinidæ*, of which the shells are much valued for their beauty, and when they were rare in collections, were sometimes sold for extraordinary prices. They are now comparatively cheap and plentiful, being found in great numbers on some parts of the Australian coast.

PHEI'DIAS (Lat. *Phidias*), son of Charmides, the greatest sculptor of ancient Greece, born at Athens probably between 500—490 B.C. His first instructor in art was Hegias of Athens; he afterwards studied under a more famous master, Ageladas of Argos. He appears to have first acquired distinction in his profession soon after the battle of Salamis, and indeed his great works were all executed during a period most favorable for the development and encouragement of genius, when Greece was triumphant over external enemies, and her people enjoyed a more perfect liberty than

almost at any other period of their history. With the character of the age correspond the works of its poets, particularly of the tragedians Æschylus, Sophocles, and Euripides, and of its sculptors, particularly of Pheidias. Under Cimon's administration the Athenians began the work of restoring their city, which the Persians had destroyed, in more than its former magnificence, and to fill it with noble works of art. P. was accordingly employed in making the colossal brazen statue of Minerva, *Athena Promachos*, which was placed upon the citadel, and was executed probably about 460 B.C. To the government of Cimon succeeded that of Pericles, still more brilliant, and signalized by an extraordinary development of art. Pericles not only gave to P. a commission to execute all the more splendid statues that were to be erected, but made him general superintendent of all works of art going on in the city. Plutarch tells us that P. had under him architects, statuaries, workers in copper and bronze, stone-cutters, gold and ivory beaters, &c.

To P., as director-general of all the skilled artists and artificers of Athens, we owe, among other glorious edifices, the Propylæa and the Parthenon, the sculptured ornaments of which were executed under his direct superintendence, while the statue of the goddess Athene, the materials for which were ivory and gold, was the work of P. himself (circa 438 B. C.). This statue was clothed with a golden robe, which alone was worth 44 talents of gold. The statue is gone forever, and the Parthenon is now only a magnificent wreck, but we still possess some splendid evidence of the genus of P., in the sculptures of the metopes, and friezes of the temple of Athene. See ELGIN MARBLES. Next year P. went to Elis, where he executed a colossal statue of Zeus for the Olympeium at Olympia (q. v.), also of ivory and gold (about 433 B. C.). This was reckoned his masterpiece. On his return to Athens, political passions were running high. There was a strong—at least a violent—party inimical to Pericles, but as they did not dare to attack the great statesman, they assailed him through his friends P., Anaxagoras, Aspasia, &c. P. was accused of having appropriated to himself some portion of the gold destined for the robe of Athene. This accusation he repelled by taking off the robe and weighing it. He was then accused of impiety, for having introduced his own likeness and that of Pericles on the shield of the goddess. On this most frivolous and contemptible pretext he was thrown into prison, and died there, but whether of sickness or poison is uncertain. His death took place about 432 B. C. The works executed by, or ascribed to P., were numerous, but we have mentioned the most celebrated. Their prevailing characteristic appears to have been an ideal sublimity, and even the imperfect relics that we possess are the most noble specimens of sculpture in the world.

PHENO'MENON (Gr. appearance), the name given in philosophy to an object or fact as it is perceived by us, as distinguished from what it is in itself. In the philosophy of Kant, that, whatever it may be, which is behind the phenomenon, and causes it, is called the *noumenon*, as being merely assumed or thought of in the mind. See METAPHYSICS, PERCEPTION.

PHE'NYL, AND THE PHENY'LIC GROUP. Phenyl ($C_{12}H_5$) is an organic radical, which has not yet been isolated. Its most important compounds are: (1.) Carbolic or Phenic Acid ($HO,C_{12}H_5O$), known also as Phenol, Hydrated Oxide of Phenyl, and Phenyl-Alcohol. See CARBOLIC ACID. (2.) Hydride of Phenyl ($C_{12}H_6$), known also as Benzole, Benzine, and Phene. See BENZOLE. (3.) Phenylamine or Phenylia ($C_{12}H_5,H_2N$, or $C_{12}H_7N$), better known under the name of Aniline, one of the most important of the artificially formed bases.

Aniline derives its name from *anil*, an obsolete name for indigo, which is one of the sources from which it is most readily procured. It exists amongst the products of the distillation of coal, and probably other organic compounds, but is always obtained by the manufacturing chemist either from indigo or from nitro-benzole. Dr. Hofmann, to whom we are mainly indebted for our knowledge of the chemistry of this substance, gives the following directions for obtaining it from indigo: 'Powdered indigo boiled with a highly-concentrated solution of hydrate of potassa, dissolves with evolution of hydrogen gas to a brownish-red liquid, containing a peculiar acid, called the *anthranilic* acid. If this matter be transferred to a retort, and still further heated, it swells up, and disengages aniline, which condenses in the form of oily drops in the neck of the retort and in the receiver. Separated from the ammoniacal water by which it is accompanied, and re-distilled, it is obtained nearly colorless. The formation of aniline from indigo is represented by the following equation:

Indigo. Hydrated Potassa.

$$\overbrace{C_{16}H_5NO_2} + \overbrace{4(KO,HO)} + 2HO =$$

Aniline. Carbonate of Potassa.

$$\overbrace{C_{12}H_7N} + \overbrace{4(KO,CO_2)} + 4H.'$$

By this process, the indigo is made to yield about one-fifth of its weight of pure aniline. Nitro-benzole is converted into aniline by the action of various reducing agents, such as hydrosulphate of ammonia, or acetate of protoxide of iron; and the distillation of one part of nitro-benzole, one part of acetic acid, and one and a half parts of iron filings, is regarded by Hofmann as the best means of preparing aniline, which is now required in large quantities for the dyers.

'When pure,' says Dr. Hofmann, 'aniline forms a thin, oily, colorless liquid, of faint vinous odor, and aromatic burning taste. It is very volatile, but has nevertheless a high boiling-point, 359°·6. In the air, it gradually becomes yellow or brown, and acquires a resinous consistency. Its density is 1·028. It is destitute of alkaline re-action on test-paper, but is remarkable for the number and beauty of the crystallizable compounds it forms with acids. Two extraordinary re-actions characterize this body, and distinguish it from all others—viz., that with chromic acid, and that with solution of hypochlorite of lime. The former gives with aniline a deep-greenish or bluish-black precipitate; and the latter, an extremely beautiful violet-colored compound, the fine tint of which is, however, very soon destroyed.' In the manufacture of aniline on a large scale, several bases having higher boiling-points than aniline are formed. To one of these—a beautiful crystalline compound, represented by the formula $C_{24}H_{14}N_2$—the name of *Paraniline* has been given, from its being isomeric with aniline. Aniline is a substance of the greatest importance in theoretical organic chemistry, from the large number of derivatives and substitution-products which it yields, and for the knowledge of which we are almost entirely indebted to Hofmann, whose investigations originally appeared in a series of papers in the *Transactions of the Philosophical Society*. These compounds are, however, for the most part of too complicated a nature to be noticed in these pages. But, independently of its theoretical importance, this substance has recently been extensively employed in the arts, a series of pigments of unequalled beauty having been obtained from it by the action of oxidizing agents. It is to Mr. W. Perkin that we are indebted for the idea of applying practically the property possessed by aniline of forming violet and blue solutions with chromic acid and with hypochloride of lime, to which we have already referred; and he succeeded in fixing these colors, and adapting them to the use of the dyer. The most important of these coloring matters are described in the article DYE-STUFFS (q. v.).

(4.) Trinitrophenic Acid [$HO,C_{12}H_2(NO_4)_3O$], in which three of the equivalents of the hydrogen of phenic acid are replaced by three equivalents of the group, NO_4; known also as Carbazotic Acid (q. v.) and Picric Acid. In addition to the remarks contained in the article on CARBAZOTIC ACID, it may be noticed that while a solution of this acid communicates a bright-yellow tint to animal textures, as the skin, wool, and silk, it has no such effect on tissues composed of vegetable fibres, such as cotton and linen, and hence it may be employed to ascertain whether the materials of any tissue belong to the animal or to the vegetable kingdom. A solution of a salt of this acid, when treated with indigo, yields a beautiful green color, which is employed in the manufacture of artificial flowers, and for various other purposes. In doses of from 1 to 10 grains, it acts on rabbits as a strong poison, occasioning convulsions and speedy death. It has been prescribed in small doses, with moderate success, in cases of intermittent fever; but patients to whom it is given should be previously informed that it possesses the property of giving to the eye a yellow and, as it were, a jaundiced appearance. All the salts of this acid are of a beautiful red or yellow tint, and most of them form brilliant crystals. When heated, or in some cases when only struck, they explode with considerable violence.

PHE'ON, in Heraldry, the barbed head of a dart. It is represented as engrailed on the inner side, and its position is with the point downwards, unless otherwise blazoned.

PHE'RÆ, a powerful city of Thessaly, near Mount Pelion; according to legend, the ancient royal seat of Admetus and Alcestis; and afterwards of political consequence under 'tyrants' of its own, who long made their influence felt in the affairs of Greece, and repeatedly attempted to make themselves masters of Thessaly. One of these tyrants named Alexander, is particularly celebrated for his cruelties. It was one of his practices to bury innocent persons alive, and another to sow them up in the skins of wild beasts and set his hounds upon them. After a bloody reign of thirteen years, he was slain by his wife and her brother, 357 B.C. Five years later, P., with the rest of Thessaly, became subject to Philip of Macedon.—At P. there was a mineral spring, named Hyperia, famous for its healing virtues. A few ruins at Velestino still mark the site of the city.

PHEBECY'DÉS, an ancient Greek writer, born in the island of Syros, one of the Cyclades, in the 6th c. B.C. He is said by Diogenes Laertius to have been a rival of Thales, and to have learned his wisdom from the Egyptians and Chaldeans. He wrote

a Cosmogony in a kind of prose much resembling poetry, under the title *Heptamychos*, the meaning of which is doubtful. In a manner rather poetic than philosophic, he endeavored in this work to show the origin of all things from three eternal principles, *Time* or *Kronos; Earth*, as the formless and passive mass; and *Æther* or *Zeus*, as the formative principle. He taught the doctrine of the existence of the human soul after death; but it is uncertain if he held the doctrine of the transmigration of souls, afterwards promulgated by his disciple, Pythagoras. Of his work, only fragments are extant, which have been collected and elucidated by Sturtz (Gera, 1798; 2d ed., Leip. 1824.—Another P., who lived in the 5th c. B.C., compiled the mythical histories of Athens and other states, but, except a few fragments, the work is lost. See Sturtz, *Pherecydis Fragmenta* (Leip. 1824).

PHIGA'LIAN MARBLES, the name now given to the sculptured frieze taken from the cella of the temple of Apollo at Phigalia in Arcadia in 1814, and transferred to the British Museum. It represents the contests between the Centaurs and Lapithæ. The Phigalian temple of Apollo is, next to the Theseium at Athens, the most perfect architectural ruin in all Greece; but owing to its sequestered position at the head of a lonely and rocky glen among the Arcadian hills, it long remained unknown in modern times, except to the shepherds of the district; and to the same circumstance it probably owes, in part, its preservation. Chandler first visited and described it in 1765; he was followed by Gell, Dodwell, and others; and in 1812 it was very carefully examined by a body of artists and scholars, the results of whose investigations are given in Stackleberg's *Der Apollo-tempel zu Bassä in Arkadien* (Rome, 1826). The temple is built of a hard yellowish-brown limestone, stands north and south, was originally about 125 feet long and 48 broad, and had 15 columns on either side, and 6 on either front, in all 42, of which 36 still remain.

PHILADE'LPHIA, the chief city and seaport of Pennsylvania, U.S., and the second city in population and importance in America, is situated on the west bank of the Delaware River, at the mouth of the Schuylkill, on a plain 2 to 4 miles wide between the two rivers; lat. 39° 56′ 59″ N., long. 75° 9′ 54″ W.; 125 miles north-east of Washington, 87 miles south-west of New York. Its greatest length is 22 miles, its breadth is from 5 to 10 miles, and its area 129 miles. The city is neatly but plainly built of red bricks and marble, with fine squares laid out as parks. The picturesque eminence of Fairmount, with its reservoirs of water raised from the Schuylkill, and the Laurel Hill and other ornamental cemeteries, are favorite public resorts. Among the finest edifices are the Girard (formerly United States) Bank, Custom-house, Mint, the Public Ledger Building, the City Hall, and the buildings of the Girard College, most of them built of white marble, the last in the Corinthian style, having cost 2,000,000 dollars. The most noted building is Independence Hall, occupied in the revolution of 1776 by the Continental Congress, in which was voted and signed the Declaration of Independence. The Philadelphia Library, founded by Benjamin Franklin, contains 100,000 vols., and the Mercantile Library has 135,000. P., in fact, possesses some of the most valuable libraries in the U.S. The Academy of Fine Arts has, in connection with it, a gallery exhibiting upwards of 1000 pictures. For the Centennial Exhibition, held here in 1876, a main building 1876 feet long, with numerous and extensive supplementary halls and galleries, was erected in Fairmount Park at a cost of about 4,500,000 dollars.

The medical schools of P. have long been held in high esteem, and attract every year a large body of students. There are 6 medical colleges; 15 other colleges (one entitled a university); more than 40 hospitals—3 for the insane, 1 for deaf-mutes, and one for the blind; 91 charitable and benevolent institutions; besides numerous literary, scientific, and art associations; Bible, tract, and missionary offices and agencies. The Girard College, a free school for orphans, founded by Stephen Girard, a Philadelphia merchant, supports and educates 550 boys, on a foundation of 8,000,000 dollars. The Masonic Temple is a remarkable building. P. is in point of area the largest city in the U. S. In Fairmount Park is the first established Zoological Garden in the States. Next to New York, P. is the largest publishing center in the U. S., issuing very numerous daily and weekly papers, and other publications. Of its 500 churches, about 100 are Presbyterian and nearly as many Episcopal, Methodists and Baptists coming next. There are only 15 Friends' meeting-houses. Of about 50 banks, 30 are national. From its excellent water supply and nearness to available coal-fields, P. has risen to be the first manufacturing city in the Union, both as regards the number of persons employed, and the extent and variety of its manufactures; breadstuffs and petroleum are the chief exports. P. owns the only American lines of iron steam-ships which ply between America and Europe. The assessed value of real and personal property is about $600,000,000. Pop. (1840) 93,665; (1870) 674,022; (1880) 847,170.

The site of P. was discovered in 1623 by the Dutch of New York who settled there; they were followed by the Swedes in 1638. When the Settlement of the Delaware fell under English authority, P. was laid out in 1682 by William Penn, on 'a spot that seemed to have been appointed for a town,' and of which he wrote, 'Of all places in the world, I remember not one better seated.' Its early settlers were mostly of the Society of Friends. In 1684 it had 2500 inhabitants. It grew rapidly by large immigrations from Germany and the North of Ireland. In 1719 was here printed the first American newspaper, the *Weekly Mercury*. In 1728 was established the *Gazette*, afterwards edited by Franklin. The first colonial congress met here in 1774; in 1777 the town was occupied by the British forces under General Lord Howe, when the city contained 21,767 inhabitants. It was the seat of the United States bank, the capital till 1800, and the first city in America, until surpassed by New York.

PHI'LÆ, the name of a celebrated island lying in the midst of the Nile, south of Syene, beyond the frontier of Egypt, in 24° 1′ 28″ N. lat. It was called by the Egyptians Menlak, the place of the Cataract; or *Menuab*, the Abaton or Sanctuary; and by the Copts, Pilak or 'Cataracts.' It is a small granite rock, about 1000 feet long, and 200 feet broad, on which is placed a suite of buildings, not of the most remote antiquity, but distinguished for great architectural beauty. The oldest of these, consisting of a hypœthral or roofless hall, was built in the reign of Nectanebus I., 377—357 B.C. A second mention of the same monarch occurs on the first propylon, where a door, constructed in his reign, has been incorporated into the constructions by a later Ptolemy. Both these are dedicated to the goddess of Isis, who in P. was venerated as Athor or the Egyptian Venus. The principal remains consist of the great temple of Isis, erected by Ptolemy II. or Philadelphus, and continued by his successors, especially by Ptolemy III., Euergetes, 247—222 B C.

The temple consists of a shrine or sekos, a pronaos, an open portico, and two pylons or gateways. Both of the propylons were constructed by Ptolemy VII., or Philometer, and Lathyrus; but the first was added to by Ptolemy IX., or Euergetes II., 145—141 B.C. On the second pylon, the monarch is represented slaying the hostile nations. The colonnade was principally erected by Tiberius. The charming little temple, the Mastabat el Pharaoun, or Pharaoh's Bed of the Arabs, was made in the reign of Trajan, 100 A.D. The temples are particularly important as containing the principal representations of the story of Osiris, his birth, bringing up, death, and embalmment by Isis. Commenced in the reign of Nectanebus I., and continued by the Ptolemies and Romans, the worship of Isis lingered here till 453 A.D., or sixty years later than the edict of Theodosius. After the subjection of the Blemmyes to the Nubian Christians, the temple was converted into a church, and the paintings daubed with mud; and, in 577 A.D., the bishop Theodorus changed the pronaos of the temple of Isis into the church of St. Stephen; and a Coptic church, at a later period, was built out of the ruins. The whole area of the ancient temple was about 435 feet long by 135 broad, in the center of the dromos. At the present day the island is deserted. It is a favorite resort of travelers ascending to Nubia, and is one of the best of the remaining ruined sites of ancient Egypt.

Pliny, N. H., v., c. 29; Servius, *Æneid*, v. 154; Jones and Goury, *Views on the Nile;* Wilkinson, *Modern Egypt*, ii. 295—303; Brugsch, *Reiseberichte aus Ægypten*, p. 256; Lepsius, *Reise*, p. 262.

PHILA'NTHROPY, a word formed from the Greek, and signifying the 'love of mankind.' In the history of German school education it has acquired a special meaning. The influence exercised by Rousseau was not less great on education than on politics, and was as visible in the pedagogues of Germany and Switzerland as in the men of the French Revolution. It is to the brilliant and one-sided advocacy by the author of *Emile*, of a return to nature in social life and in the training of the young, that Basedow owed his novel and enthusiastic educationalism. A brief notice of the institution, which was opened under his auspices at Dessau in 1774, and which was called *Philanthropin*, is given in the article on Basedow. Other establishments of the same kind were founded in different parts of Germany, but the only one which still survives is Salzmann's Institute at Schnepfenthal, in Gotha, opened in 1784.

PHILE'MON AND BAU'CIS, according to a classic myth, finely poetized by Ovid in his *Metamorphoses*, were a married pair, remarkable for their mutual love. Jupiter and Mercury, wandering through Phrygia in human form, were refused hospitality by every one, till this aged pair took them in, washed their feet, and gave them such humble fare as they could provide. On going away, the gods took them with them to a neighboring mountain, on looking from which they saw their village covered with a flood, but their own cottage changed into a splendid temple. Jupiter permitted them to make any request they chose, but they only asked to be servants of his temple, and that they might die at the same time. When, accordingly, they were seated at the

door of the temple, being now of great age, they were changed, Philemon into an oak, and Baucis into a linden. They felt the change taking place, and as long as the power remained with them, looked most tenderly upon one another.

PHILEMON, EPISTLE OF PAUL TO, is the shortest of the four extant letters which the apostle wrote from Rome during his captivity. We either directly learn, or legitimately infer from its contents, that Philemon, who probably lived at Colossæ, was a man of considerable wealth, the head of a numerous household, and liberal to the poor. He had possessed a slave called Onesimus, who had run away from him, after—it has been thought (verse 18)—robbing or defrauding him. Onesimus, however, coming to Rome, had been brought into contact with Paul, and converted to Christianity. At first the apostle thought to retain him as his personal attendant, for he was now, as he tells us (verse 9), 'Paul the aged;' but on further consideration, he resolved to send him back to his former master. The epistle is simply a brief letter, begging Philemon to pardon Onesimus, and to receive him 'not now as a servant, but above a servant, a brother beloved.' It exhibits an exquisite tenderness and delicacy of feeling, with all that tact and subtlety of address, by which Paul was wont to find his way into the innermost heart of men. The historical evidence of its authenticity is complete. Even Baur has remarked that modern criticism in assailing this particular book runs a greater risk of exposing itself to the imputation of an excessive distrust—a morbid sensibility to doubt and denial—than in questioning the claims of any other epistle ascribed to Paul.

PHILIDOR, the assumed name of a French family, which has produced many distinguished musicians, and one celebrated composer. The real name of the family was DANIGAN, and the additional appellation P. was assumed by Michael Danigan, the hautboist to Louis XIII., on account of his having equalled a celebrated player on the same instrument, named Filidori. The name was transmitted to his descendants, the most famous of whom was his grandson FRANÇOIS ANDRE DANIGAN, who was born at Dreux, in the department of Eure et Loir, 1726, studied music, and produced a great many comic operas, all long forgotten. It may be noticed that, while residing in London—whither he had fled on the outbreak of the revolution—(1779), he set to music the 'Carmen Sæculare' of Horace, a work which is considered by many as a masterpiece of musical art. He died in London, 31st August 1795. P.'s modern reputation rests exclusively on his skill in the game of chess, the principles of which he has laid down with exceeding clearness. It was in great measure his passion for this game which prompted him to visit Germany and Holland, where at that time the most distinguished players were to be found, in order to measure his strength with theirs. He was one of the founders of the London Chess Club. Here it was that in 1777 he published his *Analyse du Jeu des Echecs* (Analysis of the Game of Chess). One principle, then unique, seems to lie at the root of all P.'s games—i. e., to maintain and support carefully the pieces in the center of the board—and rather than deviate from this principle, he rejects the opportunity of making an effective and advantageous move. He practised with success the playing of games blindfold; but in this particular he has been far surpassed in recent times by Harrwitz, and more recently by Morphy.

PHILIP II., king of Macedonia, and father of Alexander the Great, was born at Pella in 382 B.C. He was the youngest son of Amyntas II. and Eurydice. At Thebes, whither he was taken as a hostage by Pelopidas, he spent part of his early life, employing his exile in studying the art of war, and the constitution and laws of the Greek states, as well as the literature and the character of the people—pursuits which were of the greatest service to him afterwards, when called on to administer the government of the Macedonian kingdom. The assassination of his eldest brother, Alexander II., by Ptolemy Alorites, after a short reign of two years (369—367 B.C.), and the death of his second brother, Perdiccas III., in battle (360 B.C.), placed him at the head of affairs in Macedonia, as guardian to his nephew Amyntas, still an infant. In a few months, P. made himself king, the rights of Amyntas being set aside. Dangers soon beset him from without and from within. The Illyrians and other neighboring tribes assailed his kingdom on different sides; while two pretenders to the throne, urged on by the Athenians and Thracians, stirred up civil commotion. But foreign and domestic enemies soon disappeared before the decision, the energy, and the wise policy of the young king. In the brief space of a year he had secured the safety of his kingdom, and had gained for himself a dreaded name. At this time he was only 24 years of age. Henceforward his policy was one of aggression, and his every thought was directed to the extension of his empire and the spread of Macedonian influence. The Greek towns on the coast of Macedonia were the first objects of attack. After possessing himself of Amphipolis and Pydna, by means little consistent with the faith of treaties, he handed over to the Olynthians the city of Potidæa, which he had taken from the Athenians.

In Thrace he captured the small town Crenides, which, under its new name, PHILIPPI, soon acquired great wealth and fame, and ultimately became celebrated in profane as well as in sacred history. The surrounding district was rich in gold-mines, which proved a source of great revenue to P. (about, say, £250,000 annually), and supplied him plentifully with the means of paying his armies, of bribing traitorous Greeks, and of opening the gates of many cities, the sieges of which might otherwise have cost the blood of thousands. After a few years of comparative leisure, he turned his ambitious views southward; and capturing Methone (at the siege of which he lost an eye), he advanced into Thessaly, and ultimately to the Strait of Thermopylæ, which, however, he did not attempt to force, as it was strongly guarded by the Athenians. He therefore returned into Macedonia, and directed his arms against the Thracians, waiting for a more fitting occasion to carry out his darling project. Such an opportunity was not long wanting. After capturing all the towns of Chalcidice—the last of which was the important city of Olynthus—he made peace with the Thracians, and next year with the Athenians, who had been at war with him in defence of their allies the Olynthians. It was this siege of Olynthus by P. which called forth these Olynthiac orations of Demosthenes, which are still admired as efforts of oratorical genius hitherto unequalled in any country.

P. was now requested by the Thebans to interfere in the war ('the Sacred War') which was raging between them and the Phocians. He marched into Phocis, destroyed its cities, and sent as colonists to Thrace many of the inhabitants (346 B.C.). The place which the Phocians had occupied in the Amphictyonic Council was transferred to P., and he was appointed, jointly with the Thebans and Thessalians, as president of the Pythian games. His next step was to secure a footing in the Peloponnese, by espousing the cause of the Argives, Messenians, and others, against the Spartans. In 339 B.C. the Amphictyonic Council declared war against the Locrians of Amphissa; and in the following year, appointed P. commander-in-chief of their forces. The Athenians were alarmed at his approach into Greece in this capacity, and formed a league with the Thebans against him; but their united army was utterly defeated at the battle of Chæronea (338 B. C.), and all Greece was at the feet of the conqueror. He was now in a position to enter on the great dream of his later years—viz., to invade the Persian empire, and revenge the injuries of Greece. Deputies from the different states of Greece assembled in congress at Corinth; and after resolving to make war on the Persian king, chose P. as leader of their armies. Preparations were in progress for this great expedition when he was suddenly cut off by the hand of the assassin Pausanias, at a festival celebrating the marriage of his daughter with Alexander of Epirus (336 B.C.). A private grudge at P., for neglect to punish an insult offered to Pausanias by Attalus, was said to be the motive which inspired the murderer, though suspicion is not wanting that the deed was done at the instigation of Alexander and his mother Olympias, who had retired from the court in disgust at P.'s marriage, the year previous, with Cleopatra, daughter of Attalus, one of his generals.

P. was a man given to self-indulgence and sensuality; he was faithless to the observance of treaty obligations, and unscrupulous as to the means by which he gained his ends; but he had to deal with factious and faithless opponents, which may help to explain, if it does not justify his policy; while his clemency as a victor has won the admiration even of the virtuous Cicero, who pronounces him 'always great.' Of his force and energy of character, his acuteness, fertility of invention and eloquence, it is impossible to speak too highly. He was at the same time a lover of learning, and a liberal patron of learned men. He reigned from 359 to 336 B.C.

PHILIP III., OF MACEDON. On the death of Alexander the Great at Babylon in 323 B C., the army elected as king, under the name of Philip III., Arrhidæus, son of Philip and Philinna of Larissa, one of his many wives. He was a youth of weak understanding, and was totally unfit for the duties of government. His wife Eurydice (daughter of Amyntas, son of Perdiccas III.), whom he married in 322 B.C., endeavored, on their return to Macedonia, to oppose the measures of Polysperchon and Olympias in support of the young Alexander; posthumous son of Alexander the Great and Roxana. But her army was defeated; she herself was taken prisoner; and, along with her husband, was put to death in 317 B.C.

PHILIP II., KING OF SPAIN, the only son of the Emperor Charles V. (q. v.) and Isabella of Portugal, was born at Valladolid, 21st May 1527. He was brought up in Spain, and carefully educated under the superintendence of able tutors, by whose instructions he greatly profited, becoming an accomplished linguist and mathematician, and a connoisseur in architecture and the fine arts. But all attempts to indoctrinate him with the chivalric ideas

of the time were utterly futile. From his very childhood he was distrustful and reserved; he invariably spoke with slowness and an air of deep reflection which was too marked to be wholly real, and exhibited in his manners a *sang-froid* which even in his early years was rarely disturbed by ebullitions of passion. While still very young he was intrusted, under the direction of a council, with the government of Spain, and in 1543 he espoused Mary of Portugal, who died three years after. In 1548 he went to join his father at Brussels, and there adopted the multitudinous equipage and minute and pompous etiquette of the late Burgundian court, which from this time he retained. While at Brussels, P. was presented to his future subjects, and was at the same time fully initiated into his father's policy, the two chief items of which were the maintenance and extension of absolute rule throughout his dominions, and the support and propagation of the Catholic religion. In 1554 he married Mary Tudor, Queen of England, and to gain the support of that country to his political projects, and at the same time restore it to the Roman Catholic pale, he laid aside his ordinarily cold and haughty demanor, and labored to ingratiate himself with his wife's subjects, taking the utmost care to avoid exciting the national jealousy of foreign influence. But his plans were discovered and frustrated, and this disappointment, combined with the annoyance to which he was subjected by the jealousy of his wife, prompted him to leave England (which he did for ever), and return to Brussels (September 1555).

In the following month he became, by the abdication of his father, the most powerful potentate of Europe, having under his sway, Spain, the Two Sicilies, the Milanese, the Low Countries, Franche Comté, Mexico, and Peru; his European territories being more fertile, and their inhabitants more wealthy and prosperous, than any others on the continent, while his army was the best disciplined, and headed by the greatest generals of the age. The treasury alone was deficient, having been drained by the enormous expenditure of his father's wars. P. was eager to begin the crusade in favor of Catholicism, but he was compelled to postpone it, owing to a league which had been formed between France, the Pope, and the Sultan, to deprive him of his Italian dominions. He soon got over his religious scruples at engaging in warfare with the pope, and intrusted the defence of the Sicilies to Alva (q. v.), who speedily drove out the pope and the French, and conquered the papal territories, while P. himself vigorously prosecuted the war against France in the north, and defeated the French at St. Quentin (q. v.) (August 10, 1557) and Gravelines (July 13, 1558). These reverses forced the French (the pope having already made a separate treaty) to agree to terms of peace at Chateau-Cambresis (April 2, 1559). P.'s wife was now dead, and after an unsuccessful attempt to obtain the hand of her successor, Queen Elizabeth, he espoused Isabella of France, and returned to Spain, where from this time he always resided. Before leaving the Low Countries, he solemnly promised to withdraw almost the whole of his Spanish troops who preyed upon the peaceful Flemings, but he firmly refused to annul or modify the rigorous edicts of his father against heretics.

His realm being now at peace, he resolved, as a necessary preliminary to the carrying out of his great proselytizing scheme, to replenish his treasury, a thing impossible without forced contributions, which, at that time, could only be obtained in those countries over which he held absolute rule—viz., Spain and America. He therefore set about establishing absolute government in those of his states that were in possession of something like free institutions, and with this view sought to introduce the Inquisition into the Low Countries and Italy. But the introduction of this instrument of tyranny was successfully resisted in Naples and the Milanese; in Sicily its powers were so shackled as to render it quite a harmless institution; but these failures only stimulated him the more to establish it in all its pride and power in the Low Countries. For a number of years it continued in vigorous action in that country; but the natural result of such a course of conduct was a formidable rebellion of all classes, Catholic and Protestant, which was partially successful—the northern portion (the 'seven united provinces') establishing its independence in 1579. In this conflict the resources of Spain were largely expended, and to replenish his treasury in the speediest manner possible, P. exacted enormous contributions from Spain, abolishing all special communal or provincial privileges and rights which might interfere with his actions, and suppressing all insurrection and discontent by force of arms or the Inquisition. During the first half of his reign he engaged in a desultory warfare with the Barbary corsairs, who were supported by the Turks—the only memorable incident of which was the famous naval victory of Lepanto (q. v.), won September 16, 1571.

In 1580 the direct male line of Portugal having become extinct, P. laid claim to the throne, and after the Duke of Alva had occupied the kingdom with an army, the Spanish monarch's title was recognized by the Portuguese estates. His enmity to England on account of the anti-Spanish policy of Queen Elizabeth incited him to attempt the conquest of that country, but his most formidable attempt failed signally. See ARMADA. After the accession of Catharine de Medicis to power, France and Spain drew closer the bonds of amity which had previously subsisted between the two countries; but the refusal of Catharine to adopt P.'s plans for the wholesale slaughter of heretics produced a coolness in their relations. However, when Henry, king of Navarre, a Huguenot, became heir-presumptive to the throne, P. allied himself with the Guises and the other chiefs of the Catholic party who were in rebellion, and his obstinate persistence in these intrigues after the cause of the Guises was shown to be hopeless, prompted Henry to declare war against him. The Spaniards had the worst of it, and P. was glad to conclude the treaty of Vervins (2d May 1598). He died in the Escurial at Madrid, on 13th September of the same year. It cannot be denied that P. was gifted with great abilities, but he was also a visionary, especially in politics, and engaged in so many grand enterprises at once as to overtask his resources without leading to any good or profitable result. No single kingdom in Europe could have long stood against him, but he was always at war with at least two at a time; and even the splendid opportunity which the extinction of the direct Capetian line in 1589 gave him for uniting France, Spain, and Portugal in one great monarchy, could not restrain this unfortunate peculiarity.

His fanatical enthusiasm for Catholicism, in which he was surpassed by no man who ever lived, and the zeal with which he persecuted all heretics through the Inquisition, combined with the odious tyranny of his secular government to degrade Spain, by breaking the proud and chivalrous spirit which had been the source of its pre-eminence among European nations, while his virulent persecutions of the industrious Moriscoes, and his oppressive exactions, put a stop to the commerce of the country. By his fourth wife, Anne of Austria, he had a son, Philip III.

PHILIP V. king of Spain, and the founder of the Bourbon dynasty in that country, was the second son of the Dauphin Louis (son of Louis XIV.) of France, and was born at Versailles, December 19, 1683. The last king of Spain of the Hapsburg dynasty, Charles II., had successively promised the succession to the throne to Charles, archduke of Austria, the great grandson of Philip III. of Spain, and to P., then duke of Anjou, the son of his own eldest sister; but becoming cognizant of a secret treaty which had been agreed to between England, France, and Holland for the partition of Spain, he, to prevent the dismemberment of his kingdom, left by will the succession to P. of Anjou. France immediately seceded from the partition treaty, and, on the death of Charles II. in 1700, P., who was the favorite candidate among the Spaniards, with the exception of those in the eastern provinces, took possession of the kingdom (April 21, 1701); and, to gain over Savoy to his side, and thus create a diversion in Italy against Austria, he married Maria Louisa, daughter of Victor Amadeus. War almost immediately broke out between the rival claimants, Charles being supported by the 'grand alliance,' which included England, Austria, and Holland, and subsequently (January 1702) Prussia, Denmark, and Hanover (May 1703), Portugal, and (October 1703) Savoy. See SUCCESSION, WAR OF SPANISH.

The fortune of war was mostly on the side of the allies; but France and Spain carried on the contest heroically, and, though at great sacrifices, the throne was secured to P. by the peace of Utrecht (April 11, 1713). In the following year the queen died, and P. espoused Elizabeth Farnese of Parma, who immediately induced her husband to commit the reins of government to Alberoni (q. v.); in fact, so much was the weak-minded king under the influence of his talented young wife, that he granted everything she asked. 'He was,' says Sismondi, 'remarkable for good nature, he had few faults and as few virtues, his sentiments were just and honorable, but he was wholly deficent in energy; he had no taste for anything beyond devotional exercises and the chase; he was made to be governed, and he was so all his life.' Alberoni's adventurous foreign policy, which at first succeeded in restoring the Spanish rule in Sicily and Sardinia, brought down upon Spain the wrath of the Quadruple Alliance (France, England, Holland, and Austria), and war was only averted by his being dismissed; but his dismissal was really produced by his neglecting to further the queen's pet scheme of providing sovereignties in Italy for her sons, who seemed to have little chance of obtaining the throne of Spain. The strong bond of union which had hitherto subsisted between Spain and France was broken, in 1725, by the refusal of the regent of the latter country to fulfil certain matrimonial agreements; but four years afterwards the two countries joined with England and Holland against the emperor, and in 1731 P. took measures to recover the old Spanish possessions in Italy. The war which followed at last satisfied the queen by giving the kingdom of the two Sicilies to her son Charles (1736), but P. in attempting to obtain still greater advantages over Austria, was led into a war of which he was not destined to see the result. He died at Madrid, July 9, 1746.

PHILIPPE II., better known as PHILIPPE AUGUSTE, king of France, was the son of Louis VII. and Alix of Champagne, and was born in August 1165. He was crowned, in 1179, during the life of his father, succeeded him in 1180, and proved one of the greatest monarchs of the Capetian dynasty. His marriage with Isabella of Hainault, a descendant of the Carlovingians, established more completely the right of his family to the throne of France. He first made war upon the Count of Flanders, to obtain the districts of Vermandois, Valois, Amienois, and Artois, which belonged to his wife, and, after various fortune, obtained Amienois and part of Vermandois at once, and the rest after the count's death in 1185. By the advice of St. Bernard (q. v.) he rigorously punished heretics, despoiled the Jews, absolving their debtors of all obligations, excepting one-fifth, which he transferred to himself; put down with vigor the numerous bands of brigands and priest-haters who devastated the country and burned the churches and monasteries, compelling their chief leader, the Duke of Burgundy, to submit (1186) to his authority—acts which gave him great popularity among his subjects. He sustained the sons of Henry II. of England in their rebellions against their father, and conquered, in conjunction with Richard Cœur-de-Lion, many of the English possessions in France. After the accession (1282) of Richard to the throne, P. and he set out together on the third crusade; but quarrelled while wintering in Sicily, and this dissension continuing, P., after a sojourn of 3½ months in Syria, set out (31st July 1190) on his return to France, after taking a solemn oath to respect the integrity of Richard's dominions; but no sooner had he returned than he entered into an arrangement for the partition of Richard's territories in France with his unworthy brother John. Some acquisitions were made, but Richard's sudden return overset the calculations of the conspirators, and a war immediately commenced between the two monarchs, in which P. had at one and the same time to defend his territories from the English, and the Counts of Champagne, Boulogne, Bretagne, and Hainault, who attacked them on all sides.

In order to obtain money he was obliged to rescind his edicts against the Jews; but the mediation of Pope Innocent put an end (13th January 1199) to a war which was productive of no other result than the exhaustion of the strength of the combatants. Richard of England died within two months after; but war almost immediately recommenced with England, regarding the respective claims of King John of England and his nephew Arthur of Bretagne to the French heritage of Richard Cœur-de-Lion, which consisted chiefly of Anjou, Maine, and Touraine. Arthur had applied for aid to P., and the French king immediately responded by causing the young duke to be recognized in the above-mentioned provinces; but a quarrel in which he became involved with the pope on account of his having divorced his second wife, Ingelburga of Denmark, to marry Agnes of Meran, a Tyrolese princess, compelled him to leave the English in possession for a little time longer. The defeat, capture, and subsequent murder of Arthur, however, again brought him into the field. The English provinces in France were attacked by the combined French and Bretons; Normandy and Poitou, with the three disputed provinces, were annexed to France; and the English dynasty in Bretagne dispossessed by a French one (26th October 1206). During 1211—1214, P. was engaged in a war with King John of England and the Emperor Otho of Germany, who had leagued themselves against him, in which he was on the whole successful. During the rest of his reign, P. was occupied in consolidating his new possessions, and took no part either in the war with the Albigenses or that in England, though his son Louis (q. v.) went to the latter with an army.

P. succeeded in establishing the unity of his dominions, and in emancipating the royal authority from the trammels of the papacy and clergy, and vindicated his sovereign authority over the latter as his subjects, irrespective of the pope. His measures, without alienating the greatest feudal lords, tended firmly to establish his authority over them, and to emancipate the larger towns from their sway. To increase the unity of the kingdom, and strengthen the central power, he established at Paris a chamber of twelve peers, six lay and six ecclesiastical, who almost always supported his plans, even against the court of Rome. Finally, he largely improved and embellished Paris, built many churches and other institutions, and encouraged commercial associations; he also fortified many of the chief towns, including the capital. He died at Mantes, July 14, 1223.

PHILIPPE IV., surnamed *Le Bel* or 'Fair,' king of France, the son of Philippe III., king of France, and Isabella of Aragon, was born at Fontainebleau in 1268, and succeeded his father in 1285. By his marriage with Queen Joanna of Navarre, he obtained Navarre, Champagne, and Brie. For several years he carried on a struggle with the Count of Flanders to obtain possession of that country, and also seized Guienne from the English; but was, in the end, obliged to restore Guienne and Flanders beyond the Lys. The great events of P.'s reign were his war with the papacy and the extermination of the Knights Templars; the former had its origin in the attempt of the king to tax the clergy as well as the laity for the heavy expenses of his numerous wars. Boniface forbade the clergy to submit to taxation, while P., on his side, ordered that neither money nor valuables were to be exported, thus cutting off a main supply of papal revenue; and on the pope's legate insolently reprimanding him, he threw him into prison.

P. now called an assembly of states, in which deputies of towns appeared—though not for the first time—and obtained assurance of their support, even in case of excommunication and interdict. Boniface, in turn, assembled a council at Rome (1302), which supported his view, and the celebrated bull, *Unam Sanctam* (q. v.) was issued. P. caused the bull to be publicly burned, and with the consent of the states-general confiscated the property of those prelates who had sided with the pope. Boniface now excommunicated him, but the king, nothing daunted, sent to Rome his general, William de Nogaret, who seized and imprisoned the pope; and though he was released after a few days by a popular rising, he soon afterwards died. In 1304, P. obtained the elevation of one of his own creatures to the papal chair as Clement V., on condition of his residing at Avignon, and giving up the Knights Templars (q. v.). In accordance with this agreement, the Templars were seized (1306—1314), and burned by hundreds, and their wealth appropriated by Philip. The grandmaster, Jacques Molay, was burned, 18th March 1314, and when dying he summoned P. to compear within a year and a day, and the pope within forty days, before the judgment-seat of God; strange to say, both the pope and king died within the time mentioned, the latter at Fontainebleau, November 29, 1314. P. during his whole reign steadily strove for the suppression of feudalism and the introduction of the Roman law; but while thus increasing the power of the crown, and also that of the third estate, he converted royalty, which was formerly protecting, kind, and popular to the mass of the people, into a hard, avaricious, and pitiless taskmaster. Under him the taxes were greatly increased, the Jews persecuted, and their property confiscated; and when these means were insufficient to satisfy P.'s avarice, he caused the coinage to be greatly debased; yet he was an able monarch, and under him France was extended almost to its present limits on the north and east.

PHILIPPE VI., OF VALOIS, king of France, was the son of Charles of Valois, younger brother of Philippe IV., and succeeded to the regency of France on the death of Charles IV., the proclamation of a king being deferred on account of the pregnancy of Charles IV.'s widow; but on her giving birth to a daughter, P. caused himself to be crowned king at Reims (May 29, 1328), and assumed royal authority. His right to the throne was denied by Edward III. of England, the grandson of Philippe IV., who declared that females, though excluded by the Salic law, could transmit their rights to their children, and therefore insisted upon the superiority of his own claims. P. however, was not only already crowned king, but he had the support of the people. His reign commenced gloriously, for marching into Flanders to support the court against his rebellious subjects, he wiped out the disgrace of Courtrai by vanquishing the Flemings at Cassel (August 23, 1328). He was obliged to give up Navarre (q. v), as the Salic law of succession did not apply to it, but he retained Champagne and Brie, paying for them a considerable annual stipend. P. seems to have had no settled plan of government, and no systematic political action; his acts were regulated by the whim of the hour, and were mostly calculated to gratify his own vanity and love of show. From 1330 to 1336, constant encroachments had been made upon the English possessions in France, till at last Edward III.'s patience was exhausted; and, on August 21, 1337, he formally declared war, and a commencement of this terrible hundred years' contest was made both in Guienne and Flanders; it was carried on languidly for several years, the only prominent incident being the destruction of the French fleet off Sluys (June 24, 1340).

In March 1343, P. established the 'gabelle,' or monopoly of salt, a heavy percentage tax on all mercantile transactions. The constant round of fêtes and tournaments at court was never interrupted, even when the war had well-nigh exhausted the wealth of the country, for the money to carry them on was immediately provided by some new tax or fresh confiscation. In 1346, Edward III. landed in Normandy, ravaged the whole country to the environs of Paris, and totally defeated P. at Crécy (q. v.). A truce was then concluded, but the devoted kingdom had no sooner been released from war, than destruction in another and a more terrible form, that of the 'Black Death' (q. v.), threatened it. The wild extravagance of the court was nothing lessened by this visitation; but the financial embarrassments in which P. found himself, compelled him to agree to the passing of a law (1338) which gave to the assembly of the states the sole power of imposing

taxes. He received Dauphiné in gift in 1349, purchased Majorca from its unfortunate king, and died August 22, 1350, neither loved nor respected. He was a despiser of learning, and a bigot.

PHILIPPE LE HARDI (*Philip the Bold*), the founder of the second and last ducal house of Burgundy, was the third son of Jean, king of France, and his wife Bonne of Luxemburg, and was born January 15, 1342. He was present at the battle of Poitiers (1356), and displayed such heroic courage, venturing his own life to save that of his father, as gained for him the sobriquet of *le Hardi*, or 'the Bold.' He shared his father's captivity in England, and on returning to France in 1360, received in reward of his bravery the duchy of Touraine, and subsequently (1363) also that of Burgundy, being created at the same time the first peer of France. On the accession of his brother, Charles V., to the throne of France, P. had to resign Touraine, but, as a compensation, obtained in marriage, Margaret, the heiress of Flanders.

In 1372, he commanded the French army opposed to the English, and took from them many of their possessions. In 1380, he exerted himself to suppress the sedition of the Flemish towns against their count, and succeeded with some of the malcontents; but the citizens of some of the populous places, especially Ghent, were possessed with such a fever of independence, that after many fruitless attempts to induce them to return to their allegiance, P. raised an army, and inflicted upon them the bloody defeat of Rosebeck (November 27, 1382), leaving 26,000 of them on the field. Flanders, the county of Burgundy, Artois, Rethel, and Nevers fell to him by the death of the count in 1384, and the influence of his power, combined with prudence and good management on his part, soon won the affection and esteem of his new subjects. Energy and wisdom characterized his government; arts, manufactures, and commerce were much and judiciously encouraged, and his territory (a kingdom in extent) was one of the best governed in Europe. During the minority and subsequent imbecility of his nephew Charles VI. of France, he was obliged to take the helm of affairs, and preserve the state from insurrection and sedition within, and the attacks of the English without. He was on his way to repel an attack of the latter on Flanders when he died at the chateau of Hall in Brabant, a little to the south-west of Brussels, April 27, 1404.

PHILIPPE LE BON, i. e., 'the Good,' Duke of Burgundy, the son of Jean 'Sans-peur' by Margaret of Bavaria, and grandson of Philippe the Bold, was born at Dijon (the capital of the duchy), June 13, 1396, and on the assassination of his father on the bridge of Montereau at the instigation of the dauphin (afterwards Charles VII.), succeeded to the duchy of Burgundy. Bent on avenging the murder of his father, he entered into an offensive and defensive alliance with Henry V. of England at Arras in 1419, at the same time recognizing him as the rightful regent of France, and heir to the throne after Charles VI.'s death. This agreement, which disregarded the Salic law, was sanctioned by the king, parliament, university, and states-general of France by the treaty of Troyes, but the dauphin declined to resign his rights, and took to arms; he was, however, defeated at Crevant (1423) and Verneuil (1424), and driven beyond the Loire. Some disputes with the English prompted P. to conclude a treaty with the king of France in 1429. However, the English, by ceding to P. the province of Champagne, and paying him a large sum of money, restored him to their side. At this time, by becoming heir to Brabant, Holland, Zealand, and the rest of the Low Countries, he was at the head of the most flourishing and powerful realm in Western Europe; but though much more powerful than his superior, the king of France, he preferred to continue in nominal subjection. Smarting under some fresh insults of the English viceroy, and being strongly urged by the pope, he made a final peace (1435) with Charles, who gladly accepted it even on the hard conditions which P. prescribed. The English, in revenge, committed great havoc among the merchant navies of Flanders, which irritated P. to such an extent that he declared war against them, and, in conjunction with the king of France, gradually expelled them from their French possessions.

The imposition of taxes, which were necessarily heavy, excited a rebellion, headed, as usual, by the citizens of Ghent, but the duke inflicted upon them a terrible defeat (July 1454), though he wept over a victory bought with the blood of 20,000 of his subjects. The latter part of his reign was filled with trouble caused by the quarrels between Charles VII. and his son, the Dauphin Louis (afterwards Louis XI.), who had fled from his father's court, and sought shelter from P., although, after ascending the throne, far from showing gratitude, he tried, in the most dishonorable manner, to injure his benefactor. P. died at Bruges, July 15, 1467, deeply lamented by his subjects. Under him, Burgundy was the most wealthy, prosperous, and tranquil state in Europe; its ruler was the most feared and admired sovereign of his time, and his court far surpassed in brilliancy those of his contemporaries. Knights and nobles from all parts of Europe flocked to his jousts and tournaments.

PHILIPPEVILLE, a thriving town and seaport of Algeria, in the province of Constantine, and forty miles north-north-east of the city of that name, on the Gulf of Stora, between Cape Boujaroun and Cape de Fer. It was laid out in 1838 by Marshal Valée, on the ruins of the ancient Russicada, and is one of the prettiest towns in Algeria, and thoroughly French in its character. It is an important entrepôt of the commerce of the east of Algeria, and the country in the vicinity is picturesque and fertile, producing grain, tobacco, cotton, flax, and fruits. It contains numerous public offices, a large hospital and dispensary, Catholic and Protestant churches, public library and museum, theater, &c. In the vicinity are quarries of the famous Filfila marble. A harbor has been constructed, including a pier and dock, which afford shelter to small merchant ships in bad weather. There are here several establishments for curing fish, and trade is carried on in grain and in fabrics of native manufacture. P. is the chief station of the railway for the province of Constantine, and is connected by steamer with Marseille and Algiers. Pop. (1872) 13,022.

PHILI'PPI, a city of Macedonia. It was named after Philip II. of Macedon, who conquered it from Thrace (up to which time it had been called Crenides, or the 'Place of Fountains'), and enlarged it because of the gold-mines in its neighborhood. Philip worked the mines so well, that he got from them 1000 talents a year. It is famous on account of the two battles fought in 42 B.C. between Antony and Octavianus on the one side, and the republicans under Brutus and Cassius on the other. The first engagement was undecided; in the second, 20 days after, the republic finally perished. The apostle, Paul founded a Christian church here in 53 A.D., to which one of his epistles is addressed. The ruins of the city still bear the name of Philippi, or Feliba.

PHILI'PPIANS, EPISTLE TO THE, one of the latest of the Pauline epistles. It was transmitted, from Rome probably about the year 63 A.D., through Epaphroditus, apparently a pastor of the Philippian church, who had been sent to minister to the necessities of the apostle. The Philippian church was looked upon with peculiar tenderness and affection by Paul. It was the first fruits of his evangelization in Europe; its members were singularly kind towards him; again and again, when he was laboring in other cities, such as Thessalonica and Corinth, they sent him contributions that he might not be burdensome to his new converts, and now they had sent one of the brethren all the way to Rome with presents for him, knowing that he was in bonds, and suspecting—what was in fact the case—that he might be in sore straits for his daily bread. His letter to them is deeply affecting. It contains not so much of doctrinal matter, as of a warm outpouring of his personal feelings towards his friends at Philippi. The historical evidence in favor of the authenticity of the Epistle is so strong, that it could hardly give way to any internal criticism; and the objections of this kind, urged by Baur, Schwegler, and others of the Tübingen school, who regard it as a Gnostic composition of the 2d c., are regarded as preposterous even by many Biblical scholars who do not profess to be orthodox.

PHILI'PPICS, originally the three orations of Demosthenes against Philip of Macedon. The name was afterwards applied to Cicero's orations against the ambitious and dangerous designs of Mark Antony. It is now commonly employed to designate any severe and violent invective, whether oral or written.

PHI'LIPPINE ISLANDS, lie to the north of Borneo and Celebes, in 5° 30′—19° 42′ N. lat., and 117° 14′—126° 4′ E. long. They are more than 1200 in number, with an area of about 150,000 square miles. Pop. (1876) 6,173,632, three-fourths of whom are subject to Spain, the remainder governed, according to their own laws and customs, by independent native princes.

Luzon, in the north, has an area of 51,300 square miles, and Mindanao, or Magindanao, in the south, fully 25,000. The islands lying between Luzon and Mindanao are called the Bissayas, the largest of which are—Samar, area 13,020 square miles; Mindoro, 12,600; Panay, 11,340; Leyte, 10,080; Negros, 6300; Masbate, 4200; and Zebu, 2352. There are upwards of a thousand lesser islands of which little is known. To the south-west of the Bissayas lies the long, narrow island of Paragoa or Palawan, formed of a mountain-chain with low coast-lines, cut with numerous streams, and exceedingly fertile. The forests abound in ebony, log-wood, gum-trees, and bamboos. Area 8820 square miles. To the north of Luzon lie the Batanen, Bashee, and Babuyan islands, the two first groups having about 8000 inhabitants, the last unpeopled.

The Sooloo Islands form a long chain from Mindanao to Borneo, having the same mountainous and volcanic structure as the P. I., and all are probably fragments of a submerged continent. Many active volcanoes are scattered through the islands; Mayon, in Luzon, and Buhayan, in Mindanao, often causing great devastation. The mountain-chains run north and south, and never attain a greater elevation than 7000 feet. The islands have many rivers, the coasts are indented with deep bays, and there are many lakes in the interior. Earthquakes are frequent and destructive,

Manila, the capital, having been nearly destroyed by one in 1863. In 1864, another terrific earthquake visited Mindanao, destroying most of the houses. Three successive earthquakes in 1880 did great damage, especially in Manila, where many buildings were totally ruined. The soil is fertile, except where extensive marshes occur. In Mindanao are numerous lakes, which expand during the rainy seasons into inland seas. Rain may be expected from May to December, and from June to November the land is flooded. Violent hurricanes are experienced in the north of Luzon and west coast of Mindanao. Especially during the changes of the monsoons, storms of wind, rain, thunder and lightning prevail. The weather is very fine, and heat moderate, from December to May, when the temperature rapidly rises and becomes oppressive, except for a short time after a fall of rain. The fertility of the soil and humid atmosphere produce a richness of vegetation which is nowhere surpassed. Blossoms and fruit hang together on the trees, and the cultivated fields yield a constant succession of crops.

Immense forests spread over the P. I., clothing the mountains to their summits; ebony, iron-wood, cedar, sapan-wood, gum-trees, &c., being laced together and garlanded by the bush-rope or palasan, which attains a length of several hundred feet. The variety of fruit-trees is great, including the orange, citron, bread-fruit, mango, cocoa-nut, guava, tamarind, rose-apple, &c.; other important products of the vegetable kingdom being the banana, plantain, pine-apple, sugar-cane, cotton, tobacco, indigo, coffee, cocoa, cinnamon, vanilla, cassia, the areca-nut, ginger, pepper, &c., with rice, wheat, maize, and various other cereals.

Gold is found in river-beds and detrital deposits, being used, in form of dust, as the medium of exchange in Mindanao. Iron is plentiful, and fine coal-beds, from one to four feet thick, have been found. Copper has long been worked in Luzon. There are also limestone, a fine variegated marble, sulphur in unlimited quantity, quicksilver, vermilion, and saltpetre—the sulphur being found both native and in combination with copper, arsenic, and iron.

Except the wild cat, beasts of prey are unknown. There are oxen, buffaloes, sheep, goats, swine, harts, squirrels, and a great variety of monkeys. The jungles swarm with lizards, snakes, and other reptilia; the rivers and lakes with crocodiles. Huge spiders, tarantulas, white ants, mosquitoes, and locusts are plagues which form a set-off to the beautiful fire-flies, the brilliant queen-beetle (*Elater noctilucus*), the melody of myriads of birds, the turtle-doves, pheasants, birds of paradise, and many lovely species of paroquets, with which the forests are alive. 'Hives of wild bees hang from the branches, and alongside of them are the nests of humming-birds dangling in the wind.'

The caverns along the shores are frequented by the swallow, whose edible nest is esteemed by the Chinese a rich delicacy. Some of them are also tenanted by multitudes of bats of immense size. Buffaloes are used for tillage and draught; a small horse for riding. Fowls are plentiful, and incredible numbers of ducks are artificially hatched. Fish is in great abundance and variety. Mother-of-pearl, coral, amber, and tortoise-shell are important articles of commerce.

The Tagals and Bisayers are the most numerous native races. They dwell in the cities and cultivated lowlands; 2,500,000 being converts to Roman Catholicism, and a considerable number, especially of the Bisayers, Mohammedan. The mountain districts are inhabited by a negro race, who, in features, stature, and savage mode of living, closely resemble the Alfoors of the interior of Papua, and are probably the aborigines driven back before the inroads of the Malays. A few of the negroes are Christian, but they are chiefly idolaters, or without any manifest form of religion, and roaming about in families, without fixed dwelling. The Mestizos form an influential part of the population; by their activity engrossing the greatest share of the trade. These are mostly of Chinese fathers and native mothers. Few Spaniards reside in the P. I., and the leading mercantile houses are English and American. The Chinese exercise various trades and callings, remaining only for a time, and never bringing their wives with them. The principal languages are the Tagalese and Bisayan. Rice, sweet potatoes, fish, flesh, and fruits form the food of the Tagals and Bisayers, who usually drink only water, though sometimes indulging in cocoa-wine. Tobacco is used by all. They are gentle, hospitable, fond of dancing and cock-fighting.

With the exception of two Spanish brigades of artillery and a corps of engineers, the army is composed of natives, and consists of seven regiments of infantry and one of cavalry. There is also a body of Spanish militia in Manila, whom the governor, as commander of the naval and land forces, may call out in an emergency. The navy has four steamships, one brig, six gun-boats, and a great number of feluccas for coast service. Education is far behind, and similar to what it was in Europe during the middle ages. There is an archbishop of Manila, and bishops of New Segovia, Nueva Caceres, and Zebu. Religious processions are the pride of the people, and are formed with great parade, thousands of persons carrying wax-candles, &c. The natives not only build canoes, but ships of considerable tonnage. They weave various textile fabrics of silk, cotton, abaca, and very fine shawls and handkerchiefs from the fibre of pine-apple leaves. These are called pinas, and often sell for one or two ounces of gold apiece. The pinilian is the finest sort, and is only made to order—one for the queen of Spain costing 500 dollars. They work in horn, make silver and gold chains, fine hats and cigar-cases of fibres, and beautiful mats of different colors, ornamented with gold and silver. The governor-general is appointed direct from Spain, and resides at Manila. There are also a lieutenant-governor, governors of provinces and chiefs of pueblos or townships, who are elected yearly. Acting governors reside also at Zamboanga in Mindanao, and Iloilo in Panay. They are appointed for six years by the governor-general.

It is to be remembered that all the ports of this archipelago, except Sual, Iloilo, Zebu, and Manila, are still closed against foreign vessels. In 1868, there seemed a gleam of hope that a more liberal commercial policy would be adopted by Spain for their possessions among the Philippine Islands. In that year it was decreed that differential duties should be abolished in April 1871. They were abolished accordingly, but only for three months. In July an, order was issued granting importers, under the Spanish flag, of foreign goods, an advantage of 2·5 per cent. The value of the imports into the United Kingdom for the P. I. and Ladrones in 1880 was £1,688,663; of our exports thither, £1,328,482. The total exports from the P. I. in 1877 were valued at £3,592,900; of which Great Britain got £1,239,000; India, £80,000; Hong-Kong, £40,000. The imports for 1876 were £2,397,432, the duties on which amounted to 7¾ per cent. on their value. The principal exports are sugar, tobacco, cigars, indigo, Manila hemp, or Abaca (q. v.), coffee, rice, dye-woods, hides, gold-dust, and bees-wax. Cotton, woollen, and silk goods, agricultural implements, watches, jewelry, &c., are imported. British and American merchants do the largest business, the imports from Great Britain being about £1,000,000 per annum.

The Sooloo islands have a population of 150,000; are governed by a sultan, whose capital is Sung, in 66° 1′ N. lat., and 120° 55′ 51″ E. long., who also rules over the greatest part of Paragoa, the northern corner only being subject to Spain.

Luzon has a population of 2,500,000, one-fifth part being independent; the Bissayas islands, 2,000,000, of whom three-fourths are under Spanish rule. The population of Panay amounts to 750,000, and that of Zebu to 150,000. Of the numbers in Mindanao nothing is known; the districts of Zamboanga, Misamis, and Caragan, with 100,000 inhabitants, being all that is subject to Spain. The greater part of the island is under the sultan of Mindanao, resident at Selanga, in 7° 9′ N. lat. and 124° 38′ E. long., who, with his feudatory chiefs, can bring together an army of 100,000 men. He is on friendly terms with the Spaniards. Besides Manila, there are very many large and important cities, especially in Luzon, Panay, and Zebu. The great centers of trade are Manila in Luzon, and Iloilo in Panay.

The P. I. were discovered in 1521 by Magellan, who, after visiting Mindanao, sailed to Zebu, where, taking part with the king in a war, he was wounded, and died at Mactan, 26th April 1521. Some years later the Spanish court sent an expedition under Villabos, who named the islands in honor of the Prince of Asturias, afterwards Philip II. For some time the chief Spanish settlement was on Zebu; but in 1581 Manila was built, and has since continued to be the seat of government.

PHI'LIPPINS, a Russian sect, so called from the founder, Philip Pustoswiät, under whose leadership they emigrated from Russia in the end of the 17th c., are a branch of the RASKOLNIKS (q. v.). They call themselves Starowerski, or 'Old Faith Men,' because they cling with the utmost tenacity to the old service-books, the old version of the Bible, and the old hymn and prayer-books of the Russo-Greek Church, in the exact form in which these books stood before the revision which they underwent at the hands of the patriarch Nikon in the middle of the 17th century. There are two classes of the Raskolniks—one which recognizes popes (or priests); the other, which admits no priest or other clerical functionary.

The P. are of the latter class; and they not only themselves refuse all priestly ministrations, but they regard all such ministrations—baptism, marriage, sacraments—as invalid; and they rebaptize all who join their sect from other Russian communities. All their own ministerial offices are discharged by the Starik, or parish elder, who for the time takes the title of pope, and is required to observe celibacy. Among the P. the spirit of fanaticism at times has run to the wildest excesses. They refuse oaths, and decline to enter military service; and having, on account of this, and many other incompatibilities of the system, with the Russian practice, encountered much persecution, they resolved to emigrate. Accordingly, in 1700, under the leadership of Philip Pustoswiät, they settled partly in Polish Lithuania, partly afterwards in East

Prussia, where they still have several small settlements with churches of their own rite. They are reported to be a peaceable and orderly race. Their principal pursuit is agriculture; and their thrifty and industrious habits have secured for them the goodwill of the proprietors.

PHILIPS, AMBROSE, was born in Shropshire in 1675. He studied at St. John's College, Cambridge, and took his degree of M.A. in 1700. In 1709 his Pastorals appeared, along with those of Pope, in *Tonson's Miscellany;* and the same year, having gone on a diplomatic mission to Copenhagen, he addressed from thence a 'Poetical Letter' to the Earl of Dorset, which was published, with a warm eulogium from Steele, in the *Tatler*. In 1712, he brought on the stage *The Distressed Mother*, a tragedy adopted from Racine's *Andromaque*, which had great success. He subsequently wrote two other tragedies, but they proved failures. Some translations from Sappho, which appeared in the *Spectator*, added greatly to P.'s reputation, but Addison is believed to have assisted in these classic fragments.

Some exaggerated praise of P. having appeared in the *Guardian*, Pope ridiculed his pastorals in a piece of exquisite irony, which led to a bitter feud between the poets. P. even threatened personal chastisement, and hung up a rod in Button's Coffee-house, but no encounter took place. One of the names fastened upon P. was that of 'Namby Pamby,' arising from a peculiar style of verse adopted by him in complimentary effusions, consisting of short lines and a sort of infantine simplicity of diction, yet not destitute of grace or melody. The accession of the House of Hanover proved favorable to the poet; he was appointed paymaster, and afterwards a commissioner of the lottery; and going to Ireland as secretary to Archbishop Boulter, he became secretary to the Lord Chancellor, M.P. for Armagh, and registrar of the Prerogative Court. He died in 1749. P. is somewhat conspicuous in literary history from the friendship of Addison and the enmity of Pope; but his poetry, wanting energy and passion, has fallen out of view.

PHI'LIPSTOWN, a market and post town (formerly the assize town) of King's County, province of Leinster, Ireland, 47 miles south-west from Dublin. Its charter dates from 1567; and in the reign of James II. it obtained the privilege of sending two members to parliament. This privilege was withdrawn at the Union. It is at present, and has long been a place of hardly any trade and entirely without manufacture, and the town has fallen still more into decay since the withdrawal of the assizes (1838) to the neighboring and more flourishing town of Tullamore. Pop. (1881) 829, principally Catholics.

PHILISTINES (*LXX.*, *Allophuloi*, Strangers), a word either derived from a root *phalasa* (Æth.), to emigrate, wander about, or identified with Pelasgi (q. v.), or compared by others with *Shefela* (Heb.), lowlanders; designates a certain population mentioned in the Bible as being in frequent contact with the Jews, and who lived on the coast of the Mediterranean, to the south-west of Judæa, from Ekron towards the Egyptian frontier, bordering principally on the tribes of Dan, Simeon, and Judah. Our information about the origin of the P. is extremely obscure and contradictory. The genealogical table in Genesis (x. 14) counts them among the Egyptian colonies (the 'Casluhim, out of whom came Philistim'); according to Amos ix. 7, Jeremiah xlvii. 4, and Deuteronomy ii. 23, they came from Caphtor. But supposing that the Casluhim were some separate tribe, and yet Caphtorian colonists, the question still remains, whether Caphtor can be identified with Cappadocia in Asia Minor, as the early versions (*LXX.*, *Targ.*, *Pesh. Vulg.*) have it; or whether it be Pelusium, Cyprus, or the Isle of Crete. The latter opinion seems not the least probable among them. At what time they first immigrated, and drove out the Canaanitish inhabitants, the Avvim, is difficult to conjecture. They would appear to have been in the country as early as the time of Abraham; and in the history of Isaac, Abimelech, king of Gerar, is distinctly called king of the Philistines. Yet, even supposing that in Genesis the country is designated by the name which it bore at a later period, there can yet be no doubt of the people being firmly established at the time of Moses (Exodus xv. 14, &c.). Thus the date of their immigration would have to be placed at about 1800 B.C.

At the Exodus, Moses, evidently fearing an encounter with the warlike colony for his undisciplined band, did not choose the shorter way to Canaan through their territory, but preferred the well-known circuituous route. At a later period, however, Joshua, having triumphed over 31 Canaanite princes, also conceived the plan of making himself master of the possessions of the P.; but his intended disposal of their country for the benefit of the tribe of Judah was never carried out. At this time, they were subject to five princes (Seranim = axles, pivots), who ruled over the provinces of Gaza, Ashdod, Askalon, Gath, and Ekron. Not before the period of the Judges did they come into open collision with the Israelites; and the strength and importance in which they suddenly appear then, contrast so strangely with their insignificance at the time of the patriarchs, that many theories—a double immigration principally—have been propounded to explain the circumstance. We find them daring powerful nations like the Sidonians, whom, about 1209 B.C., they forced to transfer their capital to a more secure position on the island of Tyre; or the Egyptians, with whom they engaged in naval warfare at the same time under Rameses III. With the Israelites their war assumed the air of guerrilla raids, sometimes into the very heart of the country. Under Shamgar (about 1370 B.C.), they were repulsed with a loss of 600 men; however, about 200 years later, the Israelites were tributary to them, and continued to groan under their yoke, with occasional pauses only, until Samson first commenced to humiliate them. But they were still so powerful at the time of Eli, that they carried away the ark itself. Under Samuel, their rule was terminated by the battle of Mizpah.

Saul was constantly engaged in warding off their new encroachments, and at Gilboa, he and his sons fell in a disastrous battle against them. At this time, they seem to have returned to their primitive form of a monarchy, limited, however, by a powerful aristocracy, the king's formal title again being 'Abimelech' = 'Father-king,' as we find it in Genesis. David succeeded in routing them repeatedly; and under Solomon their whole country seems to have been incorporated in the Jewish empire. The internal troubles of Judæa emboldened the P. once more to open resistance. Under Joram, in union with the Arabians, they invaded Judæa, and not only carried away the royal property, but also the serail and the royal children. Uzziah, however, recovered the lost ground; he overthrew them, and dismantled some of their most powerful fortresses—Gath, Yabne, and Ashdod, and erected forts in different parts of their country. Under Ahaz, they rose again, and attacked the border-cities of the 'plain' on the south of Judah; and a few years later, renewed their attacks, in league with the Syrians and Assyrians. Hezekiah, in the first years of his reign, subjected their whole country again, by the aid of the Egyptians, whom we find in the possession of five cities. The Assyrians, however, took Ashdod, under Tartan, which was retaken again by Psammetich, after 29 years' siege. About this time, Philistæa was traversed by a Scythian horde on their way to Egypt, who pillaged the temple of Venus at Askalon. In the terrible struggles for supremacy which raged between the Chaldæans and Egyptians, Philistæa was the constant battle-ground of both—her fortresses being taken and retaken by each of them in turn; so that the country soon sank into ruin and insignificance. Yet a shadow of independence seems to have been left to it, to judge from the threats which Zechariah (ix. 5), after the exile, utters against Gaza and Askalon, and their pride.

In the time of the Maccabees, the P. were Syrian subjects, and had to suffer occasionally from the Jews, although inter-marriages between the two nations were of no rare occurrence. Alexander Balas transferred part of the country to Judæa; another part was taken by Alexander Jannæus; Pompey incorporated some of the cities with Roman Syria; Augustus transferred another portion to Herod; and finally, Salome, his sister, received a small principality of it, consisting of Jamnia, Ashdod, and Askalon. But by this time the name of the country had long been lost in that of Palestine, which designated all the territory between the Lebanon and Egypt.

Of their state of culture, institutions, &c., we know very little indeed. They appear as a civilized, agricultural, commercial, and warlike nation. They trade largely, and their wares seem to have been much sought after. Their worship was much akin to that of the Phœnicians—a nature-religion, of which Dagon, Ashtaroth, Baalzebub, and Derceto were the chief deities. Priests and soothsayers abounded; their oracles were consulted even by people from afar. They carried their charms about their persons, and their deities had to accompany them to the wars. They do not seem to have practised circumcision. As to their language, so little is known about it, that conjectures seem more than usually vain. Those who take them to have been Semites, conclude that their language, too, was Semitic; others, who would identify them with the Pelasgians, differ also respecting their language. Thus much is certain, that their proper names, as they are recorded in the Bible, are mostly Semitic, and that there always remained a difference of dialect between the Hebrew and the Philistæan idiom.

The name of Philistines is given by German students to all non-students in general, and the citizens of the special university-place in particular.

PHILLIP, JOHN, R.A., was born, 22d May 1817, at Aberdeen. At a very early age he gave indication of the talent which afterwards so distinguished him; and before he had attained his fifteenth year, had painted various pictures showing his feeling for color. He thus procured an introduction to the late Lord Panmure, by whom he was enabled to go to London to pursue his studies. He began by copying from the Elgin marbles at the

British Museum, and after a few months was admitted as a student at the Royal Academy.

All his early subjects were of Scotch character, such as a 'Scotch Fair,' 'Baptism in Scotland,' a 'Scotch Washing,' 'The Offering,' &c. In the year 1851 he went to Spain in search of health, which he found, and with it a change in the character of his subjects. On his return home he established himself at the head of the painters of the habits and customs of the Spanish people. In 1853 he exhibited at the Royal Academy 'Life among the Gipsies at Seville.' His pictures for 1854—1855, 'A Letter Writer of Seville,' and 'Ell Paseo,' were both purchased by Her Majesty the Queen. In 1857, he attained the rank of Associate of the Royal Academy, and the following year exhibited a most powerful picture of 'Spanish Contrabandistas,' which was purchased by the late Prince Consort, of whom he also painted a portrait the same year for the town-hall of his native city. In 1859, he received the full honor of Royal Academician. His work for exhibition in 1860 was certainly the most difficult he had yet tried, and his success was proportionably great. 'The Marriage of the Princess Royal' was pronounced by both his fellow-artists and the public as a decided success. His next portrait subject (exhibited 1863) was, if possible, a still more difficult task, being the 'House of Commons, 1860,' containing upwards of thirty portraits of the leading members of both sides of the House; in it he was equally successful. However much he excelled in portraiture, his heart was more in his Spanish subjects, of which he was understood to have in progress more works (the fruits of his last two visits to Spain) than he could have finished in several years.

The characteristics of Mr. P.'s style are rich powerful color, broad light and shade, strong bold outline, and great variety and truthfulness of texture; there was no artist in his day who had more power over his brush, or whose example produced a greater effect on the colorists of the present British school. He died February 27, 1867.

PHILIPPO'POLIS, chief town of the recently organized province of Eastern Roumelia, Turkey, 91 miles W.N.W. from Adrianople. It stands on a small island formed by the Maritza, which here becomes navigable. This island rises as a hill in the midst of a vast plain, which extends beyond Adrianople on the east, and from the base of the Rhodope Mountains on the south, to the Balkan chain on the north. The plain is extremely fertile, and is celebrated for the excellence of the rice which it produces. P. carries on a very extensive commerce both with Austria and with the East. P. is an ancient town, and in the time of the Romans bore the name of *Trimontium*. Three-fifths of the inhabitants are Christians, one-fifth Jews and gipsies, the remainder Mohammedans. P. is the seat of a Greek archbishop. The North American Board of Missions has a station at Philippopolis. Pop. about 60,000.

PHI'LIPPSBURG, a town of the grand-duchy of Baden, 16 miles north from Carlsruhe, on the right bank of the Rhine, at the mouth of the Salzbach. In former times it was one of the most important fortresses on the Rhine, and belonged to the Bishop of Spires. During the Thirty Years' War, P. fell successively into the hands of the Swedes, the French, the Imperialists, and again of the French, who were confirmed in possession of it by the Peace of Westphalia. In the wars of Louis XIV., it was taken by the Germans, and assigned to Germany by the peace of Nimeguen in 1679; but was again taken in 1688 by the French under Vauban, and once more restored to Germany by the peace of Ryswick in 1697. The French captured it again in 1734, and relinquished it in 1735. During the wars of the French Revolution, P. was bombarded, taken, and its fortifications completely destroyed in 1800. Pop. 2317.

PHI'LO JUDÆ'US, *the Philosopher* (there being another Jewish Greek writer of this name), was born at Alexandria, about the time of the birth of Christ. Belonging to one of the most wealthy and aristocratic families—his brother was the Alabarch Alexander—he received the most liberal education; and, impelled by a rare zeal for learning, he, at a very early age, had passed the ordinary course of Greek studies which were deemed necessary for one of his station. Although every one of the different free sciences and arts included in the *Encyclika*, he says, attracted him like so many beautiful slaves, he yet aimed higher, to embrace the mistress of them all—Philosophy. Metaphysical investigation was the only thing which, according to his own confession, could give him anything like satisfaction or pleasure. The extraordinary brilliancy of his style, which, by his contemporaries, was likened to that of Plato—his rare power of thought and imagination, and an erudition which displayed the most astonishing familiarity with all the works of the classical Greek poets and philosophers, while at the same time it made him an adept in the fields of history, geography, mathematics, astronomy, physiology, natural history, music, &c.—could not but be of vast influence both upon his co-religionists and those beyond the pale of his ancestral creed. He had completely mastered the literature of his nation; but, strange to say, he chiefly knew it, as far as it was Hebrew, from translations. Thus, the Bible was only familiar to him through the Septuagint version, with all its shortcomings. When about 40 years of age, he went to Rome as the advocate of his Alexandrian brethren, who had refused to worship Caligula in obedience to the imperial edict. He has left an account of this embassy, into the result of which we need not enter here. Of his life we know little except what is recorded above, and that he once went to Jerusalem. His second mission to Rome, to the Emperor Claudius, on which occasion he is said to have made the acquaintance of the Apostle Peter, as reported by Eusebius, is doubtful.

The religious and philosophical system of P., however, which is really the thing of most consequence, is most minutely known, and is deserving of the profoundest study, on account of the vast influence which it has exercised both on the Jewish and Christian world. To understand his system aright, it will be necessary to remember the strange mental atmosphere of his days, which we have endeavored briefly to sketch in our introduction to Gnostics (q. v.). The Alexandrines had endeavored to make Judaism palatable to the refined Greeks, by proving it to be identical with the grandest conceptions of their philosophers and poets, and had quite allegorized away its distinctive characteristics. P. was the first man who, although himself to a great extent imbued with allegorizing tendencies, made a bold and successful stand against a like evaporization of the revealed religion of his fathers: which, indeed, in many cases had led people to throw off its yoke also outwardly. A most zealous champion of Judaism, his bitterness in rebuking those co-religionists who tried to defend their secret or overt apostacy by scoffing at the Law itself, who were 'impatient of their religious institutions, ever on the look-out for matter of censure and complaint against the laws of religion, who, in excuse of their ungodliness, thoughtlessly argue all manner of objections'—knows no bounds. He cannot understand how Jews, 'destined by divine authority to be the priests and prophets for all mankind,' could be found so utterly blind to the fact, that that which is the position only of a few disciples of a truly genuine philosophy—viz., the knowledge of the Highest, had by law and custom become the inheritance of every individual of their own people; whose real calling, in fact, it was to invoke the blessing of God on mankind, and who, when they offered up sacrifices 'for the people,' offered them up in reality for all men.

To P., the divinity of the Jewish Law is the basis and test of all true philosophy. Although, like his contemporaries, he holds that the greater part of the Pentateuch, both in its historical and legal portions, may be explained allegorically, nay, goes so far even as to call only the Ten Commandments, the fundamental rules of the Jewish theocracy, direct and immediate revelations, while the other parts of the Book are owing to Moses: he yet holds the latter to be the interpreter specially selected by God, to whose dicta in so far also divine veneration and strict obedience are due; and again, although many explamtions of a metaphysical nature could be given to single passages, yet their literal meaning must not be tampered with. This literal meaning, according to him, is the essential part, the other explanations are mere speculation—exactly as the Midrash and some Church Fathers hold. Only that allegorical method differed in so far from that of his contemporaries, that to him these interpretations—for which he did not disdain sometimes even to use the numbers symbolically, or to derive Hebrew words from Greek roots, and the like—were not a mere play of fancy, in which he could exercise his powers of imagination, but, to a certain extent, a reality, an inner necessity. He clung to philosophy, as combined with the Law. If the former could be shown, somehow or other, to be hinted at in the latter, then only he could be that which all his soul yearned to be—viz., the disciple of both: a Greek, with all the refinement of Greek culture; and a Jew—a faithful, pious, religious Jew. Nay, he even urged the necessity of allegory from the twofold reason of the anthropomorphisms current in Scripture and from certain apparent superfluities, repetitions, and the like, which, in a record that emanated from the Deity, must needs have a special meaning of their own, which required investigation and a peculiar interpretation. See MIDRASH, HAGGADA. Yet this fanciful method never for one moment interfered with his real object of pointing out how Judaism most plainly and unmistakably was based upon the highest ethical principles.

His writings develop his ideas and his system in the two directions indicated. In that division of his writings principally, which treats of the Creation (*Kosmopoia*), he allows allegory to take the reins out of his hands; in that on the Laws (*Nomoi*), on the other hand, he remains remarkably sober and clear, extolling the Mosaic legislation throughout, at the expense of every other known to him. In a very few instances only he is induced to find fault, or to alter slightly, by way of allegory, the existing ordinances.

His idea of God is a pre-eminently religious, not a philosophical one. He alone is the real Good, the Perfect; the world has

only an apparent existence, and is the source of all evil. God is only to be imagined as the primeval light, which cannot be seen by itself, but which may be known from its rays, that fill the whole world. Being infinite and uncreated, He is not to be compared with any created thing. He has therefore no name, and reveals Himself only in designations expressive of this 'inexpressibility.' He is also named the Place (the talmudical *Makom*) because He comprises all space, and there is nothing anywhere besides Him. He is better than Virtue and Knowledge, better than the Beautiful and the Good (*Kalokagatheia*), simpler than the One, more blissful than bliss. Thus, He has, properly speaking, no quality, or only negative ones. He is the existing Unity or Existence itself (*Ôn*, or *Ôn*), comprised in the unpronounceable Tetragrammaton. As Creator God manifests Himself to man, and He is then called 'The Beginning, the Name, the Word, the Primeval Angel.' In this phase of active revelation of God, which is as natural to Him as burning is to the heat, and cold to the snow, we notice two distinct sides, the Power and the Grace, to which correspond the two names of Elohim and Adonai, used in the Bible.

The *Power* also gives the laws, and punishes the offender; while the *Grace* is the beneficent, forgiving, merciful quality. Yet, since there is not to be assumed an immediate influence of God upon the world, their respective natures being so different, that a point of contact cannot be found, an intermediate class of beings had to be created to stand between both, through whom He could act in and upon creation—viz., the spiritual world of ideas, which are not only 'Ideals,' or types, in the Platonic sense, but real, active powers, surrounding God like a number of attendant Beings. They are His messengers, who work His will, and by the Greeks are called good demons; by Moses, angels. There are very many different degrees of perfection among them. Some are immediate 'serving angels;' others are the souls of the pious, of the prophets, and of the people of Israel, who rise higher up to the Deity; others, again, are the heads and chief representatives of the different nations, such as Israel does not need, since they conceive and acknowledge the Everlasting Head of all beings, Himself. The *Logos* comprises all these intermediate spiritual powers in His own essence. See article LOGOS for P.'s views on this part of his system. Man is a microcosm, a little world in himself, a creation of Logos, through whom he participates in the Deity, or, as Scripture has it, 'he is created in the image of God.' He stands between the higher and lower beings—in the middle of creation. The ethical principles of Stoicism, P. identified with the Mosaic ethics, in which the ideal is most exalted moral perfectibility or sanctity, and man's duties consist in veneration of God, and love and righteousness towards fellow men. P. holds firmly the belief in immortality. Man is immortal by his heavenly nature; but as there are degrees in his divine nature, so there are degrees in his immortality, which only then deserves this name when it has been acquired by an eminence of virtue.

There is a vast difference between the mere living after death, which is common to all mankind, and the future existence of the perfect ones. Future recompense and punishment are not taken by him in the ordinary sense of the word. Virtue and sin both have all their rewards within themselves; but the soul, which is 'pre-existing,' having finished its course in the sublunar world, carries this consciousness with it in a more intense and exalted manner. Paradise is Oneness with God; there is no hell with bodily punishments for souls without a body, and no Devil in the Philonic system.—Philo's Messianic notions are vague in the extreme, and he partly even interprets certain scriptural passages alluding to some future Redeemer as referring to the soul. Yet he indicates his belief in a distant time when some hero will arise out of the midst of the nation, who will gather all the dispersed together; and these, purified by long punishments, will henceforth form a happy, sinless, most prosperous community, to which all the other nations will be eager to belong.

We have only been able to indicate, in the slightest of outlines, the principal features of P.'s theology and philosophy, without endeavoring to follow any one of the manifold systematic schemes into which his scattered half-obscure dicta have been pressed. The influence P. has exercised upon Christianity and Judaism (in the later writings of which his name occurs as 'Yedidyah the Alexandrine') is enormous, and the various articles in the course of this work (GNOSTICISM, JEWS, LOGOS, &c.) dwell more or less upon this point. What he has done for the development of Philosophy, is discussed under that head, and in the articles PLATO, NEO-PLATONISM, &c.

Of the many works left under his name, several have been declared spurious, but in some cases without much show of reason. His writings are generally brought under three chief divisions, the first of which comprises those of a more general and metaphysical nature, such as, *De Mundi Incorruptibilitate*, *Quod Omnis Probus Liber*, *De Vita Contemplativa*. The second contains those written in defence of his compatriots, *Adversus Flaccum*, *Legatio ad Caium*, *De Nobilitate*. The third and most important is devoted to the interpretation and explanation of Scripture in the philosophical manner indicated, *De Mundi Opificio*, *Legis Allegoriarum Libri III.*; containing also a number of special treatises, *De Circumcisione*, *De Monarchia*, *De Præmiis Sacerdotum*. *De Posteritate Caini*, *De Cherubim*. &c.; five books *On the History of Abraham*, *De Josepho*, *Vita Mosis*, *De Caritate*, *De Pœnitentia*, &c.; to which also belong *De Parentibus Colendis*, *De Virtute eiusque Partibus*, first published by A. Maï; and certain very doubtful fragments, first discovered in an Armenian translation, such as *De Providentia* and *De Animalibus*, &c. Many of his works, however, seem irredeemably lost. The *editio princeps* by Turnebus, dates Paris, 1552; reprinted Geneva, 1613; Paris, 1640; &c. Mangey published a more critical edition (Lond. 1742, 2 vols. fol.), and Richter a slightly improved one (Leip. 1828—1830, 8 vols.). An edition of Pfeiffer (1785, &c.) remained incomplete. Another edition was published by Tauchnitz (1851, &c.). As yet, there are several codd. in the Escurial, in Rome, in St. Petersburg, which have never been collated, and which promise, to judge from the few readings known, to furnish an immense help for that really critical edition, which as yet is a desideratum.—Of the scholars who have written on P., we mention principally Dahl, Bryant, Gfrörer, Creuzer, Grosmann, Wolff, Ritter, Beer, &c. The English translation of P. in 4 vols., forms part of Bohn's *Ecclesiastical Library*.

PHILO'LOGY. This word, as a technical name for a branch of knowledge, has gone through various phases of meaning. Originally signifying the love of talk or discourse, and then, in a more restricted sense, the love of philosophical conversation such as is exhibited in the dialogues of Plato, it came, in the later period of Greek literature, to mean the study and knowledge of books, and of the history and other science contained in them. In this sense it passed over to the Romans, under whom the name of philologists was applied to men distinguished for universal learning, more especially to the *grammatici*, whose chief occupation of editing and illustrating the classic poets, naturally led them to this multifarious knowledge; and when Martianus Capella (q. v.) in the 5th c. composed his Encyclopædia (q. v.) or curriculum of education, embracing the 'seven liberal arts' (Grammar, Dialectic, Rhetoric, Music, Arithmetic, Geometry, and Astronomy), he designates the collective whole by the name of philology. What is known as the Revival of Literature after the dark ages, is nothing else than the revival of the ancient philology. But when men, instead of looking only at what had been written, began to examine the world for themselves, and enlarge the bounds of science, it became impossible for one man to cultivate the whole round of knowledge, and the term philology was by degrees restricted to a knowledge of the languages, history, laws, &c. of the ancient world (by which the Greek and Roman world was chiefly thought of), or, more narrowly still, to the study merely of the languages—of grammar, criticism, and interpretation. A more complete conception of philology, as an indepen ent branch of knowledge, was that of F. A. Wolf, who assigned as its field all that belongs to the life of the ancient peoples; and the conception is still further extended by Böckh, who makes it almost synonymous with history—its problem being the reproduction of the past; in this sense, the word is applicable to all peoples at all periods of their history, so that we are beginning to have an Indian philology, a German philology, a Slavic philology, no less than a classic philology. The fullest and most systematic exposition of what philology in this sense ought to embrace, has been given by G. Haase in Ersch and Grüber's *Ency.*, 3d sect., vol. xxiii.

Of philology, even in its widest sense, the study of language was always, and necessarily, a fundamental part; and, in the usual sense of the word, it has been the chief part—often nearly the whole. For a long time after the revival of learning, the classic writers were studied chiefly for their language and style, and those of them that did not come up to an imaginary standard of purity were despised and neglected, however valuable they might be for their matter. But although great and even undue attention was thus given to language, it was only as an instrument, as means to an end. The philologist studied a language in order to be able to understand it and use it—to get at the thoughts conveyed in it, or to convey his own thoughts with force and elegance to others. This is the object of the grammars, dictionaries, annotated editions, and criticisms, which constitute the chief part of philological literature. But within recent years, philology has entered upon a new phase, or rather a new study has sprung up alongside of the old. As the naturalist investigates a class of objects not with a view to turn them to use, but to understand their nature, and classify them; so the new school of philologists examine and compare the structures of the various languages, and arrange them in classes and families, with the ultimate view of arriving at some theory of language in general—its mode of origin and growth. The comparison of the structure of two or more languages is called Comparative Grammar, and the whole of this

new branch of study is sometimes designated as Comparative Philology; but it seems better to leave the old field in possession of the old name, and in contradistinction to philology as the practical knowledge of languages, to speak of the study of language as a phenomenon *per se*, as the Science of Language. The German term *Sprachenkunde*, and the French *Linguistique*, have more especial reference to the naturalist, or classificatory aspect of the study.

So long as the view prevailed that language was a human invention, anything like a science of it was impossible. According to that view, which was early started, and was especially elaborated and discussed by Locke, Adam Smith, and Dugald Stewart, it was only after men found that their rapidly increasing ideas could be no longer conveyed by gestures of the body and changes of the countenance, that they set about inventing a set of artificial vocal signs, the meaning of which was fixed by mutual agreement. On this theory, there might be a history of the subsequent course of the different languages, but inquiries into the nature and laws of language after the manner of the physical sciences would be absurd. In opposition to the philosophers who attributed the origin of language to human invention, some theologians claimed a divine origin for it, representing the Deity as having created the names of things, and directly taught them to Adam. Both these theories may now be considered as given up by all who are entitled to speak on the subject. Everything, in fact, tends to show that language is a spontaneous product of human nature—a necessary result of man's physical and mental constitution (including his social instincts), as natural to him as to walk, eat, or sleep, and as independent of his will as his stature or the color of his hair.

Language was an object of speculation among the Greek philosophers; but as was the case with their inquiries into the outward world generally, they began at the wrong end; they speculated on the origin of things before they had examined the things themselves. They knew no language but their own, and all others were indiscriminately classed as 'barbarous' or foreign; they had no test of affinity among tongues except mutual intelligibility. The theories of the modern philosophers of the 18th c. were nearly as baseless; they were mere *à priori* speculations, akin to Burnet's (q. v.) 'theory of the earth,' which was constructed before the strata of the earth's crust had been explored. The great obstruction to the true course of inquiry was the assumption, first made by the Church Fathers, and for a long time unquestioned, that Hebrew was the primitive language of man, and that therefore all languages must be derived from Hebrew. A prodigious amount of learning and labor was wasted during the 17th and 18th centuries, in trying to trace this imaginary connection. Leibnitz was the first to set aside this notion, and to establish the principle that the study of languages must be conducted in the same way as that of the exact sciences, by first collecting as many facts as possible, and then proceeding by inductive reasoning. It was owing to his appeals and exertions that missionaries, travelers, and others, now began making those collections of vocabularies and specimens of languages and dialects which form the *Herbarium*, as it were, of human speech. A valuable Catalogue of Languages in six volumes was published in Spanish in 1800, by Hervas, a Jesuit missionary. It contains specimens and notices of more than 300 languages, and many of the true affinities are happily traced. A similar work was Adelung's *Mithridates* (4 vols. Berlin, 1806—1817), based on the catalogue of Hervas, and also on the collections which the Russian government had caused to be made.

In none of these efforts, however, although much truth was struck out, were there anything like fixed principles of scientific classification. The light that brought order into the chaos rose with the study of Sanscrit (q. v.), first made accessible to European scholars by Sir William Jones, Colebrooke, and other members of the Asiatic Society, founded in Calcutta in 1784. The similarity of Sanscrit to Greek and Latin, especially in the grammatical forms, struck every one with surprise. Sir William Jones declared that 'no philologer could examine the Sanscrit, Greek, and Latin without believing them to have sprung from the same source, which perhaps no longer exists. There is a similar reason, though not quite so forcible, for supposing that both the Gothic and the Celtic had the same origin with the Sanscrit. The old Persian may be added to the same family.' Rather than admit this relation, which it was seen would involve also ethnological affinities, some, as Dugald Stewart, denied that Sanscrit had ever been the language of a people, and held that it was an invention of the Brahmans, who had constructed it on the model of the Greek and Latin. Fr. Schlegel's work, *On the Language and Wisdom of the Indians* (1808), although defective and erroneous in point of scholarship, has the merit of boldly embracing the languages of India, Persia, and Europe in one family group, by the comprehensive name of Indo-Germanic. It was this work that called the attention of German scholars to a field of labor which they have since made specially their own.

The successive publications of Bopp (q. v.), beginning in 1816, and culminating in his great work on the grammar of the Aryan languages, *Vergleichende Grammatik* (Berl. 1833—1852; a 2d ed. recast and enlarged, 3 vols., Berl. 1857; an English translation of 1st ed. was published in 3 vols., 1845—1850, and, revised, in 1854), created the new science of Comparative Grammar, and laid a sure and broad foundation for the science of language generally. Concurrent with the labors of Bopp, were those of Pott in his Etymological Researches (*Etymologische Forschungen*, 2 vols., 1833—1836; 2d ed. 1859) and other works. Not less important, though confined to one stock of the Aryan family, the Teutonic, was the Great German Grammar (*Deutsche Grammatik*, 4 vols., 1818—1837) of J. Grimm (q. v.). William von Humboldt (q. v.) did much to establish a philosophy of language—the relations and interactions of mind and speech; a department of the subject which has been further cultivated in recent years by Steinthal. The method of investigation, thus invented and perfected in the field of the Aryan tongues, has been applied to other languages, and considerable progress has been made in grouping the principal varieties of human speech into families, which again fall into subdivisions or branches, according to the different degrees of nearness in the relationship. In establishing these relationships, although a comparison of the vocabularies—the numerals, pronouns, and more essential nouns and verbs—may establish a general affinity, and render a common origin probable; yet the surer test lies in the grammatical forms. For when those elements of a language which express the relations of things—case, number, tense—have once become mere terminations, and lost their original form and independent meaning, they can only be transmitted by tradition; and when the same grammatical forms are found possessed in common by two or more tongues, they must be an inheritance from a common ancestor. It follows from this that the 'genealogical' classification, as it is called, cannot be carried out with great surety or rigor except in the case of languages in which grammatical forms had become in some degree fixed before their divergence—in other words, of the inflectional languages. Accordingly, the only two well-defined genealogical families are the Aryan and the Semitic, which embrace the whole of the languages of the inflectional type.

Besides the division of languages into families bearing traces of a common origin, there is a division into three orders, as they may be called, depending upon a radical difference of structure. Speech, as the expression of thought, contains two elements: ideas or conceptions, which constitute the substance or material part; and the relations of these ideas to one another, which constitute the formal part; and the nature of a language depends upon the particular way in which the vocal expression of these two elements is combined. At the foundation of all words lie Roots (q. v.), or simple sounds expressive of meaning. Now, some languages, as the Chinese (q. v.), use these roots in their naked form as words, the same syllable, according to its position, serving as noun, adjective, verb, &c.—e. g., *ta* means great, greatness, to be or to make great, greatly or very. The relational part of the thought, for the most part, gets no vocal expression, it is only indicated by position, as when *min*, people, and *li*, power, are simply put together (*min li*) to signify the people's power. Relations not readily indicated by position are expressed in a roundabout way by using additional significant words: thus, *tschung* (mass or multitude) *jin* (man) = men; *niu* (woman) *tsè* (child) = daughter; *y min li* (employ people power) = with people's power. Even in such cases, each root preserves its independence, and is felt to express its own radical meaning. Languages like the Chinese, whose development has been arrested at this rudimentary stage, are called *Monosyllabic* or *Isolating*.

The next stage of development is that of the *Agglutinate* languages, which are by far the most numerous, including the Turanian and American families. In these, the relational part of thought obtains prominent vocal expression by separate roots joined or *glued* on to the significant roots as terminations. These terminations were originally themselves significant roots, and many of them are still used as separate significant words, although the greater part have sunk down to mere signs of cases and other relations. The compound expression thus formed never, however, attains perfect unity; the significant root always remains rigid, unobscured in its sense and unchanged in form, and the termination is felt as something distinct from the body of the word.

Thus, the Finnish declension exhibits a structure of the most mechanical and transparent kind—e. g., *karhu*, bear; *karhu-n*, of the bear; *karhut-ta*, without bear; *karhu-sta*, out of the bear; and so on through fifteen cases. The insertion of the plural suffix, *i*, gives *karhu-i-n*, of the bears; *karhu-i-ta*, without bears; *karhu-i-sta*, out of the bears; &c. But this composite mechanical structure reaches its climax—remaining all the while perfectly transparent—in the Turkish verb. Thus, the root *sev* has the indefinite meaning of loving, and the inf. is *sev-mek*, to love; which then, by the insertion of certain suffixes, can take on as many as

forty forms or voices—e. g., *sev-me-mek*, not to love; *sev-e-me-mek*, not to be able to love; *sev-dir-mek*, to cause to love; *sev-dir-ish-mek*, to cause one another to love; *sev-il-mek*, to be loved; *sev-il-e-me-mek*, not to be able to be loved; &c. Each of these forms, then, runs through a large round of tenses and moods, with their persons and numbers.

The languages of the American Indians are all of this agglutinating type, although they have also got the name Incorporative, or Intercalative, because they run a whole phrase or sentence into one word—e. g., *hoponi*, to wash; *hopocuni*, to wash hands; *hopoaduni*, to wash feet; *ninacagua*, I (*ni*) eat (*gua*) flesh (*naca*). The Basque language partakes of this character.

It is only in the third or *Inflectional* stage that perfect unity of the two elements is attained. In the Aryan and Semitic tongues, which alone have reached this highest state of development, the significant root and the termination have become blended into one both in effect and form, and phonetic changes have for the most part obliterated the traces of composition. Yet no doubt is felt by philologists that the most highly organized of the inflecting or amalgamating languages began with the radical stage, and passed through the agglutinate. The analytic powers of comparative grammar have succeeded in tracing back the formal elements of the Aryan tongues to original independent words, agglutinated to other words to modify them. See INFLECTION. Against this theory it has been urged, that there is no historical instance of a language so changing its type, and passing from one stage to another. But a sufficient account of this phenomenon may be found in the different mental habits and political positions of the peoples (see Max Müller, *Lectures on the Science of Language*, First Series, page 316). Besides, the languages of the lower types do show a tendency, under favorable circumstances, to produce grammatical forms of the higher hind. Even in Chinese, in some of its modern dialects, something like cases is to be seen; and Finnish and Turkish, in contact with the inflected languages of Europe, are making approaches to the inflectional type.

On the other hand, the inflectional languages had, before the earliest times of which we have any written monuments, entered on the reverse phase—the *analytic*. By the process of phonetic change and decay, the grammatical forms have been gradually becoming obliterated and losing their power, and their place has been supplied by separate words, in the shape of prepositions and auxiliary verbs. See INFLECTION.

Connected with these radical differences of type, is one of the higher and more speculative problems of the science—the question as to the common origin of all languages. The inherent and apparently ineffaceable difference of structure in the three orders above described, as well as the absence of all sure marks of genealogical affinity even between the two families of the inflectional type, the Aryan and the Semitic, are considered by some as insuperable objections to the theory of a common origin. But although it may be fruitless to look for extensive identifications of the roots and grammatical forms of the Aryan tongues, even in the oldest forms to which we can trace them, with those of the Semitic, still more with Chinese or Turkish elements; it seems rash and unscientific to affirm that, going back to the radical stage, the development of all could not have begun from a common stock of monosyllabic roots. The wonderful transformations exhibited by language in the course of its known history, seem sufficient ground for maintaining the *possibility* of a common origin. On the other hand, the nature of the case forbids all hope of ever being able to *prove* it; for the coincidences that occur (e. g., Chinese *fu*, Tibetan *pha*, Lat. and Gr. *pa*-ter, Eng. *fa*-ther; Chin. *mu*, Egyp. *mu*, Lat. and Gr. *ma*-ter, Eng. *mo*-ther), even though they were much more numerous than they are, might well arise from the mind and vocal organs of man being everywhere essentially the same.

Languages, like living organisms, are in a state of continual flux or change, and an essential part of the science consists in investigating the laws according to which these changes take place. It is because there are such laws that a science of language is possible. In tracing words to their origin, and identifying them with words in other languages, we are no longer guided by mere similarity of sound; on the contrary, identity of sound is often a proof that a proposed etymology is wrong. It has been established, for instance, by induction (see GRIMM'S LAW), that *c* in Latin is regularly represented by *h* in Gothic and English; while for Gothic or English *c*, the corresponding letter in Latin is *g*. Accordingly, we readily recognize Latin *corn-u* and English *horn* as cognate words; while a suggestion to connect the English *corn* with *cornu*, is immediately rejected. If *corn* has a representative in Latin, it must begin with *g*, which points out *granum* as the word. *Grain* is not the English representative of *granum;* it *is* granum, borrowed from the Latin through the French. The expert etymologist can often identify with certainty two words, although not a letter remains the same. In simple cases, this is done by every one. Who, for instance, doubts that Aberdeenshire *fa*, *filk*, are merely dialectic varieties of Eng. *who*, *which*. Yet the same persons who readily admit such cases, are sceptical when it is proposed, for instance, to identify Fr. *larme*, with Eng. *tear*. The grounds of identification, however, are similar in both instances; the only difference being, that with regard to *larme* and *tear*, they require to be traced historically. No one will dispute that *larme* is a corruption of Lat. *lacrima;* in fact, it can be followed through the successive stages of change.

Now we know that the Romans had a peculiarity of letting *d* in some positions degenerate into *l*. Nor is this unaccountable, when we consider that the contact of organs which produces *d*, differs from that which produces *l*, chiefly in being more energetic; a slovenly *d* slides into *l*. Thus the Greek name, Odysseus, became, in the mouth of the Romans, Ulysses; they said *odor* (a smell), but *oleo* (I smell); and, instead of *impedimentum*, *dedicare*, we sometimes find *impelimentum*, *delicare*. These and other instances would warrant us to conclude that *lacri-ma* was a corruption of *dacri-ma* (corresponding to Gr. *dakru*), even if we had not the express statement of Festus that *dacrima* was the older form. After this there is no difficulty in recognizing *dacri*, or *dakru*, as identical with Gothic *tagr*, Eng. *tear*.

In order to give a rational account of the phonetic changes now exemplified, the nature of articulate sounds, and of the organs that produce them, must be carefully investigated. The most valuable contributions, in English, to this important preliminary branch of the study (called *Phonetics*), are those of Mr. Alex. J. Ellis, and of Mr. Melville Bell, in his book entitled *Visible Speech*. See PHONETIC WRITING and VISIBLE SPEECH. A *résumé* of the subject, with diagrams of the organs of voice in the position of pronouncing the different articulations, is given in the second series of Max Müller's *Lectures on the Science of Language*.

The transformations that words exhibit, as they are traced down the stream of history, are of the nature of phonetic decay, and are due to a natural tendency to economize muscular energy by pronouncing two syllables in one. The dropping of inflections, the shortening of words by internal elision and otherwise (Fr. *père*, from Lat. *pater;* Eng. *fair*, from A. S. *fæger;* *stranger*, from old Fr. *estrangier*, Lat. *extraneus*), are all owing to the action of this force, and the uniformities observable among such changes, can be explained on physiological principles.

Dialectic diversification is not so easily accounted for; it is difficult to say why sister nations—as in the case of the Aryan family, or of the nations speaking Romanic tongues—should have given such different forms to the same stock of primitive roots; why, e. g., Gr. *pente* (Æol. *pempe*), *pepo*, should be in Lat. *quinque*, *coquo*. Max Muller thinks it necessary to go back to a time when many of the articulations were not yet sharply defined; and he appeals, in illustration to the confusion children make between such sounds as *tat* and *cat;* and, what is still more in point, to the analogy presented by languages like the Polynesian. In the language of the Sandwich Islands, the two consonants, *k* and *t*, run into one another, 'and it seems impossible for a foreigner to say whether what he hears is a guttural or a dental. The same word is written by Protestant missionaries with *k*, by French with *t*. It takes months of patient labor to teach a Hawaian youth the difference between *k* and *t*, *g* and *d*, *l* and *r*. . . . If colonies started to-morrow from the Hawaian Islands, the same which took place thousands of years ago, when the Hindus, the Greeks, and Romans left their common home (see ARYAN), would take place again. One colony would elaborate the indistinct, half-guttural, half-dental contact into a pure guttural; another, into a pure dental; a third, into a labial.' Much light is thrown on this question by those phonetic peculiarities—those deficiencies and predilections of articulation which characterize whole tribes and nations, as they often do individuals. They may have originated, perhaps, in the idiosyncrasies of individual ancestors (a lisping patriarch might produce a tribe of lispers, without their inheriting the physical defect which caused the lisp in him), or in a common habit of the organs of speech produced by external circumstances; but once established, they are very persistent and influential.

The Mohawks, and several other American tribes, have no *p*, *b*, *m*, *f*, *v*, or *w;* they never articulate with their lips. In Chinese, there is no *d;* *r* is also wanting; and as the habit of the language requires a vowel after every consonant, the nearest approach they can make to the sound of *Christ* is *Ki-li-se-tu*. An analogous habit of articulation transforms the English word *gold* in the mouth of a Kafir into *i-go-li-de*. On this principle can be explained the Fr. *espérer*, from Lat. *sperare;* *establir* or *établir*, from *stabilire;* *école* (*escole*), from *schola*, &c. In the Celtic tongue, an initial *s* with a consonant after it was an unwonted combination; when it would have occurred, a vowel was always prefixed; and, on adopting the Latin languge, the Celtic peoples carried their old habit of pronunciation with them. The effects upon a language of thus coming in contact with another, are important elements in its history. See ENGLISH LANGUAGE AND LITERATURE.

The positive part of the science of language having pushed inquiry back until it arrives at monosyllabic roots that admit of no

further analysis, there stops, as at the legitimate boundary of its province. It assumes the existence of a certain store of crude or primary matter, and merely concerns itself with how out of this matter the structure as we know it, has been built or has grown up. But a question yet remains, which, although it can never receive but a conjectural answer, has a wonderful fascination for the speculative mind, and was, in fact, the question with which all inquiries into language began; the question, namely: How did language take a beginning at all? how came this primitive material of language, these significant roots, into existence? The answer may be thus conceived: To speak is a necessity of man's rational and emotional nature; he speaks because he thinks and feels. When the mind receives an impression or intuition, by an instinctive impulse of the nature of reflex action, some outward expression—a gesture or vocal sound—breaks forth, which by association, becomes a sign or symbol, to the individual and to his associates, of the impression or idea that gave it birth.

Associated at first with individual impressions and objects, these sounds, by the process of abstraction, which is pre-eminently a human faculty, would gradually come to represent more generalized impressions—would become words, as distinguished from mere animal sounds. The necessity of words to think in is much insisted on by speculators on this subject, as being the motive-power in the generation of language; and no doubt it is true that, without language, thought could advance but little, if at all, beyond what is manifested by the brutes. But when they argue as if this necessity of having his ideas objectively depicted, in order to exercise his own reason, would impel an individual man to construct a language for his own use, they make the unwarranted assumption that, under any circumstances, even though he grew up from infancy in solitude, the thinking powers of a human being must necessarily develop themselves. The necessarily few facts that bear on the case look the other way. Kaspar Hauser (q. v.), instead of elaborating a system of symbols of thought for himself, had forgotten what he had once possessed; his faculties of thought and of speech seem to have been simultaneously arrested. Observation seems to favor the opinion, that man in solitude—if he could exist in solitude—would be as mute as the lower animals. The social nature of man helped to give birth to the germs of speech, no less than to his rational nature; an instinctive desire to give a sensible sign of his impressions to his fellows, was perhaps the primary impulse; the aid thus given to his own thinking powers, a secondary result. Be this as it may, it seems reasonable to assume, as it has been well put by Steinthal, that 'at the origin of humanity, the soul and the body were in such mutual dependence, that all the emotions of the soul had their echo in the body, principally in the organs of respiration and the voice. This sympathy of soul and body, still found in the infant and the savage, was intimate and fruitful in the primitive man; each intuition woke in him an accent or a sound.'—Farrar, *Origin of Lang.*

Were these sounds, then, guided by chance or caprice? or if not, what determined particular articulations to be associated with particular objects or ideas? Any mystic innate correspondence between sounds and things, is out of the question; but what more reasonable than to suppose that the natural sounds emitted by so many things, animate and inanimate, should suggest the character of the articulations which the ideas of the things called forth—not so as to produce exact imitations, which it is not of the nature of articulate sounds to be, but such resemblances as would suffice for association. See ONOMATOPŒIA. In the case of ideas unconnected with any natural sound, names would readily be suggested in many cases by analogies, real or fancied, with things that were attended by sounds. We can see, again, a physiological fitness in the articulation *sta*, to stand, with the idea of stability; with the attitude, the organs involuntary assume the position with which this syllable is emitted. Similar instances might be multiplied. We are not to suppose that the same thing would suggest the same sound to all, or even to the same individual at all times. The language-making faculty in the flush of its spring would throw out a multitude of names for the same thing (synonyms), as well as apply the same name to many different things (homonyms); but by a process of natural elimination, those only would survive that were felt best to answer the purposes of speech. The abstracting faculty would also soon dissociate them from the concrete individual objects that first suggested them, and convert them into symbols of the prominent attributes of whole classes. It is these generalized names, syllables significant of such general simple notions as seeing, moving, running, shining, striking, cutting, or being sharp, that, by a kind of inverse process, became the roots of language as it now exists.

A syllable expressive of a single prominent attribute forms the foundation of the names of a whole class of objects, the specific differences being marked by other significant syllables joined on to it. See ROOTS. In some such way, by the unconscious working of man's intellectual nature, we may conceive language to have grown out of the exclamatory or interjectional stage into the rational structure that we now admire. This theory of the origin of roots, together with the constant operation of phonetic change, accounts for the absence of all traces of onomatopœia in the great bulk of the words of a language, and seems to meet the objections of Max Müller and other philologists to the onomatopœic theory.

With regard to these primary or radical words it is only necessary to observe here that they are all significant of sensible or physical ideas, and expressions for immaterial conceptions are derived from them by metaphor. How, from a comparatively few roots of this kind, the vocabulary of the richest language may grow, is further illustrated in the article ROOT.

Another speculative question regards the length of time that language must have taken to advance from the rudimentary stage to the state in which it is found in the earliest records. Bunsen assigns 20,000 years as the lowest limit; but it is evident that the same uncertainty must always rest on this question as on the corresponding one in geology.

Separate points of philology will be found treated under a variety of heads. See—besides the articles already referred to—ALPHABET; the several letters, A, B, &c.; GENITIVE; NOUN; ADVERB; PRONOUN; DIALECT; PERSIAN LANGUAGE AND LITERATURE; SEMITIC LANGUAGES; &c.

The literature of the new science of language is already rich; but much of it is scattered through the transactions of societies and periodicals. Of separate works of a comprehensive kind, in addition to those already named, we may mention, in German, Schleicher, *Die Sprachen Europas* (Bonn, 1850), and *Vergleichende Grammatik der Indo-Ger. Sprachen* (2 vols. Weimar, 1861); J. Grimm, *Ueber den Ursprung der Sprache* (Ber. 1852); Diez, *Etymol. Wörterbuch der Romanischen Sprachen* (2d ed. Bonn, 1861), and *Vergleichende Grammatik der Romanischen Sprachen* (3 vols. Bonn, 1836—1842); translations of both works into English have been published by Williams and Norgate (1864). Heyse, *System der Sprachwissenschaft* (Ber. 1856); Steinthal, *Die Classification der Sprachen* (Ber. 1856); and *Der Ursprung der Sprache* (Ber. 1851). In French, Renan, *Histoire Générale et Système comparé des Langues Semitiques* (3d ed. Paris, 1863); and *De l'Origine du Language* (3d ed. Paris, 1863); Pictet, *Les Origines Indo-Européennes* (Paris, 1859).

English scholars were late in entering this field of research. Horne Tooke's (q. v.) *Diversions of Purley*, though a work of genius, and though it has been the means of first awakening in many an interest in the nature of language, was written without sufficient acquaintance with the kindred tongues, and before the true key to the inquiry had been obtained, and therefore few of the results can now be accepted. Among the first important contributions were Prichard's *Eastern Origin of the Celtic Nations* (Oxf. 1831), and the contributions of the Rev. Richard Garnett to the *Quarterly Review* in 1835—1848. Mr. Garnett's essays in the *Quarterly*, and his subsequent papers printed in the proceedings of the London Philological Society (in the formation of which, in 1842, he took an active part), have been reprinted under the title of *Philological Essays* (Williams and Norgate, 1859), and are models of linguistic research. The philological articles of the *Penny Cyclopædia* also contributed to popularize the study in England.

Of substantive works, the most important, though bearing more directly on the Greek and Latin tongues, are *The New Cratylus* (1839, 3d ed. 1859), and the *Varronianus* (1844) of J. W. Donaldson (q. v.). Winning's *Manual of Comparative Philology* (1838) had previously given a popular sketch of the affinities of the Aryan languages. Latham's *Elements of Comparative Philology* (1862) gives an elaborate classification of the languages of the world, with specimens; only a small part of the work is given to the general principles of the science. Farrar, *On the Origin of Language* (1860), chiefly deals with the speculative part of the subject; in his *Chapters on Language* (new ed. 1873), he defends his original positions; his *Families of Speech* (new ed. 1873) deals with classification. The writings of Max Müller (*Comparative Mythology* in the *Oxford Essays*, 1856; *Lectures on the Science of Language*, 1861; second series, 1864; new ed. of both, 1871) went far to make the study of this science take root in Britain. The principles of linguistic science are set forth in Whitney's *Language and the Study of Language* (1868), and *The Life and Growth of Language* (1875). Other recent works are: Key's *Origin and Development of Language* (1874); and Sayce's *Principles of Comparative Philology*.

On the principles of classification above sketched, the chief languages of the earth may be thus arranged:

I. *Monosyllabic or Isolating.*—1. Chinese, the typical language of this order. 2. Tibetan, which shows some beginnings of grammatical forms. 3. The languages of the Eastern Peninsula—Siamese, Anamese, Burman, Japanese and the language of Corea are doubtful.

II. *Agglutinate.*—1. The most important division of this order is the Turanian family, comprising 'all languages spoken in Asia and Europe (including Oceania), and not included under the Aryan and Semitic families, with the exception of Chinese and its

cognate dialects. For the subdivisions of this family, see TURANIAN LANGUAGES. 2. *African Languages.*—Some of the languages of Africa are allied to the Semitic family, and were introduced by immigration, such as the dialect of Tigré in Abyssinia (see ETHIOPIA), and the Arabic dialects spoken by the Mohammedan population of the coasts, and which have even penetrated deep into the interior. How far the Berber dialects are of Semitic character, is a disputed question; and the same is the case with the language of the Gallas in Abyssinia. Little has as yet been done in investigating and classifying the native Agglutinate languages of Africa, which have been designated by the common name of Hamitic. The ancient Egyptian, from which the modern Coptic is derived, would seem never to have got beyond the isolating stage (see HIEROGLYPHICS). Some of the languages adjoining Egypt are thought to be allied to the Coptic. The negro languages, properly so called, of the Sudan, and of the west coast from the Senegal to the Niger, are exceedingly numerous and widely diverse. The languages to the south of the equator are markedly different from those to the north. They fall, according to some, into two great families, the Congo family on the west, and the Kafir family on the east. The Hottentot language is distinct from both. A valuable contribution has recently been made to the study of part of the field by Bleek's *Comparative Grammar of the South African Languages* (1862). 3. *The Languages of the American Indians.*—The native languages of the New World are numbered by many hundreds, all differing totally in their vocabulary, but still agreeing in the peculiar grammatical structure which has given the name of Incorporative (see above). Their area is fast contracting, and they seem destined to disappear.

III. *Inflectional.*—This order consists of two families so distinct in their grammatical framework that it is impossible to imagine a language of the one family derived from one of the other. It is the peoples speaking these languages that have been the leaders of civilization within the historic period. The subdivisions of these families will be best understood from the accompanying tables, taken from Max Müller's Lectures, First Series.

No. I.—GENEALOGICAL TABLE OF THE ARYAN FAMILY OF LANGUAGES.

Living Languages.	Dead Languages.	Branches.	Classes	
Dialects of India	Prakrit and Pali — Modern Sanscrit.—Vedic Sanscrit.		Indic	Southern Division
" the Gypsies				
" Persia	Parsi—Pehlevi—Cuneiform Inscriptions — Zend		Iranic	
" Afghanistan				
" Kurdistan				
" Bokhara				
" Armenia	Old Armenian			
" Ossethi				
" Wales		Cymric	Celtic	Aryan Family.
" Brittany				
" +	Cornish			
" Scotland		Gadhelic		
" Ireland				
" Man				
" Portugal	Langue d'oc / Langue d'oil — Lingua vulgaris — Oscan / Latin / Umbrian		Italic	
" Spain				
" Provence				
" France				
" Italy				
" Walachia				
" the Grisons			Illyric	
" Albania				
" Greece	Κοινη — Doric—Æolic / Attic—Ionic		Hellenic	
" Lithuania				
" +	Old Prussian	Lettic	Windic	Northern Division
" Kurland and Livonia (Lettish)				
" Bulgaria	Ecclesiastical Slavonic	South-East Slavonic		
" Russia (Great, Little, White Russian)				
" Illyria (Slovenian, Croatian, Servian)				
" Poland				
" Bohemian (Slovakian)	Old Bohemian	West-Slavonic		
" Lusatia	Polabian			
" Germany	Middle High-German, Old High-German	High-German	Teutonic	
" +	Gothic			
" England	Anglo-Saxon	Low-German		
" Holland	Old Dutch			
" Friesland	Old Friesian			
" North of Germany (Platt-Deutsch)	Old Saxon			
" Denmark	Old Norse	Scandinavian		
" Sweden				
" Norway				
" Iceland				

No. II.—GENEALOGICAL TABLE OF THE SEMITIC FAMILY OF LANGUAGES.

Living Languages.	Dead Languages.	Classes.	
Dialects of Arabic		Arabic or Southern	Semitic Family.
Amharic	Ethiopic		
+	Himyaritic Inscriptions		
" the Jews	Biblical Hebrew	Hebraic or Middle	
+	Samaritan Pentateuch (3d c. A.D.)		
+	Carthaginian, Phœnician Inscriptions		
+	Chaldee (Masora, Talmud, Targum, Biblical Chaldee)	Aramaic or Northern	
" Neo-Syriac	Syriac (Peshito, 2d c. A.D.)		
+	Cuneiform Inscriptions of Babylon and Nineveh		

PHILOME'LA, the name of a personage in Greek legend, who was changed according to one account into a swallow, to another into a nightingale. Modern poets are (or rather were, for it was chiefly an 18th c. fashion) fond of calling the nightingale by its classic name.

PHILOPŒ'MEN, the most illustrious patriot and general who figures in the later history of Greece, belonged to one of the best families of Arcadia, and was born at Megalopolis about 252 B.C. At an early age he lost his father, and was brought up by a wealthy citizen, named Cleander, who took care that he should receive an excellent education. His earliest experiences of war were confined to the border raids of the Arcadians into Laconia; but in 222 B.C., he was one of the defenders of Megalopolis against Cleomenes, king of Sparta. Next year, when the Macedonian king Antigonus marched to the assistance of the Achæans, P. joined him at the head of 1000 horse, and contributed materially to the terrible defeat which the Spartan king received at Sellasia. As tranquility was now for a short time restored to Greece, P. went abroad to perfect himself in the art of war, and served in Crete with such distinction, that on his return to the Peloponnesus, in 210, he was appointed general of the Achæan horse, and at once proceeded to discipline his men in a vigorous and masterly style. In the expedition against Elis (209) he slew the Elean leader, Demophantus with his own hand. In 208 he was raised to the highest military dignity then possible in Greece, being elected *strategus* or commander-in-chief of the Achæan League, and in this capacity signalized himself by the great improvements which he effected in the drill, discipline, and armor of the Achæan soldiery. It seemed as if the ancient heroism of the land were reviving.

The battle of Mantineia, which took place in the course of the same year, and in which the Spartans were again utterly routed —their general and king, Machanidaf, falling by the sword of P. himself—raised him to the pinnacle of fame, and at the Nemean festival which followed he was proclaimed liberator of Greece. His exalted honors did not in the slighest degree disturb the integrity of his character. So great was his influence over his quarrelsome countrymen, that the Macedonian monarch, Philip, began to fear that Greece would regain its independence, and tried to have him secretly assassinated; but the infamous treachery was discovered in time, and its only effect was to endear P. still more to the Achæans. Another of his determined enemies was Nabis, successor of Machanidas in the 'tyranny' of Sparta, but in 201 he inflicted on the latter a severe defeat at Skotetas on the borders of Laconia. During the next few years he was absent in Crete, partly, it would seem, for political reasons, but returned to the Peloponnesus in 194 to find matters in a serious condition. A new and dreaded power—the Romans—had appeared, and overthrown both Philip and Nabis, and P. foreboded future mischief to all Greece from these ambitious warriors. On the departure of the consul Flamininus, Nabis recommenced hostilities against the Achæans; P. was once more appointed strategus (192); and in a pitched battle nearly annihilated the troops of Nabis, who himself was shortly afterwards killed by the Ætolians. He now exerted all his power to heal the divisions among the Achæans, and to prevent them from affording the Romans a pretext for taking away their independence. In 188, he took a fierce revenge on Sparta for having put a number of his friends to death, and was in consequence strongly censured by the Roman senate, and by Q. Cæcilius Metellus, who was sent out as a commissioner to Greece in 185.

Two years later P. (now an old man of 70) was elected strategus for the eighth time. When lying ill of a fever at Argos, news was brought to him that the Messenians had broken their connection with the league; P. instantly rose from his sick bed, hastened at the head of some cavalry to quell the revolt, but was overpowered by numbers, and fell into the hands of Deinocrates, the leader of the Messenians, who two nights after sent him a cup of poison, which P. drank off and died. The remains of the hero were brought in solemn procession to his native city—the historian Polybius carrying the urn—and statues were erected to his memory by his grateful and repentant countrymen.

PHILO'SOPHY. This word meant originally the 'love of knowledge,' and indicated, therefore, a special taste, appetite, or desire, of which the subject-matter was knowledge. At first, man's pursuit of knowledge was subservient to the immediate uses of life; but, in the course of time, an interest was taken in knowing the order of the world, independent of its application to the common utilities. We find that this stage had been reached in Greece especially, about five or six centuries before Christ; at which time the name 'philosophy' took its rise, being attributed to Pythagoras.

The word has had a variety of acceptations, although all pervaded by the one idea of employing the human understanding in the search for increasing knowledge and certainty. It always implies this effort in a distinguished degree, such as only a few persons in any age have ever been able to sustain. The pursuit of knowledge had to become an end in itself, for the mere improvement of practice would not at first have been a sufficient motive for men to undergo the labors of scientific inquiry. Indeed, this improvement was not at all apparent as a consequence of the earliest efforts of speculation. As one celebrated example, the investigation of the properties of the sections of the cone—the ellipse, parabola, and hyperbola—was without any practical use for nearly two thousand years.

As may be readily supposed, the precise aim of philosophy, the statement of what constitutes its end, has varied with the advancement of its study. In modern times the pursuit of truth has taken a well-defined form, expressed by the name Science (q. v.). But, in the ancient world, this operation was a mixture of speculation, practice, and sentiment—of legitimate inquiry with aspirations after the unattainable; and hence the word 'philosophy,' in its modern employment, often refers to the subjects that have not as yet adopted the strict scientific form. On this view, science is the goal and the grave of philosophy. (See Lewes's *Biographical History of Philosophy*.) It is chiefly with reference to morals, metaphysics, and the human mind generally, that the term is still retained.

The characters that distinguish the highest form of truth are Generality and Certainty or precision; and in proportion as a subject has advanced in these respects, it might be said to have become philosophical, but we now prefer to use the word scientific. The theoretical foundations of a practical subject, as grammar, are sometimes pretentiously called the philosophy of it. So any department of nature or humanity, where explanations by general laws are furnished, is styled 'philosophical;' thus, we have the philosophy of zoology or of history, and a 'philosophical' naturalist or historian.

Again, after definite branches of knowledge have taken a scientific shape, and have been reckoned as distinct 'sciences' mathematics, &c.) the general principles and views that are supposed to run through the whole, are sometimes called 'philosophy.' This was one of the meanings of the word in Plato. The great work of Auguste Comte bases its title (*Cours de Philosophie Positive*) upon this consideration.

Professor Ferrier remarks that philosophy is not truth, but '*reasoned* truth;' that is, it must be truth presented under the forms and processes that evolve and establish the highest or scientific knowledge. This is merely another mode of stating that philosophy implies a special procedure for attaining truth, the ordinary unregulated operations of the understanding being insufficient.

Among the oldest problems of philosophy, we are to reckon the attempt to generalize the universe, or to resolve all nature into some great unity, or common substance or principle. Thales considered Water the primordial and fundamental principle. Anaximander adopted as the foundation of the universe something called by him the Infinite or Indeterminate, out of which the various definite substances, air, fire, water, &c., were generated, and to which they were again resolved. Anaximenes assumed Air as the primordial substance, which, by rarefaction, produced fire and ether, and by condensation, water, earth, and stone. These three philosophers all belonged to the Ionic colony of Miletus. Pythagoras was an emigrant from Ionia to Italy; he gave Number as the essence and foundation of all existing things: the different numbers being representative of different natural properties and powers; thus, *five* stood for color, *six* for life, &c. Xenophanes of Kolophon attacked the popular polytheism, and propounded one great indivisible agency comprehending and identified with the universe, which he would not designate as finite or infinite, in motion or at rest. Parmenides of Elea distinguished between self-existent being, Ens, or the absolute, characterized by extension and duration, and phenomenal nature, the region of inferior certainty, or mere opinion. This was the first sketch of what has since been called Ontology, or the science of the *noumenon*, or absolute being. Herakleitus of Ephesus maintained an absolute of a totally different character—a principle of incessant Change, the negation of all substance and stability, a power of perpetual destruction and renovation.

Empedocles took his stand upon the Four Elements out of which all things were constituted by the action of the opposing principles of love, and enmity or discord—a poetical representation of attraction and repulsion. Anaxagoras also treated the world as made up of elements, but indefinite in number. By the attraction of each for its own kind, the primitive chaos was separated, but, excepting 'mind,' no element ever was perfectly pure, the character of each substance being determined by the predominance of the proper element. These elements were called the 'homœomeries.' Diogenes of Apollonia, the last of the series called Ionic philosophers, adopted in a modified form the tenet of Anaximenes, that Air was the primordial element. The celebrated Atomic theory originated with Leukippus, but is commonly identified with his pupil Democritus of Abdera. The elements of Anax-

agoras were acted on by mind, but with Democritus their activity was inherent in themselves from the beginning.

The grand problem of External Perception (see PERCEPTION) was agitated at an early period, and has been always reckoned a leading question of philosophy. The first attempt at a solution was an application by Democritus of his atomic hypothesis. He supposed that all things were constantly throwing off images of themselves, which enter the soul through the pores of the organs of sense. He was aware that this left us in a state of uncertainty, as to whether the images corresponded to the otherwise unknown originals.

The many difficulties and uncertainties incident to the search for knowledge, could not but be felt by inquirers generally. There was one sect in particular, more especially impressed by this circumstance, and hence called Sceptics or Doubters. They were represented in antiquity by Pyrrho. They dwelt on the absence of any sure criterion of truth, and pointed out that what was considered most certain was not free from objections, or counter-arguments.

Philosophical speculation began to take definite shape in the age of Plato and Aristotle, the age of the beginnings of many of the sciences. More especially at this time do we find the distinct enunciation of the Philosophy of Human Life, otherwise called Moral and Ethical Philosophy. The questions concerning the end of life, the pursuit of happiness, and men's duties in various relationships, had been answered by a sort of rule-of-thumb experience, rather than by deep reflections or farseeing combinations. The distinctions of virtue and vice were determined by political society, and connected more or less with religion. There were tests and maxims of conduct, for the most part merely prudential. The first approach to a moralizing strain is found in the poems of Hesiod. He combines a gloomy view of life with much practical wisdom, enjoining justice, energy, temperance, and simplicity of living. The 'Seven Wise Men,' who belonged to the 6th c. B.C., followed in the same course, and uttered a variety of sayings or short maxims, of which the most ordinary subjects were 'the uncertainty of human things, the brevity of life, the unhappiness of the poor, the blessing of friendship, the sanctity of an oath, the force of necessity,' &c., together with the simple rules of prudence.

The most celebrated saying of this age was the Delphian inscription (of uncertain authorship), 'Know thyself.' The teaching of the Sophists made another stage in the history of moral philosophy. They opened up discussions on virtue, on justice, on the laws, and on happiness; and framed hortatory addresses with a view to moral culture. Socrates then came forward, and instituted a severe logical analysis of the meaning of ethical terms, asking 'What is piety? What is impiety? What is the noble? What the base? What is just? What is temperance? What is madness? What is a state? What constitutes the character of a citizen? What is rule over man? What makes one able to rule?' The rigid search after strict definitions of these terms may be said to constitute a philosophical method in ethics, and hence Socrates is called the first moral philosopher. He gave the impulse to Plato, his successor, who in his turn acted upon Aristotle, and also to the opposing sects of the Cynics and the Cyrenaics—the one affecting a hard and ascetic life, and a proud superiority of the individual will to all outward conventions and customs; the other avowing pleasure as the chief good, sitting loose to the irksome duties of the citizen, and in despair of attaining happiness, sliding into apathy. The Stoics and the Epicureans afforded a similar contrast, although differently expressed. The Stoic ideal was a being in whom the natural impulses and desires should be absolutely subjected to highly abstract views of the universe: the Epicurean ideal was a being moving harmoniously according to natural impulses—in short, following nature up to the limits of prudence.

The last phase of ancient philosophy is represented by Neo-Platonism (q. v.), or the Alexandrian school. In the middle ages, speculative philosophy took the form called Scholasticism (q. v.). At the revival of learning, Descartes and Bacon led in opposite directions, the one representing what is called *à priori* philosophizing; the other, *Induction* (q. v.). From this time, 'philosophy' comes to mean more exclusively the inquiries connected with the mind, as exemplified in the writings of Hobbes, Locke, Leibnitz, Berkeley, Hume, Reid, Kant, &c. The qualified phrase, Natural Philosophy (in the English sense), was applied to a special department of the outer world, as Moral Philosophy was used in connection with mind and the discussion of moral duties. The chief points in the history of modern philosophy will be found under the heads of GERMAN PHILOSOPHY, ECLECTICISM, COMMON SENSE, PERCEPTION, METAPHYSICS, ETHICS; and in the notices of BERKELEY, LOCKE, HUME, REID, KANT, HEGEL, FICHTE, COUSIN, HAMILTON, &c.

PHILO'STRATUS, the Elder, of Lemnos, a famous Greek sophist and rhetorician, was born probably about 170—180 A.D., studied under Proclus at Athens, and finally established himself at Rome, where he became a member of the brilliant and learned circle that gathered round the 'philosophic' Julia Domna, wife of Severus. He was alive, according to Suidas, in the time of the Emperor Philip (244—249). He is the author of a number of works still extant, and not without value on account of their matter, although the style and arrangement are faulty. Among them are a life of Apollonius (q. v.) of Tyana, a description of a collection of paintings at Naples under the title of *Imagines*, biographies of a number of sophists, *Heroica*, Letters, &c. There are complete editions of his works by Morel (Paris, 1608); Olearius (Leip. 1709); and Kayser (Zur. 1844, *et seq.*), of which the last is by far the most correct and critical.—PHILOSTRATUS the Younger, called Philostratus the Lemnian, also a teacher of elocution, was an intimate friend, perhaps a relative of the former, but nothing is known with certainty regarding him.

PHI'LTER, PHILTRE (Gr. *philtron*, love-charm, love-potion). A superstitious belief in the efficacy of certain artificial means of inspiring and securing love, seems to have been generally prevalent from very early times; and among the Greeks and Romans (among the latter in the later days of the republic, and under the emporers), love-charms, and especially love-potions, were in continual use. It is not certainly known of what these love-potions were composed—nor can we rely entirely on the details given us on this subject by classic writers, and their commentators in later time—but there is no doubt that certain poisonous or deleterious herbs and drugs were among their chief ingredients, to which other substances, animal as well as vegetable, are said to have been added, coupled with the employment of magic rites. Thessaly had the credit of producing the most potent herbs, and her people were notorious as the most skilful practisers of magic arts, whence the well-known 'Thessala philtra' of Juvenal (vi. 610). These potions were violent and dangerous in operation, and their use resulted often in the weakening of the mental powers, madness, and death, instead of the purpose for which they were intended. Lucretius is said to have been driven mad by a love-potion, and to have died by his own hand in consequence—though the story does not perhaps rest on sufficient authority; and the madness of the Emperor Caligula was attributed by some persons to love-potions given him by his wife Cæsonia—by which also she is said to have preserved his attachment till the end of his life. In the corrupt and licentious days of the Roman empire, the manufacture of love-charms of all kinds seems to have been carried on as a regular trade; the purchasers, if not the makers of them, being chiefly women. The use of philters seems to have been not unknown during the middle ages; and in the East, the nurse of superstition of all kinds, belief in the power of love-potions lingers probably down to the present day.

PHLEBE'NTERISM is a term invented by De Quatrefages to designate an anatomical arrangement, existing, as he supposed, in certain of the nudibranchiate molluscs, and characterized by ramified prolongations of the digestive tube, in virtue of which the digestive apparatus, to a certain extent, supplies the place of a complete circulatory apparatus, and aids in the process of respiration. The researches of Alder and Hancock, and other zoologists, seem, however, to show that in these animals the circulation is as complete as in the gasteropodous molluscs generally, and that these ramified prolongations are of the nature of a rudimentary liver. For further information on this subject, the reader is referred to De Quatrefages's *Rambles of a Naturalist*, vol. i. pp. 348—353.

PHLEBI'TIS, or INFLAMMATION OF THE VEINS (Gr. *phlebs*, a vein), although seldom an original or *idiopathic* disease, is a frequent sequence of wounds, in which case it is termed *traumatic* phlebitis (from the Greek *trauma*, a wound), and is not uncommon after delivery. The disease is indicated by great tenderness and pain along the course of the affected vessel, which feels like a hard knotted cord, and rolls under the fingers. The hardness is, however, sometimes obscured by the swelling of the limb beyond and about the seat of the disorder, partly in consequence of the effusion of serum caused by the obstruction to the return of the venous blood (which thus gives rise to a local dropsy), and partly in consequence of the propagation of the inflammation to the surrounding tissues. The inner surface of the inflamed vessel is supposed to throw out fibrinous fluid, which coagulates in layers, and finally closes the tube. If the vessel is small, the consequences of its obstruction may be of little importance, but when a large vein is affected, the consequences are always dangerous, and may be fatal.

There are two modes of recovery: solution of the coagulated fibrine may take place, and the vessel may again become pervious; or, as is more commonly the case, the obstruction may continue, but a collateral venous circulation may be established, and the circulation thus carried on through a circuitous route. With the return of the circulation—in whichever of these two ways it is ac-

complished—the swelling subsides, and the patient gradually recovers. If, however, the disease advances, suppuration takes place within the coagulum, and one of two things happens; either abscesses are formed along the vein, or the pus gets into the current of blood and contaminates the circulation, giving rise to the perilous disease known as *Pyæmia* (q. v.). Either condition is dangerous; the latter pre-eminently so.

Phlebitis generally originates in some local injury of a vein, and the inflammation, when once established, is readily propagated along the course of the vessel. Sometimes very slight injuries give rise to it. It occasionally occurs after venesection, especially with a dull lancet, or one soiled by contact with diseased matter. Women are peculiarly liable to this disease after delivery, as the veins of the womb are apt to become inflamed, and to communicate the inflammation to the venus trunks connected with them. See PHLEGMASIA.

There is considerable difference of opinion as to the treatment to be pursued; some high authorities (Dr. Wood, for example) recommending 'the very free use of leeches along the affected vein,' and that they 'should be repeated over and over again if the symptoms of inflammation should persevere,' the subsequent application of cold lotions, and the internal use of mercury 'pushed to a moderate salivation;' while others question the utility of such treatment, and recommend 'rest, warm fomentations, and poultices, early incision of abscesses, evacuation of bile and fæces by one or two doses of calomel, opium to relieve pain and insure quiet of mind and body, and wine, especially if there has been great loss of blood.'—Druitt's *Surgeon's Vade Mecum*, 8th ed., p. 326. The latter is in most cases the preferable mode of treatment.

During convalescence, the patient must be satisfied if the swelling goes down slowly. Time is required for the enlargement of the veins by which the collateral circulation is to be carried on; and active counter-irritation, such as the application of ointments of iodine or mercury, if employed incautiously, frequently does harm by increasing the inflammation. With care, however, they are useful appliances; and if, after giving them a fair trial, much swelling should remain, the practitioner must have recourse to carefully regulated bandaging, and the use of diuretics.

PHLE'BOLITES (Gr. *phlebs*, a vein, and *lithos*, a stone) are calcareous concretions formed by the degeneration of coagulations in veins, or occasionally originating in the coats of the vessel. They are seldom detected till after death, although cases are on record in which, occurring in subcutaneous veins, they have given rise to external tumors of considerable size.

PHLEBO'TOMY. See BLEEDING.

PHLE'GETHON, i. e., the Flaming, a river of the infernal regions, whose waves rolled torrents of fire. Nothing would grow on its scorched and desolate shores. After a course contrary to the Cocytus (q. v.), it discharged itself, like the latter stream, into the Lake of Acheron.

PHLEGMA'SIA A'LBA DO'LENS, or MILK-LEG, is a disease which is most common in women after parturition, especially if they have lost much blood, but sometimes occurs in unmarried women, and occasionally in males. It usually commences about a week or ten days after delivery with a feeling of pain in the loins or lower part of the abdomen, whence it extends to the groin and down the thigh and leg. The pain soon becomes very severe, and principally follows the course of the internal cutaneous and crural nerve of the thigh and of the posterior tibial in the leg. The limb soon begins to swell, and in the course of a couple of days, is sometimes twice its ordinary size, and as the swelling develops itself, the acuteness of the pain considerably diminishes. The limb is partly flexed, and lies motionless; any movement aggravates the pain. The swelling extends uniformly over the limb, which is pale and shining, and hot and firm to the touch, seldom pitting on pressure. The femoral vein may usually be felt like a hard chord, and this symptom, taken with the swelling, clearly indicates that this affection is essentially *crural phlebitis*. The uniformity of the cord is interrupted by nodules, arising either from inflamed cellular tissue, or from clots within the vein. Both legs are seldom attacked at the same time, and the left thigh is the most common seat of the disease.

This affection usually terminates favorably, the acute symptoms disappearing in about ten days or a fortnight. The swelling, however, often continues for a long time, and sometimes lasts for life. Very different opinions have been held regarding the nature of this disease. At one time it was considered as the result of metastatic secretion of milk (or, in other words, as due to the milk leaving the breast, and settling in the thigh, and hence the term *milk-leg*). There is now no doubt that the disease is inflammation originating in the veins of the womb, and extending to those of the lower extremity. The treatment is the same as for Phlebitis (q. v.) generally. Warm poppy fomentations, or bran poultices sprinkled with laudanum, may be applied externally at the beginning of the attack, after which flannel saturated with a liniment, composed of one part of laudanum to two parts of soap liniment, may be applied round the limb in the form of a bandage, applied not so tightly as to occasion pain. If necessary, the bowels must be gently opened with castor oil, and opium given to allay pain and induce sleep.

PHLE'UM. See TIMOTHY GRASS.

PHLOGI'STON (Gr. *combustible*) was the term employed by Stahl, professor at Halle, in his *Zymotechnia Fundamentalis*, 1697, to designate a hypothetical element which, by combining with a body, rendered it combustible, and which occasioned combustion by its disengagement, there being left, after its evolution, either an acid or an earth. In the above-named work, he maintains that the processes of obtaining sulphur from sulphuric acid, and of procuring the metals from their earths or *calces*, are analogous, and consist alike in the addition of his phlogiston. Thus, sulphur, according to the phlogistic theory—which held undivided sway, in chemistry until the time of Lavoisier, who substituted for it the theory of oxygenation (1775—1781), and was maintained by a few chemists, especially Priestley, till the beginning of the present century—was composed of sulphuric acid and phlogiston; lead, of the *calx* of lead and phlogiston; &c. In consequence of the general adoption of the phlogistic theory, when Priestley, in 1774, discovered oxygen, and when Scheele, a little later, discovered chlorine, the names these chemists gave to their discoveries were *dephlogisticated air* and *dephlogisticated marine acid*. According to modern views, mainly based on Lavoisier's experiments, the *addition* of oxygen takes place in the formation of acids and of earths, instead of the *substraction* of phlogiston. The question whether the process was, in fact, one of addition or subtraction, was finally decided by the balance, an instrument to which chemistry owes most of its marvelous progress during the last three-quarters of a century.

PHLOX, a genus of plants of the natural order *Polemoniaceæ*, distinguished by a prismatic calyx, salver-shaped corolla, and unequal filaments. The species are pretty numerous, mostly perennial plants with simple leaves, and mostly natives of North America. A number of species are common in our flower-gardens. This has of late become a favorite genus with florists, and many very fine varieties have been produced.

PHO'BEROS, a genus of trees of the natural order *Flacourtiaceæ* or *Bixaceæ*, of which one species, *P. Mundtii*, the *Klipdoorn* of the Dutch colonists of South Africa, although only 20—30 feet high, attains a diameter of three feet or more, and is very useful for the purposes of wagon-makers and house-carpenters, the wood being hard and fine-grained; another South African species, *P. Ecklonii*, the *Roodpeer* of the colonists, has a hard, heavy, and fine-grained wood, used by cabinet-makers, mill-wrights, &c.

PHOCÆ'NA. See PORPOISE.

PHO'CAS, emperor of Constantinople (602—610), was a Cappadocian by birth, and was for some time groom to Priscus, one of the celebrated generals of the Emperor Mauricius (q. v.). His brutal courage gained him a great reputation among the soldiers, and though only a centurion at the time of the revolt against Mauricius, he was elevated to the throne by the soldiers. To secure himself, he caused Mauricius to be murdered, along with his five sons and his principal adherents; and then, by a treaty disgraceful to the empire, got rid of the Avars. But his troubles were just commencing, for Khusru II. (q. v.), Shah of Persia, hearing of the death of his friend and benefactor, Mauricius, an event which freed him from the obligation of amity with the Eastern Empire, took up arms to revenge his friend's murder, and to recover for Persia all the territories previously under her sway. The war was fiercely carried on for 24 years, during the first 18 of which the Persian army were uniformly successful, and the Byzantines were almost completely driven out of Asia. See KHUSRU II. and HERACLIUS.

P. remained in the capital, to overawe his turbulent subjects, conscious of his unfitness to command the army; and abandoned himself to his animal appetites, tyrannizing over the people without the least regard to justice, and putting to death whomsoever he thought dangerous, among others, Narses, the celebrated general in the former Persian war. Constantina, the widow of Mauricius, excited against the tyrant two formidable insurrections, the latter in 607, but both were speedily quelled; and the ex-empress, with her daughters, were beheaded on the same spot where her husband and sons had been slain. Her principal adherents, some of whom were among the highest officers of state, suffered death under the most horrible tortures. These cruelties, and the successes of the Persians, had well-nigh ruined P.'s power and influence. But he gave the *coup de grâce* to it himself by insulting his favorite and son-in-law, Crispus, who had remonstrated with him on his conduct. Crispus revenged himself by forming a conspiracy against him, along with Heraclius, exarch of Africa—the result of which was the otherthrow of the tyrant, who was taken prisoner (October 3, 610). After being insulted and tortured, he

was beheaded, and his body dragged through the streets by the mob.

PHO'CIDÆ. See SEAL.

PHO'CION (Gr. *Phokiôn*), an Athenian general, of noble and unselfish character, was born about the end of the 5th c. B.C. Clinton, in his *Fasti Hellenici*, gives the date 402 B.C. He was of humble origin, but appears to have enjoyed a superior education, and to have studied under Plato, Xenocrates, and perhaps Diogenes also, from the last of whom he may have acquired his habit of indulging in caustic sarcasm. P. first attracted notice in the great sea-fight at Naxos (376), where he commanded a division of the Athenian fleet, and materially helped to secure the victory for his countrymen. Strange to say, however, we scarcely hear of him again for more than 20 years; but in 351, along with Evagoras, he undertook the conquest of Cyprus for the Persian monarch, Artaxerxes III. (Ochus), and was completely successful. About the same time, but the exact date is uncertain, he led an Athenian expedition into the island of Eubœa, where Philip of Macedon was intriguing, and inflicted a severe defeat on that powerful sovereign of Tamynæ.

In 341, he was again successful in crushing the Macedonian party in Eubœa, and in restoring the ascendency of Athens. Two years before this, he had achieved a similar result at Megara; and in 340, when sent to the aid of the Byzantines against Philip, he acted with so much prudence and tact, and inspired the citizens with so much zeal and courage, that Philip was forced to abandon the siege, and even to evacuate the Chersonesus; while P. captured several of his ships and coast-garrisons, besides making havoc of a good deal of the Macedonian territory. Nevertheless, with just appreciation of the real weakness of Greece Proper, and of the strength of Macedon, he advocated, even in the midst of his triumphs, pacific views, and the establishment of better relations with the enemy. His advice was not taken; but the fatal battle of Chæronea, only two years afterwards, in which the independence of the Greek republics was lost for ever, proved its soundness. The murder of Philip, in 336, occasioned the greatest exultation, and Demosthenes even proposed a public sacrifice of thanksgiving, and the establishment of religious honors to the memory of the assassin, but P. resisted, and prevented so monstrous a proposal. Henceforth, his career is chiefly political. We see him struggling at Athens to repress what appeared to him the reckless desire for war on the part of the fanatical patriots, on account of which he was regarded as a traitor, but his personal honor is above suspicion. After the death of Alexander in 323, the aged P. endeavored, but in vain, to hinder the Athenians from going to war with Antipater. The battle of Cranon, next year, which prostrated his countrymen, again evinced the wisdom of his counsels; but, though very unhandsomely treated by the Athenians, he used all his influence with the conqueror (who, like Alexander, had a profound respect for him) to mitigate their hardships.

After the death of Antipater, P. was involved in the intrigues of Cassander, the rival of Polysperchon, and was forced to flee to Phocis, where Polysperchon delivered him up to the Athenians. He was condemned, by 'a mixed mob of disfranchized citizens, foreigners, and slaves,' to drink hemlock. His body, flung unburied over the borders of the state, was carried by some of his friends to Eleusis, and burned there. The Athenians soon began to raise monuments to his memory. His life has been written by Plutarch and Cornelius Nepos.

PHO'CIS (Gr. *Phôkis*), a province of Greece Proper or Hellas, bounded on the W. by the Ozolian Lokri, on the N. by Doris, on the E. by the Opuntian Lokri, and on the S. by the Gulf of Corinth. It was about 792 square miles in extent. The greater part of the country is occupied by the famous mountain-range of Parnassus (q. v.). The principal river is the Cephissus. According to tradition, the most ancient inhabitants were the Leleges, Pelasgians, and Thracians, from the gradual mixture of whom the Phocians were believed to have arisen. These were finally united into a free federal state, which derives its chief historical importance from possessing the famous oracle of Delphi (q. v.). During the Peloponnesian war, the Phocians were close allies of the Athenians. In the time of Philip of Macedon, they were involved in a ten years' war, on account of their opposition to a decree of the Amphictyonic Council, concerning the use of a piece of land belonging to the temple of Delphi. This war, commonly known as the Sacred or Phocian War, ended disastrously for the Phocians, the whole of whose cities (22 in number) were destroyed, with one exception, and the inhabitants parcelled out among the hamlets.

PHŒ'BUS (i. e., the Bright or Radiant), a title, and subsequently a name, of Apollo. It had reference both to the youthful beauty of the god, and to the radiance of the sun, when, latterly, Apollo became identified with Helios, the sun-god.

PHŒNI'CIA (Gr. *Phoinike*, derived either from *Phoinos*, purple, or *Phoinix*, palm-tree—both designations descriptive of the chief produce of the country; the Hebrew term *Kenaan*, Lowland, referring to its physical condition) is the name given by the Greeks and Romans to a certain territory situated about 34°—36° N. lat., bounded by the Mediterranean on the W., by Syria to the N. and E., and Judæa to the S. Except where the Mediterranean set a natural boundary, the frontiers differed widely at different periods, north, south, and east, according to the gradual rise and decline of the country. Its length may be said to have been about 200 miles, while its breadth never exceeded 20 miles, making a total of about 2000 square miles. We may here mention some of the products of the soil, the exportation of which, to a certain extent, laid the foundation of her greatness. Pine, fir, cypress, cedars, terebinths, palm and fig-trees, sycamores, olive-trees, and acacias, crown the heights; while wheat, rye, and barley are found in the lower regions, together not only with ordinary fruit, but also with apricots, peaches, pomegranates, almonds, citrons, sugar-cane, grapes, bananas—all growing luxuriantly, and forming a forest of finely-tinted foliage. The land further yields silk and cotton, indigo and tobacco; and the modern inhabitants of Shur, like their forefathers of old, drive a profitable traffic with the produce of Mount Lebanon, its timber, wood, and charcoal. Flocks of sheep and goats, and innumerable swarms of bees, supply meat, milk, and honey. The sea furnished shoals of fish, and molluscs for the purple of Tyre. There are no precious metals found anywhere in P.; but it is rich in iron, and the stone-quarries of Lebanon were already worked in Solomon's time.

The question of the origin of the Phœnicians is one which has hitherto not been solved satisfactorily. Their own account, as preserved by Herodotus, speaks of their having immigrated from the 'Sea called Erythra;' a report further confirmed by another passage in his History, and by Justin. Strabo speaks of two islands in the Persian Gulf, called Tyros or Tylos and Aradus, in which temples were found similar to those of the Phœnicians; and the inhabitants of these cities stated that the Phœnicians had left them in order to found new colonies. The Erythrean Sea, in its widest sense, extends from the eastern shores of Egypt to the western shores of India; and since Genesis calls Canaan, the founder of the race, a descendant of Ham, not of Shem, some investigators have come to the conclusion, that the Persian or Arabian Gulf is the original home of the Phœnicians. Against this notion, however, weighty arguments have been brought forward, both from the genuine traditions of the people itself, as preserved, not in a corrupted Greek shape, but in their myths, in the biblical accounts, in their language, which even in its very oldest remnants (Canaan = Lowland; Sidon = Fishing-place; Giblites = Mountain-people) is purely Semitic. It would be vague to speculate on the time at which the first Phœnician settlers entered the country: as vague as to conjecture—the Erythrean Sea being put out of the question—whence they came. So much seems certain, that they did not enter it from one region, but from several sides, and at various periods; and that only very gradually, in the course of long pre-historic centuries, they grew into one nationality, embracing the tribes that inhabited the sea-coast, or Phœnicia Proper, from Sidon to Gaza, and the cities north of Sidonia. The latter term includes the many separate states originally formed by the various *gentes*, who again, originally, had their own political existence, laws, and even worship.

Gradually, however, the larger communities extended their rules over the smaller ones, or rather combined with them for the formation of a more imposing and important state, into which the different states were merged, without, however, giving up their own individual existence or cultus entirely. The most important of these special tribes or states were the inhabitants of Sidonia—a term, however, expressive both of the inhabitants of the city and of the whole country—the Tyrians, whose settlement, according to their own traditions, was prior to any other Phœnician settlement (about 2750 B.C.); and Aradus, founded, according to the native traditions, by Arvadi, 'the brother of Sidon.' From these three tribes—of the Sidonians collectively—are to be distinguished the Giblites with their two sovereignties of Byblus and Berytus, who differed in many respects from the former, and who it may be presumed, formed at first the ruling state of P., until they were brought under Sidonian dependency. Several smaller tribes or states are mentioned in Scripture—Arke, Sin, Hamath, &c.—but little is known about them.

Of the government and internal constitution of these states or cities, we know next to nothing. There were hereditary monarchs ruling over Sidon, Tyrus, Byblus, Berytus, and Aradus, for whose confirmation, however, the assent of the people was necessary in all cases. By the side of the king stood a powerful assembly, composed of representatives of the old aristocratic families of the land, whose numbers differed at various periods. When Tripolis was founded by Tyrus, Sidon, and Aradus, as a place of joint meeting for their hegemony, every one of these cities sent 100

senators to watch her special interests at the common meeting; and the senate of Sidon seems, in the 4th c. B.C., at least, to have consisted of 500—600 elders, some of whom were probably selected more for their wealth than for their noble lineage. The king sometimes combined in his person the office of high-priest.

The turbulent seething mass of the people, consisting of the poorer families of Phœnician descent, the immigrants of neighboring tribes, the strangers, and the whole incongruous mass of workmen, tradespeople, sailors, that must have abounded in a commercial and maritime nation like the Phœnicians, and out of whose midst must have arisen at times influential men enough—was governed, as far as we can learn, as 'constitutionally' as possible. The unruly spirits were got rid of in Roman fashion somehow in the colonies, or were made silent by important places being intrusted to their care, under strict supervision from home. Only once or twice do we hear of violent popular outbreaks, in consequence of one of which it was mockingly said that P. had lost all her aristocracy and what existed of Phœnicians was of the lowest birth, the offspring of slaves. As the wealth of all the world accumulated more and more in the Phœnician ports, luxury, and too great a desire to rest and enjoy their wealth in peace, induced the dauntless old pirates to intrust the guard of their cities to the mariners and mercenary soldiers, to Libyans and Lydians—'they of Persia and of Lud and of Phut,' as Ezekiel has it; although the wild resistance which this small territory offered in her single towns to the enormous armies of Assyria, Babylonia, and Greece, shows that the old spirit had not died out.

The sources for the early Phœnician history are of the scantiest description. Of the annals and state documents which filled the archives of every large city, nothing has survived except a very doubtful record, which Sanchuniatho (q. v.) is said to have compiled, about 1250 B.C., in Phœnician from official documents, and which was translated into Greek by Philo of Byblus, and a fragment of which is preserved by Eusebius. The Bible, principally Ezekiel, Menander of Ephesus, and Dius, a Phœnician, who wrote the history of Tyre from Tyrian annals, fragments of which are extant in Josephus and Syncellus, Herodotus, Diodorus, Justinus, and others, together with a very few notes scattered throughout the Church Fathers, contain the sum of all our information.

Four great periods, however, are clearly distinguishable in the history of ancient Phœnicia. The first would comprise the earliest beginnings and the gradual development of the single states and tribes, from their immigration to the historical time when Sidon began to take the lead, or about 1500 B.C. The second period dates from the conquest of Palestine by the Hebrews. Sidon had then become already the 'first-born of Kanaan,' as Genesis has it, or 'Sidon Rabbah,' the Great Sidon. The flourishing state of its commerce and manufactures appears likewise from several passages in Homer. The silver vase proposed by Achilles as a prize in the funeral games in honor of Patroclus, was a work of the 'skilful Sidonians;' the garment Hecuba offers as a propitiatory gift to Minerva was the work of Sidonian women. The gold-edged silver bowl given to Telemachus by Menelaos, Hephaistos had received from the king of the Sidonians. Ulysses is left on the island of Ithaca by the Phœnicians, who sail away to 'well-peopled Sidonia.' The gradual ascendency of the rival city of Tyre marks the beginning of the third period, in which P. reaches the height of its power, in which her ships covered all the seas, her commerce embraced the whole earth, and her innumerable colonies flourished far and near. The first historically-recorded item of Tyre's activity is her foundation of Gades, a few years before that of Utica, in 1100 B.C. The reason of the sudden greatness of Tyre is to be found in the defeat of the Sidonians by the king of 'Askalon'—a term probably meant to represent the whole pentapolis of Philistia—about the year 1209; in consequence of which, the principal families of Sidon 'emigrated in their ships to Tyre, which [viz. the Island-city] they founded.' In the 11th c., in the time of Samuel, 'the princes of the Tyrians' are already spoken of instead of the Sidonians, as the representatives of Phœnicia. During the reigns of David and Solomon—under Hiram (980—917)—the friendliest relations existed between the two nations: both in the full bloom of their power. Each country needed what the other could supply. Hence their close alliance, which led even to common commercial enterprises in ships built by Solomon, the supercargoes of which belonged to him, while the mariners and pilots were Hiram's.

By this time, Phœnician colonization had reached its uttermost extent. In the space of three centuries (1300—1000), the Phœnicians had covered all the islands and coasts of the Mediterranean with their forts, their factories, and their cities; and their ships, which ploughed the main in all directions, everywhere found their own ports. They had colonized Cyprus, thus commanding the waters of the Levant and the coasts of Syria and Cilicia. Kithion, Amathus (Hamath), Karpasia, Paphos, with its magnificent temple of Ashera, Keryneia, and Lapothos, were some of their principal settlements in those regions. Northward, on the coast of Cilicia, they founded the cities of Myriandros, Tarsos, and Soloi. Migrating to the west, they took possession of Rhodes, Crete (cf. the Myth of Zeus and Europe), Melos, Thera, Oliaros (near Paros), and Cythera, on the coast of the Peloponnesus. To the east of the Ægean, we find them at Erythræ, and further, as masters of the islands of Samothrace, Lemnos, and Thasos with its wealth of gold mines. The Ægean Sea, with all its islands, being in their hands, they sailed thence further west, to Sicily, where they settled at Motye, on the extreme west point; founded Rus Melkarth, in the south (Heraclea Minoa); in the north, Machanath (Panormos, Palermo, and further, Melite (Malta) and Gaulos. They owned Caralis (Cagliari) in Sardinia, Minorca, Iviza (Ebusos), Elba; on the opposite, or African coast, Hippo, Utica, Hadrumetum, Leptis, and some minor island states. From Sardinia and Minorca, the indefatigable mariners went still further west—through the Strait of Gibraltar to Tarshish (the California of those days) or Spain, where they founded Gadeir or Cadiz, and in the south, Karteja, Malaka, and Abdarach. From here, having colonized well-nigh the whole of the Spanish coast, they went northwards to the tin islands (Scilly Isles), and to Britain herself. And while they thus explored the regions of the Atlantic, their alliance with the Hebrews had permitted them to find the way to the Indies by the Red Rea.

The impulse given to industry and the arts by this almost unparalleled extension of their commercial sphere, was enormous. Originally, exporters or traders only for the wares of Egypt and Assyria, they soon began to manufacture these wares themselves, and drew the whole world into their circle of commerce. As to the early and most extensive commercial intercourse between P. and Greece and her colonies, nothing can be more striking than the circumstance of nearly all the Greek names for the principal objects of oriental commerce being Phœnician, or rather Semitic—identical almost with the terms found in the Old Testament. Thus, of spices—myrrh, cassia, cinnamon, galbanum, narde, aloe, crocus, nitron, balsam, &c.; of jewels and precious stones, sapphire, jasper, smaragdos; of fine materials, and garments, byssus, karpasos, sindon, &c.; musical instruments—nabla, tympanon, sambyke, &c.; oriental plants, vessels, and even writing implements. The wealth of silver, iron, tin, and lead was chiefly got from Tartessus. The descriptions of the abundance of precious metals there verge on the fabulous. Thus, the Phœnicians are supposed to have made even their anchors of silver, when they first discovered the country, not knowing how to stow away all the silver in their vessel. What must have been the state of these mines is clear from the fact, that, even in the Roman time, 40,000 men were constantly employed as miners, and the state received a clear revenue of 20,500 drachms daily. The 'Fortunate Islands,' which, according to Diodorus, they discovered after many days' sailing along the coast of Africa, beyond the Strait of Hercules, and which, to judge from the name Purpurariæ given to some islands off the coast of Mauritania, would seem to have been the Canaries, yielded them the shell-fish purpura, so useful for their dyeing manufactories. Besides their wholesale commerce carried on by fleets and caravans, they also appear to have gone about the interior of Syria and Palestine, retailing their home or foreign produce.

Although the Phœnicians were erroneously believed, by the western tribes, to manufacture all the wares in which they dealt themselves, yet no inconsiderable number of them was really their own work. None of their manufactures, however, stood in so high repute throughout antiquity as the purple dye prepared from the muricidæ, a shell-fish of its coast; and none excelled more in it than the Tyrians. Purple was an almost indispensable luxury of antiquity, particularly in Asia. In temples and palaces for gods and men, purple garments, hangings, curtains, and veils were needed; and Alexander the Great found in Susa alone a store of purple worth 5000 talents. Sidon's principal production was glass—invented there, it was said, by accident; but probably the invention was derived from Egypt, where it was in use long before; the Phœnician glass, however, was always supposed to be the best. The Sidonians knew the use of most of our own contrivances—the blowpipe, the lathe, and the graver. Hardly less great was the fame of Phœnician metallurgy. Their mining operations in the Lebanon and Cyprus, where they dug for copper; in Thasos, where, according to Herodotus, they overturned a whole mountain in searching for gold; but more particularly in Iberia, where at first silver was so abundant, that hardly any labor was required to obtain it—were stupendous; and the minute description of the mining-process contained in Job (chap. xxviii. 1—11) has probably been derived from a sight of Phœnician mining-works. That they well understood how to work the metals thus gained, has been observed already. The art of founding brass must, indeed, have reached a high perfection to enable Hiram Abif to execute such works for Solomon's Temple as they are described in the Bible. No less were they familiar with the

art of imitating precious stones, and coloring glass by means of metallic oxides.

To Sidon is further attributed the pre-eminence in the glyptic and plastic arts; and the artists sent by Hiram to Solomon were skilful workers in gold and silver, in brass, in iron, in purple and in blue, in stone and in timber, in fine linen, and the engraving of precious stones. Their architecture seems to have been of a Cyclopean nature. Their vessels, originally simple rafts, gradually developed—with the aid of the Lebanon, which afforded inexhaustible supplies of timber, and Cyprus, which possessed all the materials necessary for fitting up a ship, from the keel to the sails—into a first-rate fleet, consisting of round ships, or gauli, for short or coasting voyages; war-galleys, or triremes; and fifty-oared craft, long in build, and adapted for rapid sailing or rowing. The internal arrangement of these vessels was perfect, and excited the wonder and admiration of the Greeks, by their being so splendidly adapted at once for navigation, freight, and defence. Their extraordinary three years' voyage of discovery, undertaken in the service of Necho, round Africa, going out of the Red Sea, and returning by the way of the Strait's mouth, is as well known as their voyages in the service of Solomon.

The golden age of P., during which her colonies, her manufactures, and her commerce were in this most brilliant phase, seems to have waned simultaneously almost with that of Judæa. As Solomon in the latter, so does Hiram in the former, mark the end of that peace and happiness which had made their countries rich and glorious, as no other country of their day. According to a fragment preserved in Menander, Hiram was followed by his son Baleastartus, who died after a short reign of seven years, in 940 B. C., and a long series of political calamities and civil wars ensued.

The last of Hiram's sons, Pheletus, fell, in 898, by the hands of Ithobaal, the priest of Astarte, into whose family now passed the kingdom of Tyre. He is the Ethbaal mentioned in Scripture as the father of Jezebel, and father-in-law of Ahab; and a peculiar concidence is the simultaneous mention of the three years' drought in Judæa (to which an end was put by Elijah's prayer) and in P., where relief was obtained by Ithobaal, who seems to have stood in the odor of sanctity. It was during this unhappy period that the celebrated Elissa, better known as Queen Dido (q. v.), fled, together with some of the most aristocratic families of Sidon, to Libya, where they founded a new city (Kartachadata = Carthage), near the spot of an ancient Sidonian settlement, about 813 B.C. The fourth and last period of Phœnician history may be dated from the middle of the 8th c., when Shalmaneser, the king of Assyria, invaded P., and besieged Tyre for five years, but without result; and there is every reason to believe that the peace concluded at the end of this period was very favorable to Tyre. But soon afterwards, P. was drawn into the struggle for the supremacy then raging between Chaldæa and Egypt, and was conquered by the former power. A further calamity befel P. at the hand of Pharaoh-Apries, who anticipated Nebuchadnezzar's intended attack on Egypt by destroying the Phœnician fleet, conquering the country, and pillaging it. These calamities produced a series of internal troubles, in consequence of which the constitution was constantly changed; and we hear now of a series of kings, and now of provisional *suffetes*—all their respective reigns, however, being of a very brief duration. From that time forward, and even before the special histories of Sidon and Tyre, which alternately possessed themselves of the hegemony of Phœnicia, constitute also the history of the country itself, and to these two cities we refer for what momentous events took place in the latter days of the once mighty empire. The battle on the Issus terminated even the shadow of P.'s independent existence, and it shared the fate of Alexander's vast empire. In 65 B.C. it became, under Roman dominion, part of Syria, and has since shared her fate for good or evil. See SYRIA, SIDON, TYRE, CARTHAGE.

Religion.—With regard to the Religion of the Phœnicians, its real character has as yet been imperfectly expiscated. Deprived of all original and direct information on the subject, we have to cull what scanty notices we may from the works of Greek and Latin writers, or to gather knowledge from some vague allusions contained in the Bible. Not a scrap of native literature has been allowed to survive; and the supposed extracts from a Greek version by Philo of Sanchuniatho's Phœnician works, which we find in Eusebius—hitherto our chief source of information—must be used with more than an ordinary degree of caution. See SANCHUNIATHO. We shall therefore, without entering into futile speculations, confine ourselves to a few general and well ascertained facts; premising, however, that Phœnician theology is far from being a hopeless province, whatever it may appear now. Excavations are on foot in all directions, both in the mother-country and in the colonies, and new discoveries are being brought to light constantly.

The religion of the Phœnicians was, like all ancient Semitic religions—except that of the Hebrews—a kind of pantheistic worship of nature. While Monotheism, with the descendants of Abraham, assumed a supreme power within nature, which, according to its own free will, creates and destroys, the rest of the East assumed a Dualism: two elements, a male and a female; or two highest deities, one of whom begets, and has the power to destroy, and the other conceives and bears. These two supreme beings were sometimes merged in one deity, with male and female attributes, which spread out into immense ramifications: representatives now of the general powers of nature, now of the particular phenomena in nature, or the life of men. They had deities who ruled over the stars, the elements, the seasons; over special localities, or over certain phases of life. No nation of antiquity perhaps possessed a more endless pantheon than the Phœnicians: a circumstance easily explained by their peculiar position and relations.

Consisting originally of a variety of tribes, each of whom had their own special deities—although the supreme *Numen*, or the principle of their chief Deity, was probably the same with all—those Phœnicians who dwelt in the north differed in some respects, such as the names and attributes of certain gods, from those of the south. Besides this, it must not be forgotten that the period of Phœnician history ranges over 2000 years, and their political career, as well as their commerce, brought them in close and constant contact with nearly all the civilized nations of the then known world; and being both superstitious (as sailors and traders are prone to be), and possessed of an adaptability to which partly they owed their success in other respects, they easily, if not greedily, received into their wide pantheon those who, albeit the special national gods of others, or because of this very reason, could either harm or benefit them. It may be also that a certain easy nonchalance about these things, such as the wealthy and aristocratic classes displayed in ancient Rome and elsewhere, and the interest of the priests, who received very considerable tithes of every sacrifice (oddly enough, our information on that point leaves nothing to be desired), went hand in hand to favor the gradual introduction of as many gods and goddesses as pleased the herd. Their proper divisions, however, their real names and derivations, and the history and time of their nationalization, are things which will for ever continue to puzzle investigators.

Setting aside such more or less vague and undefined names of deities as were common to the whole Semitic stock, and as they are found in the Hebrew records—like *El* (Mighty One), or (in plural) *Elim; Ollonim* [*Elyon*] (the Most High); *Adon* (Lord); *Melech* [*Moloch*] (King); &c.—we find in the first rank of gods (of Tyre and Sidon) Baal (q. v.) and Astarte (q. v.). Baal again occurs in two different characters, as it were—as *Baalsamin* (Lord of Heavens), the highest god ruling over the Universe, the Zeus Olympios, and Jupiter Optimus Maximus; and as *Baal Melkarth*, the special national numen. Baalsamin is originally identical with the Babylonian Bel or Baal. The third supreme Tyrian goddess was Astarte, worshiped as the very counterpart of the Sidonian *Astarte*. While the latter was considered a pure virgin, whose emblem was the moon, the former (the biblical Ashera) was propitiated (as Venus, goddess and planet) by prostitution. The Tyrian Astarte was principally known under the name of Tanis (q. v.), the Assyro-Persian Tanais, and was married to Baalsamin, and also to Adonis, and bore altogether the character of a goddess who delighted in chastity.

The principal deities of Northern P.—the non-Sidonian tribes—consisted of a different trias—*El, Baaltis*, and *Adonis*. The first was the supposed founder of the two oldest Phœnician cities of Byblus and Berytus, and corresponded to (being originally, perhaps, identical with) both Baalsamin, as the highest deity, and Melkarth, as the special god of Tyre. Baaltis, Beltis (My Lady—Aphrodite), worshiped at Byblus, Berytus, Aphaka, Arke (Architis), &c., was joined to Adonis (q. v.), whose cultus had been imported from Assyria, and is therefore unknown in the more ancient Phœnician colonies, in Africa and Spain. Byblus called him Adonis Ganas, or Ganan (perhaps Gaavan, the Exalted); near Byblus, we find him worshiped as Elyon (the Highest); as Esmun in Berytus, and perhaps also under the name of Memnon, at Apamea, where an annual mourning-festival was celebrated in his honor; further, near the river Bandas at Paltos; and at the river Belus. As Serach (the Brilliant) in Phœnician, and Kharush (the Sun) in Persian, he appears to have had some relation to the star-and-planet worship which became, under Assyrian influence, a prominent feature of the Phœnician religion.

Besides these more or less localized gods and goddesses (*Dii Majores*), a certain number of deities—states and country deities—were worshiped in common by all Phœnician states. They were called the Children of Sadik (the Just), or the Children, or the Patæki (Descendants of Phtha), or the eight Kabiri (Strong Ones). They are the maritime gods, and their images were placed on the prows of Phœnician ships. As protectors of navigation, they are identified with the Dioscuri; and again, as representatives of heat, breath, and life, they received the names of Lares and Penates. Their individual names are not generally mentioned; they seem

(cf. Esmun = eighth) to have been merely counted. Their mode of worship was most mysterious—as indeed some of the earliest mysteries were closely connected with it.

Besides these, they also worshiped certain phenomena, personified attributes, and qualities. Their planetary divinities were the Sun and his four horses—to whose worship belongs, among others, to a certain extent the annual festival of the Resurrection of the (Tyrian) Herakles, under the emblem of a column in the form of a rising flame (Chaman); the Moon with her chariot drawn by white bulls; the planet Mars (Aziz or Nergal); Jupiter (Kochab Baal); Venus (Astoret Naamah = lovely Astarte), with her voluptuous cultus; and Saturnus (Moloch, Kronos), the evil principle. The elements were revered either in conjunction with certain deities or on their own account. The water, to which sacrifices were offered both in the shape of human beings and animals or fruits, was hallowed in all its shapes—as the sea, as rivers, fountains, lakes—by which people took their most solemn oaths; the fire, in connection with the oldest deity of P.; the light (Moloch); the air and the winds; the earth and all its plants, its forests, and glens, and trees, and more especially its mountains, as the 'symbols of the High Ones,' or as 'Faces of God,' such as Mount Carmel, Lebanon, Antilibanus, and others. Of animal-worship we have only small traces.

Abstract notions and ideas were not forgotten. The Year and the Months, Day and Night, Aurora (Lilith), Age and Youth, Art and Love, had their altars. Nor were certain professions and trades without their visible patrons. Thus, there are gods of agriculture and horticulture, like Dagon, the god of grain; a Dionysos, whose Phœnician name is lost, as the god of wine-growers; a god who is the numen of fruit-growing, of pisciculture, of mines, &c. Chthonian gods are not wanting. The god of Death—the king of the lower regions—is Muth = Death (Pluto), who is represented as a small child. His reign was shared by a goddess whose name is vaguely known as Eloti (My Goddess), and who is occasionally identified with Astarte, Dido, Anna, Persephone, Europa, and a great many other deities.

We have already touched upon the mode of worship of the Phœnicians, and the places chiefly selected for their rites. Mountains, heights, rivers, lakes, fountains, meadows, glens, were, as we said, the favorite habitations of the gods. But the Phœnicians were also amongst the first who erected temples. These were generally divided in two parts, containing the sacred arks (the mystic cists of the Greeks; and the chariots upon which the sacred objects were at times carried about. Not being intended to be prayer-houses, but as dwelling-places for special gods, they were rather small, and did not even contain the altar upon which the sacrifices were offered. This generally stood at the entrance of the temple, and around it the priests and hierodouloi danced in their service. Pure wells and an everlasting fire were the indispensable conditions of a sanctuary. The sacrifices themselves, as far as they consisted of animals, offer great analogies to those of the Jews; but the P. also offered up human sacrifices—chiefly first-born male children, as that which the suppliant held dearest—chiefly to Baalsamin, Baal Hamon, and Astarte. Such human sacrifices, or burnt-offerings took place annually at the great festivals of expiation, and further on extraordinary occasions, at the beginning of important enterprises, such as a campaign, and in great casualties: in order to expiate by one sacrifice the sin of all. The same fanaticism which fancied the gods best pleased by the offering up of what was most precious, led the Phœnician women, like the Babylonian, to sacrifice their honor in honor of Astarte, on certain occasions, so that certain sanctuaries became hot-beds of prostitution. Circumcision—another kind of sacrifice—was not common among all the Phœnician tribes, it being a rite principally sacred to El, the god of Berytus and Byblus.

Of festivals and pilgrimages in general, we have spoken under FESTIVALS, GREEK RELIGION, &c.; and what has been observed there respecting their character in Polytheism (their being to a great extent connected with the births, deaths, resurrections, and other personal phases of special deities), holds good here. No doubt, these festivals, like those of the Hebrews, and all other ancient nations, had, beside their religious, also their political and commercial significance; and P. was more particularly, by the eminent position she held in the world's trade, a place toward which flocked, on solemn occasions, pilgrims from all parts of Asia and Africa. 'Festival Embassies,' as they were called, were despatched thither from Syria, Arabia, Babylonia, Cappadocia, Cilicia, Egypt, Armenia; nay, from India, Ethiopia, Persia, and Scythia; and not until the 5th c. A.D. did these pilgrimages to P. cease entirely. One festival, is entirely peculiar to Tyre, and strangely enough, it is still celebrated by the present inhabitants of Sur—viz., the 'Wedding of the Land-water with the Sea-water.' On these occasions, the people walk in procession to the well near the town-gate, and pour some pails of sea-water into it, in order to render it clear and sweet again for a long time.

It would be vain to try, with our scanty and adulterated sources, to gain a deeper insight into the ideas attached to the names, attributes, and modes of worship of the deities mentioned, or to speculate upon their moral influence upon the people of Phœnicia. That these were pre-eminently practical; that arts and manufactures flourished among them, more than among any other ancient nation; that they knew how to turn science into money; that they were, in fact, shrewd men of business—all this we know, but little more. Atheists or Pantheists, whichever they must be called in the modern sense of these words, it is extremely doubtful whether they, any more than the bulk of the Hebrews before the Exile, believed, as a body, in immortality. What was their influence upon Greece, Rome, the whole ancient and modern world, in the province of religious thought, we shall never have any means fully to ascertain. Comparative Mythology, has a vast field to explore in this direction.

Phœnician Language and Literature.—With the exception of Greek and Latin, no language was so widely known and spoken throughout antiquity as the Phœnician; and monuments of it have been found, and continue to be found, almost all over the ancient world. We can only vaguely speculate on its early history and its various phases, so long as our materials yield so little information on that point. Its decline seems to date from the 8th c. B.C., when Aramaisms crept in in overwhelming numbers. Finally, the close contact with, and the everywhere preponderating influence of the Greeks, superseded—chiefly after Alexander's time—the ancient language almost completely; and even coins with Phœnician legends occur not later than the 2d c. B.C.—An important Phœnician literature seems to have been extant as late as the 1st c. A.D., but it has disappeared from the face of the earth. After the second half of the 3d c., the language had vanished entirely in the country itself, and Jerome, who lived in Palestine, mentions the Punic, but never the Phœnician. In the west, it survived to a much later period. In Mauritania and Numidia, it remained, in a corrupted form, the reigning tongue as late as the 4th c. A.D.; and Augustine draws his explanations of Scripture from the Punic current in the 5th century. There was a translation of the whole Bible into Punic made for the use of the Punic Churches; and in and near Tripolis and Bizanium, it was the language of the common people up to a late period. From the 6th c., however, it rapidly died out, chiefly in consequence of the Vandals, Goths, Moors, and other foreign tribes overrunning the country, and ingrafting their own idioms upon it.

As a branch of the so-called Semitic family of the Hebrews, Syrians, Arabs, &c., the Phœnicians naturally are closely related to these also with respect to language. The affinity of the 'speech of Canaan,' as the Hebrew is called sometimes, with the Phœnician was indeed remarked at an early period. Augustine, Jerome, and Priscian pointed out already—and sometimes in order to back some very peculiar notions—how closely these two languages and their dialects were allied. Yet it must be obvious at first sight, that however near the two idioms may originally have stood to each other, the peculiar relations and fortunes of the two races who spoke them must have produced substantial changes in their structures in the course of time. While the ancient scriptural monuments of the Hebrews—outwardly and inwardly—exhibit a rare unity of idiom and form, the ancient hallowed utterance becoming a type and model for the later generations: the Phœnicians, on the other hand, not confined within the narrow limits of their home-country, but mixing freely with all the nations of the earth, spreading their own colonies far and near among them, opened a wide field for the 'development' of their language, or rather for its corruption, by its entering into alliance with Libyan in Africa, Sardinia, and Spain, and with Aramaic in Northern Phœnicia, Cilicia, and perhaps even in Cyprus. Thus it came to pass that the two languages which originally may have been identical in old Canaan became more and more widely divergent. To enter into a more detailed disquisition on this or other cognate points, we deem more hazardous now than we should have thought it only a very few years ago; for the more ample our discoveries in Phœnician literature have become of late, the more it becomes evident that we are only at the commencement, as it were, of Phœnician philology

What we said of the structure of the Hebrew Language (q. v.), also holds good for Phœnician to a certain extent; and we shall therefore simply point out the most palpable differences between them. In the first instance, we observe the very strange circumstance, that what is considered an archaism or an isolated dictum in Hebrew, appears as a common expression in Phœnician. Certain grammatical terminations, obsolete in Hebrew, are in use in Phœnician—so that it would appear as if the Phœnician had retained more of the ancient Canaanite speech than the Hebrew, which gradually transformed and refined it by grammatical niceties. Another feature is the preponderance of the Chaldee, or rather Aramaic words and forms—although here again we are on very dubious ground. It might further be questioned whether our Phœnician Inscriptions—all belonging to a very late period—are not rather a faithful reflection of the Hebrew of their period, which, since the 8th c. B.C., had more and more changed into

Aramaic. So much is certain, that the original language of Canaan was perfectly free from Chaldaisms, and that these are but a late corruption—such as we also find in the later books of the Old Testament. Yet there are other features quite peculiar to the Phœnician, which—although not of sufficient importance to warrant our separating the dialect entirely from the Hebrew—are of a nature not to be explained by any Semitic analogy; such as certain differences in the pronunciation of vowels, in the treatment of consonants, the formation of pronouns; some verbal forms, and certain words entirely foreign to the Semitic. Again, a distinction is to be made between the Phœnician of P. and that corrupted form of it spoken in the western colonies, called Punic, and further, that idiom peculiar to the inhabitants of Leptis, called Libyo-Phœnician—a mixture of Phœnician and Lybian, with a vast preponderance, however, of the former element.

The difference in the pronunciation may be briefly characterized as a tendency towards an obscuring or lowering, as it were, of the vowels: thus, the Hebrew *a* is changed into *o*, the *e* into *i* or *y*, *i* into *y*, sometimes into *u*, and *o* into *u*. Peculiar is also the use of the Hebrew *Ayin* as a vowel (*mater lectionis*), with the pronunciation of *o* or *u*. On some occasions, however, it is entirely omitted. The gutturals are changed at times, as in the corrupted orthography of Samaritan and Sabian, so that *L* and *R* are sometimes assimilated with the next consonant in the middle of the word, or entirely omitted, &c. As to grammar, our knowledge is extremely limited. A few undoubted facts are the termination of the nominative form in *at* instead of the Hebrew *ah*, the greater variety of genitive forms in Phœnician, the difference in the formation of the pronoun, and the identity of the article with that in Hebrew (*ha*). For the Phœnician alphabet, the model of all European alphabets, see ALPHABET.

The Literature of P., in its original form, has, as we said, perished entirely. What traces and fragments we have of it, have survived in Greek translations. But from even these small remnants, we can easily imagine the extreme antiquity, and the high importance and vast extent of these productions, which, at first, seem to have been chiefly of a theological or theogonical nature. Their authors are the gods themselves, and the writings are only accessible to the priests, and to those initiated in the mysteries. From the allegorical explanations of these exalted personages sprang a new branch of sacred literature, of which those fragments of Cosmogony mentioned above are derived. To the literary age of Taaut, Kadmus, Ophion, Esmun, &c., succeeded Thabion, Isiris, Sanchuniatho, and Mochus, who founded the schools of Priests and Prophets. These cultivated the sciences, chiefly the occult ones, magic, and the like. Nearest to the Sacred Literature stands Didactic Poetry, somewhat related to the Orphic, whose chief representatives are Sido, Jopas, &c. The erotic poetry is characterized as of a very sensuous nature, both in P. and the colonies. Of historians are mentioned Mochus, Hypsikrates (Sanchuniatho?), Theodotus, Philostratus, Menander, and others; but these are mere Greek versions of their Phœnician names, and absolutely nothing has been preserved of their writings. Punic literature is also frequently mentioned by Greek and Roman writers. Geography, history, agriculture, were the fields chiefly cultivated by the colonists of Carthage and the West generally.

The monuments that have come down to us, and which not only have enabled us to judge for ourselves of the religion, the language, and the manners of the Phœnicians, are of twofold kind—they are either legends on coins and lapidary inscriptions, or Phœnician proper nouns and texts imbedded in the works of ancient classical or sacred writers. The principal and ever-growing source for our information, however, are the monumental inscriptions, of whose existence, till the middle of the 18th c., nothing was known. The most numerous Phœnician remnants have been discovered in the colonies. Richard Pococke first found, on the site of ancient Citium (Larnaka of to-day), 31 (not 33, as generally stated) Phœnician inscriptions, which he deposited at Oxford (published by Swinton, 1750). Malta, Sardinia, Carthage, Algiers, Tripolis, Athens, Marseille, have each yielded a considerable number, so that altogether we are now in the possession of about 120 monuments, either votive tablets, or tomb inscriptions. The latest and most remarkable are those now in the British Museum, discovered at Carthage a few years ago by N. Davis, consisting of votive tablets, a (doubtful) tombstone, and a sacrificial tariff, which completes another stone found some years ago at Marseille of the same nature; both setting forth the amount of taxes, or rather the proportionate share the priest was entitled to receive for each sacrifice. Another exceedingly valuable (trilingular) inscription, referring to the gift of an altar vowed to Eshmun-Asklepios, has been discovered quite recently in Sardinia. See below.

One of the most important historical monuments is the sarcophagus of Ashmanasar II., king of Sidon (son of Tennes?), found at Tyre in 1855, the age of which has variously been conjectured between the 11th c. B.C. (Ewald)—a most incongruous guess indeed—the 7th (Hitzig), the 6th (Duc de Luynes), and the 4th (Levy), of which we shall add the commencement, literally translated: 'In the month of Bul, in the fourteenth year that I reigned, King Ashmanasar, king of the Sidonians, son of King Tebnith, king of the Sidonians—spake King Ashmanasar, king of the Sidonians, saying: Carried away before my time, in the flood of days—in dumbness ceases the son of gods. Dead do I lie in this tomb, in the grave, on the place which I have built. I myself ordain that all the nobles and all the people shall not open this place of rest; they shall not seek for treasures and not carry away the sarcophagus of my resting-place, and not disturb me by mounting the couch of my slumbers. If people should speak to thee [and persuade thee to the contrary], do not listen to them. For all the nobles and all the people who shall open this sarcophagus of the place of rest, or carry away the sarcophagus of my couch, or disturb me upon this resting-place, may they find no rest with the departed; may they not be buried in a tomb, and may no son and successor live after them in their place;' &c.

The votive tablets bear the same character throughout, differing only with respect to the name of the man or woman who placed it in a certain sanctuary in accordance with his or her vow. Their material is mostly limestone or fine sandstone, rarely marble, and they vary from 5 to 15 inches in height, from 4 to 7 in width, and from 1½ to 4 in thickness. Beginning in most cases with the dedication to the god or goddess, or both, thus: '[Sacred] To the god..... [this tablet] which vowed N. son (daughter) of N. When he (she) heard my voice and blessed,' or 'hear my voice and bless;' &c. The sepulchral tablets generally run somewhat in this manner: 'Stone erected to....., who lived ..... years.'—Much yet remains to be done. Even the palæographical side has, notwithstanding all the ready material, not been settled satisfactorily yet. One point, however, is indisputable even now. There are at least two kinds of Phœnician writing to be distinguished most clearly. The older, purer, more orthographical, and more neatly executed, is found in the inscriptions of P. herself, of Malta, Athens, Citium, and Carthage; the younger, corrupted not only with respect to the grammar and language, but also with respect to the form of the letters, which are less carefully executed, and even exhibit some strange, probably degenerate characters, is found chiefly on the monuments of Cyprus, Cilicia, Sardinia, Africa, Spain, Numidia, and the adjacent parts,

Besides the monumental sources for the language, there are a few remnants of it embedded, as we said, in ancient non-Phœnician writings. The Old Testament alone, however, has preserved its words—proper nouns chiefly—unmutilated. Later eastern writers even, not to mention the Greeks and Romans, have corrupted the spelling, to such a degree, that it is often most puzzling to trace the original Semitic words. Phœnician names occur in Suidas, Dioscorides, Apuleius, in martyrologies, calendariums, Acts of Councils, in Church Fathers (Augustine,



Fig. 1.

i. e. Lerabbath, Letanith Pen-Baal
Uleaddan Lebaâl Ch[ammon A]
[Sh] Nadar Chanbaâl [Ben Abd]
Ashmun.....[Shema]
[Ko]l[a Barcha.....

'To the Lady Tanith, the face of Baal, and to the Lord Baal Chammon [is dedicated this *scil*] which has vowed Hanbaâl [the son of Abd] Ashmun.....[When he (or she) hears his voice, may he (or she) bless.']

Priscianus, Servus,) &c. The only really important remnant,

however, is found perserved — albeit fearfully mutilated and Latinized—in Plautus's *Pœnulus*, act v. s. 1 of which contains, in 16 lines, the Phœnician translation of the Latin text, with more than 100 Phœnician words. Several other phrases and words are embodied in act v. ss. 2 and 3 of the same play. Yet, although there is very little doubt among scholars about the greater portion of these texts, the corruption and mutilation which they had to undergo, first at the hands of Plautus, who probably only wrote them by the ear, then at the hands of generations of ignorant scribes, have made more than one word or passage an insoluble puzzle.

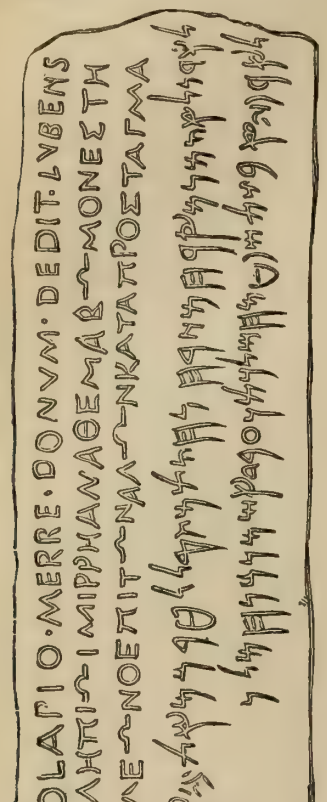


Fig. 2.

The first (Latin) division, consisting of 1¼ lines, reads: 'Cleon. Salari[orum] . Soc[ietalis] . S[ocius, odalis] . Æscolapio . Merre . Donum . Dedit . Lubens . Merito . Merente.'
The second (Greek) division (two half lines) reads: '*Ἀσκλήπιῳ Μιγδ̣ων Ἀνάθ̣εμα Βωμὸν Ἔστησε Κλέων Ὁ Ἐπὶ Τῶν Ἀλῶν Κατὰ Πρόσταγμα.*'
The third (Phœnician) division (1¼ lines) reads: 'Leadan Leeshmun Maarach Misbach Nechosheth Mishkal Litram Meuth [100] Ash Nadar Aklin Shachsag Measher Minelach Tishm[a Kjola Refia Beshat Sufetim Chamilkat Veâbd Ashmun Ben Chamilk[at].'

The first of the two specimens of Phœnician [Punic] writing subjoined is taken from one of those Carthaginian votive tablets with which the British Museum (now the wealthiest in Phœnician monuments) has lately been enriched, as mentioned before.

The emblems on it are symbolical, and refer to the deities invoked. The lower part is mutilated, but easily supplied. The date is uncertain, perhaps the 2d or 3d c. B.C.

The second is a trilingual inscription from a base of an altar, found at Pauli Gerrei, in Sardinia, and first fully explained by Deutsch. (See *Transactions* of the Royal Society of Literature, 1864).

Its contents are briefly this: A certain Cleon, Phœnician by religion, Greek by name, Roman by nationality, a salt-farmer, vows an altar—material and weight of which are only given in Phœnician; viz., copper, a hundred pounds in weight—to Eshmun-Æsculapius 'the healer' (the Phœnician *Mearrach*, clumsily transcribed *Merre* in Latin, and *Mirre* in Greek), in consideration for a cure to be performed. The date, given in Phœnican, viz., the year of two, apparently annual, entirely unknown judges, gives no clue to the time. Palæographical reasons, however, would place it in about the 1st c. B.C.

Among those who have more or less successfully occupied themselves with Phœnician antiquities, language and literature, and who have also, in some instances, deciphered inscriptions, we mention Scaliger, Bochart, Pococke, Barthelemy, Swinton, Bayer, Dutens, Hamaker, Gesenius, Movers, Munck, Judas, Bargès, De Saulcy, Ewald, Levy, Vaux, Renan, De Luynes, De Vogué Deutsch, and others; to whose writings, contained either in special works or scattered in Transactions of learned societies, we refer. Very valuable are Movers's *Phœnizier;* Schröder's *Die Phönizische Sprache;* Renan's *Mémoire* (1860), and his *Mission de Phénicie* (1870); also the relevant portions of the ancient histories of Lenormant, Duncker, and others.

PHŒNICO'PTERUS. See FLAMINGO.

PHŒ'NIX, the name of a mythical Egyptian bird, supposed by some to be a kind of plover, like the *kibitz*, often depicted with human arms, and called in hieroglyphs *rekh*. Others consider it to be the *bennu*, or nycticorax, a bird sacred to Osiris, and represented watching in the tamarisk over his coffin. The first of these representations has sometimes a star upon the head, supposed to indicate the astronomical period of its appearance. It visited Egypt after the death of its father, and entered the shrine particularly dedicated to it at Heliopolis, and there buried its parent, putting the body into an egg or case made of myrrh, and then closing up the egg. Another account is, that the P., when about to die, made a nest for itself in Arabia, from which a new P. sprung of itself. This bird proceeded to Heliopolis, and there burned and buried its father. But the more popularly-known version is, that the P. burned itself, and a new and young P. sprung from the ashes. A less received version is, that a worm crawled out of the body of the dead P., and became the future one. The P. was, according to the most authentic accounts, supposed to visit Egypt every 500 years; the precise period, however, was not known at Heliopolis, and was a subject of contention till its appearance. The connection of the Phœnix period with that of the Sothiac cycle, appears to be generally received by chronologists, as well as the statement of Herrepollo, that it designated the soul and the inundation of the Nile. A great difference of opinion has prevailed about the Phœnix period; according to Ælian, it was a cycle of 500 years; Tacitus seems to make it one of 250 years; Lepsius, a cycle of 1500 years. The P. was fabled to have four times appeared in Egypt: 1, under Sesostris; 2, under Amasis, 569—525 B.C.; 3, under Ptolemy Philadelphus, 284—246 B.C.; and lastly, 34 or 36 A.D., just prior to the death of Tiberius. The P. also appears upon the coins of Constantine, 334 A.D., viz., 300 years after the death of Christ, who was considered the P. by the monastic writers. It is supposed by the rabbins to be mentioned in Job and the Psalms.—Job xxxix. 18; Psalms ciii. 5; Herodotus, ii. 73; Achilles Tatius, iii. 25; Tacitus, *An.* vi. 28; Tzetzes *Chil.* v. 397; Lepsius, *Einleit* p. 183; *Archælogia*, vol. xxx. p. 256.

PHŒNIX. See DATE PALM and PALMS.

PHO'LAS, a genus of lamellibranchiate molluscs, of the family *Pholadidæ*. This family, to which the Ship-worm (*Teredo navalis*) also belongs, has the shell gaping at both ends, thin, white, very hard, sometimes with accessory valves; the two principal valves beset with calcareous inequalities, connected by fine transverse parallel ridges, forming a kind of rasp, used by the animal for boring a hole in rock, wood, or other substance, in which it lives. The animal itself is either club-shaped (as in *Pholas*) or worm-shaped (as in *Teredo*), with large long siphons, often united almost to the end, and a short foot. Several species are natives of the British coasts. They are popularly called *Piddocks*. They are used for bait, and also for food. How the pholades or pittocks excavate the holes in which they live, sometimes in clay or mud, but often in chalk, and even in much harder rocks, has been the subject of much dispute. An excavating instrument armed with silicious particles, has been ascribed to the animal, but no such instrument exists. The shell is studded with projections, in regular rows, giving it the character of a rasp or file; and the P., fixing itself firmly by its foot, which acts as a sucker, and working itself from side to side, makes use of the rasping power of its shell to enlarge its hole as it has need, so that the hole is always very exactly accommodated to the size of the occupant.

PHONETIC WRITING is the representation of speech by means of symbols for the elementary sounds of language. All alphabetic writing is essentially phonetic. The invention of letters was the invention of phonetic writing, as distinguished from the older pictorial, or ideographic, writing. From a variety of causes, however, no language has ever been perfectly represented by its spelling, and with the lapse of time the divergence has gone on increasing, since the spoken words are constantly undergoing change, while the spelling tends to remain fixed. In English, more especially, this divergence has been allowed to proceed to such an extreme that it is admitted on all hands to be a serious evil, and in recent times various schemes have been projected to remedy it. It is to these schemes of radically reformed spelling that the name of Phonetic Writing is now more especially applied; and what follows, represents the views and arguments of the promoters of the movement and sketches its history.

The earliest attempts at alphabetic writing were as strictly phonetic as the limited scheme of symbols allowed, or as the limited aim of writers required. The alphabets were confined almost exclusively to consonants; and the analysis of speech on which they were based was of course confined to the languages for which the alphabets were designed. When any old alphabet, therefore, came to be adopted for a new language or dialect, it would be found deficient in the means of writing any sounds which were not used in the language for which the alphabet was originally intended. Unless, then, new symbols were added for the new sounds, these latter must have been represented by conventional combinations of letters; and at this point the writing would cease to be perfectly phonetic.

The Sanscrit language furnishes the most convincing proof of the original phonetic character of alphabetic writing; for not only were words written exactly as they were sounded, but every change which a word underwent in utterance was consistently indicated by a change in the writing. Notwithstanding this fact, there is no language in which the etymological and grammatical relations of words are more clearly exhibited or easily traced than in Sanscrit. Our own language illustrates the same principle. No difficulty is experienced in discovering the relation between *loaf* and *loaves*, *wife* and *wives*, notwithstanding the change of *f* into *v* in the plural; nor would any difficulty be created though the *s* also were changed, as it is in sound, and the words written as they are pronounced—lōvz, wīvz.

The English language embraces in its dialects almost all the elementary sounds of all languages; and the Latin alphabet, which was adopted for its writing, was so insufficient in the number of its characters, that many new letters would have been required to adapt it for the representation of Anglo-Saxon and other words. But in place of being extended, the alphabet was reverentially accepted with all its imperfections; its deficiencies were supplemented by the use of servile or silent letters, and by various orthographical expedients; and thus our writing came to be irregular, difficult, and fluctuating. The great inconvenience, however, of representing by the same character the sounds of U and V, led to the introduction of the former as a new letter for the vowel sound, and to the limitation of the latter character to the consonant sound; and the further ambiguity arising from the want of an appropriate sign for the sound of W, led to the invention of that symbol, which, being formed by joining together two of the old V characters, was thence called 'double V'—pronounced, according to the old sound of V, 'double U.' The phonetic principle was fully recognized in these changes, and they furnish precedent for further changes, when a necessity for them shall be sufficiently felt and acknowledged.

There can be no doubt that phonetic writing would greatly facilitate the acquisition of the power of reading, and consequently of the education of children and illiterate adults; as well as tend to the reduction of dialects to one common standard, and further the diffusion of our language in foreign countries. To learn to read from perfectly phonetic characters, would be merely to learn the alphabet, and to spell would be merely to analyze pronunciation. A child at school might be made a fluent reader in a few weeks. All uncertainty of pronunciation would vanish at the sight of a word, and dictionaries of pronunciation would be superfluous.

Of all the languages which employ the Latin alphabet, the English is the worst represented; in some measure because of the rich variety of its phonic elements, but chiefly because, of all the nations which have adopted Latin letters, the English have done least to make their writing phonetic. Every attempt to correct the anomalies of our orthography has roused a host of prejudices, against which the efforts of private individuals have been powerless. The difference between phoneticians and their opponents seems to be a fundamental difference as to what really constitutes a word. The former, maintaining the *sound* to be the true word, would discard all associations dependent on letters, in order to represent the exact sound in the simplest manner; the latter, clinging to the literal associations of orthography, argue as if the verbal cluster of *letters* in reality constituted the word. The dispute is thus, in effect, between letters and sounds: which are the signs—which the thing signified?

In phonetic writing, the eye would no doubt confound such words as *know* and *no*, *see* and *sea*, *sighs* and *size*, when written separately, as in a vocabulary; but it cannot be supposed that such words would present more ambiguity in contextual usage than they now do in utterance, subject to the same confusion to the ear. At present, we have, in fact, two languages—one purely phonic, addressed to the ear; and the other, in some degree etymological or historical, addressed to the eye. In this respect, we are in a similar position to the Chinese, with their classical ideographic language of literature, and their multitudinous vernacular dialects. In order to establish the assertion, that the phonic word (the sound) written phonetically in a sentence would be less intelligible to the eye than the written word in its present form, it is incumbent on the opponents of phoneticism to show that the simple phonic word is now less intelligible when pronounced in a sentence, than its written symbol is when read in a sentence.

The principal objection urged against phonetic writing is, that it would obscure the etymological history now discoverable in the orthography of a word. The best answer to this objection is that the traces of etymology, preserved in the present spelling, are so imperfect and inconsistent as to be of little value compared with the embarrassments they occasion in other respects.

The first requisite for the construction of a phonetic alphabet is an exact knowledge of elementary sounds, that every element may be provided with its appropriate symbol, and that no more symbols may be introduced than there are distinct elementary sounds. The latter consideration would be of importance only in connection with a general alphabet available for all languages. An alphabet for any individual language might contain symbols for compound sounds, with no other disadvantage than that of adding to the number of symbols. It would not, for instance, be of any consequence, so far as phonetic writing is concerned, whether the word *sacks* were represented by the letters *saks*, *sacs*, or *sax*, so that the symbols used were invariably appropriated to the same sounds. Orthoepists and phoneticians are not agreed as to what elements compose many of our compound sounds, such as those heard in the words *chair*, *queen*, *tune*, *I*, *out*, &c. Any attempt, therefore, at representing compounds analytically would be premature, until the analysis of the compounds had been settled. This analysis would be absolutely necessary for a general alphabet, but not so for an alphabet for any single language. Phonetic writing, then, should be separately considered, as a means of representing the elementary sounds of all languages, and as a method of symbolizing the pronunciation of any one language. We shall now show the nature of the attempts that have been made for the phonetic writing of English.

Dr. Franklin, in 1768, proposed a phonetic alphabet for English, in which new symbols were introduced for the vowels heard in the words *on* and *up*, and the four consonants heard in the words *she*, *they*, and *thing*. Many other schemes have been from time to time proposed; but the only alphabets which have been practically applied on a large scale are those of Dr. Comstock in America, and Messrs. Ellis and Pitman in England. The object of experimenters in this department has generally been to make use of existing letters as far as possible, and only to supplement deficiencies by new forms. The common alphabet has been made to furnish almost a sufficient number of characters by the inversion of some of its letters—thus, ʌ, Ʌ, ʊ, ɔ, ə, ƨ, ɥ, &c., as in the 'Anti-absurd' alphabet of Major Beniowski; but the best scheme of phonotypes that has yet been introduced was the joint production of Mr. Isaac Pitman, the inventor of the first system of phonetic shorthand writing, and Mr. A. J. Ellis, B.A. of Cambridge, a most accomplished mathematician and linguist. This alphabet was completed in 1847; and the experiment of its introduction was carried out with great diligence and perseverance by its promoters, until an army of philanthropic assistants became enlisted in all parts of Great Britain and America. Primers and school-books were issued, and tested on juvenile and adult classes; many works of standard literature, and even the entire Bible, were translated into the new spelling; magazines were published, and ultimately a newspaper, printed in the phonetic character, was started by the enterprising orthographic reformers. In this scheme of phonotypes, dipthongal and articulate compounds were not analyzed, and the letters of the ordinary alphabet were retained in their most common signification, seventeen new characters being introduced for unrepresented or ambiguously written sounds.

The forms of these were, in most cases, happily suggestive of the displaced orthography, and the general aspect of the writing bore such a resemblance to common typography, that any good reader of the latter could decipher the new printing with ease, after a very brief study of the alphabet. The ordinary vowel let-

ters (A, E, I, O, U) were pronounced as in the words, *am, ell, ill, on, up;* the consonants C and G were sounded as in *came* and *game;* the letters K, Q, X were rejected as superfluous, and all the other letters of the common alphabet were retained, with their established sounds. Comparing this scheme of letters with the tabulated elementary sounds of English, we find that it represents all the vowels, except the nice varieties heard in the words *air, ore, err, ask;* and that all the consonants are accurately represented except *wh.* The latter element is written by letters sounding *hoo,* so that the words *where* and *whoe'er* are made identical to the eye; and the sentence, 'I saw the man *whet* the knife,' is written, 'I saw the man *who ate* the knife.'

Notwithstanding these imperfections, this alphabet was found to work well among those who were disposed for a reform. The phonetic method was proved to be remarkably simple and easy in comparison with the ordinary system; the time occupied in making fluent readers was greatly reduced; and readers of phonetic printing experienced but little difficulty in the transition to reading from common orthography.

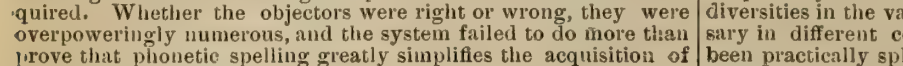
The advantages claimed for the system were chiefly: rapidity of learning to read, certainty of pronunciation, and increased facility in common reading, after the power of phonetic reading had been acquired. The chief disadvantages alleged against the system were: accustoming the eye to a false orthography, and teaching what had to be in great part unlearned after it was acquired. Whether the objectors were right or wrong, they were overpoweringly numerous, and the system failed to do more than prove that phonetic spelling greatly simplifies the acquisition of the power of reading.

The original phonotypic alphabet, described above, has been for some years discarded in the printing issued from the 'Phonetic Institution' (Bath), and a more analytic alphabet has been adopted, in which *eleven,* instead of seventeen, new forms are introduced. The latest edition of this alphabet gives the ordinary vowel letters, A, E, I, O for the sounds in the words *am, ell, ill, on,* and the letter U for the sound in *pull;* K is restored, and C rejected; J is used as in French; and the elementary sound of *wh* is still unacknowledged. The eleven new characters represent the consonants in the words *she, oath, they,* and (s)*ing;* and the vowels in the words, *ale, eel, alms, old, all, pool, up.*

The following are the forms of the new letters as printed and written, with a passage exhibiting their appearance in composition.

This Phonetic Alphabet consists of 34 letters, viz., the 23 useful letters of the common alphabet (*c, q,* and *x* being rejected), and the 11 new ones below. *J* is used for the French *j* (zh), or *g* in 'edge,' or *s* in 'vision;' hence *dj* represents *J* in *John,* and *dg* in *edge. Tç* (*t sh*) represents *ch* in *chess,* and *tch* in *catch. Y* and *w* are consonants; *wh* being replaced by *hw.* The vowels *a, e, i, o, u* have invariably the short sounds heard in *pat, pet, pit, pot, put.* All the other old letters have their usual signification. The italic letters in the words in the third line denote the SOUNDS of the letters.

VOWELS.



ɑ	ɛ	i	—	o	o	u	—
alms,	age,	air,	eat	—	all,	ope,	food	—	son,	but,
ɑmz,	ɛdj,	ɛr,	it	—	ol,	op,	fud	—	sʌn,	bʌt

DIPHTHONGS.

ɑi	ɛi.	oi,	ou.
ɑi	*ɛi*	*oi*	*ou*
oy,	*by;*	*boy,*	*now*
ɑi,	bɛi,	boi,	nou.

CONSONANTS.

C	ç,	Ƀ	ƀ,	Đ	đ,	Ŋ	ŋ.
S	*ſ,*	*ħ*	*θ*	*ð*	*ð,*	*ŋ*	*ŋ*
she,		*thin,*		*then,*		*sing.*	
çi,		θin,		ðen,		siŋ.	

The double letter *u,* as in *unit, unite, duty, value,* is written thus: "yunit, yuneit, diuti, valiu." When *ɑi, oi,* make a *dissyllabic* diphthong, the second letter is marked with a diæresis; thus, *solfɑiy soïy.*

The reduction in the number of letters from that in the Ellis and Pitman alphabet is obtained chiefly at the expense of the phonetic *principle,* in the attempt to analyze diphthongs in writing, before their correct phonic analysis has been ascertained and settled. A method has been proposed by Mr. Bell, in which the advantages of phoneticism might be secured, so far as simplifying the acquisition of reading is concerned, without alphabetic change. Thus the orthography and sound are shown together when the words *loaf, debt, wife, wreath, straight,* &c., are printed loaf, debt, wife, wreath, straight, &c.

But the question recurs: Why should established orthography be unphonetic? Or, at least, why should not some national measures be adopted to correct the anomalies of our spelling? A similar work was undertaken by the Spanish Academy in the middle of last century, and carried out so efficiently that, at the present day, the pronunciation of any word in Spanish is immediately determined with certainty by every reader who merely knows the phonetic value of the alphabetic characters. The writing of the Italian, Dutch, and many other languages has also been successfully phoneticized. A similar result would be attained in English, if the work of orthographic revision were submitted to a competent tribunal, and if such changes as might be found necessary were duly sanctioned by authority. New letters should be added to the alphabet for the six unrepresented simple consonant sounds, Sh, Zh, Th, Dh, Wh, Ng; or, at all events, the writing of these elements should be made distinctive; and, with a few rules for distinguishing the vowel sounds, little alteration of spelling would be needed to approximate the writing of English to phonetic accuracy.

A general phonetic alphabet, available for the writing of all the sounds of human speech, is still a scientific desideratum. Such an alphabet would be of great practical value to travelers, colonists, missionaries, and philologists. Much attention has been paid to this subject of late years. In 1854, a conference of philologists was held in London, at which two rival alphabets were produced, one by Professor Lepsius of Berlin, and another by Professor Max Müller of Oxford. The former has been adopted by the Church Missionary Society, but so many local diversities in the value of the characters have been found necessary in different countries, that this 'Universal Alphabet' has been practically split up into several alphabets. The writing is, besides, overladen with diacritical points. In the alphabet of Professor Max Müller, the latter difficulty is obviated by a free use of compound letters. The *Lectures on the Science of Language* by this author may be consulted with great advantage, both as to the physiology of speech and the history of words. In the second series of these Lectures, diagrams of the organic formation of many of the elements of speech are given, as well as a comparative table of four alphabets that have been used in the transcription of Sanskrit, and numerous references to the works of continental and other writers who have treated of the science of phonetics.

The most elaborate scheme of a universal alphabet hitherto published is that of Mr. A. J. Ellis. In this alphabet 94 sounds are discriminated by means of an ingenious system of compound letters, but the complexity of the writing forbids the possibility of its 'universal' adoption.

The chief difficulty in the construction of a universal alphabet has arisen from the want of a complete classification of elementary sounds; another difficulty has been created by an adherence to the inadequate letters of the Roman alphabet.

The resolutions of the alphabetic conference were decidedly in favor of Roman letters as the basis of the proposed 'standard' alphabet. But the wisdom of this decision may be questioned. No existing alphabet exhibits the natural relations of the sounds it represents; and, consequently, although an alphabet physiologically complete were framed, it could not incorporate Roman, Greek, or any other letters at present in use, without sacrificing the most essential qualities of a universal alphabet—simplicity and congruity. Symbols must be devised which would indicate to the eye all the organic relations discoverable by the ear between the various elements, and which would be free from the associations that would attach to adopted letters familiar to the eye with other meanings. This principle has been carried out on the system of *Visible Speech* (q. v.) by Mr. Melville Bell. For phonetic shorthand writing, see SHORTHAND.

PHONOGRAPH. This apparatus, invented in 1877 by Mr. Thomas A. Edison, an American electrician of note, differs from the vibrograph and phonautograph. The latter are constructed to record sound vibrations graphically, while Mr. Edison's invention, which is properly called the 'Talking Phonograph,' is designed to obtain such a record that the sound vibrations resulting from articulate speech can be mechanically reproduced at a distance of time. The invention, at the time these words are written, is only in the experimental stage, but it has been successfully exhibited both in America and in Britain. As originally made, the instrument consisted of three parts—the sender, the receiver or recorder, and the transcriber; but in the P. exhibited by Professor Fleeming Jenkin before the Royal Society of Edinburgh, the last apparatus was dispensed with, the sender being constructed to fulfil both functions. This sender consists of a tube, having an open mouth-piece at one end, and bearing at the other end a thin diaphragm of metal or other substance, with a sharp point or style affixed to the center of its outer surface.

The second apparatus consists of a cylinder, about four inches in diameter, having on its periphery a V-shaped groove, cut spirally from end to end. Over this grooved cylinder a sheet of tinfoil is placed, and the sender is advanced till the point of the style lightly touches the tinfoil, over the opening of the V-shaped

cut. While the words to be recorded are spoken or sung, the cylinder is turned rapidly, the apparatus for moving it giving a lateral as well as a circular motion. The point of the style thus traverses the tinfoil spirally from end to end, and the vibrations in the diaphragm caused by the sounds, result in a series of indentations in the tinfoil. To reproduce the sounds in the 'transcriber' (or in the 'sender' under Professor Jenkin's arrangement), the cylinder is again presented to a style attached to a diaphragm, the style being pressed against the tinfoil by a slight spring. The cylinder is now made to revolve, and the motion of the style upon the inequalities in the indented tinfoil produce vibrations in the diaphragm corresponding to the sound-caused vibrations originally created in the instrument by the voice. The sounds are thus reproduced with great exactness, but with a softening of the consonants which to some extent alters the character of the voice. If the tinfoil record of sung or spoken sounds be sent to a distance, or kept for a length of time, the original sounds can be reproduced on applying it to the proper instrument. It is stated that rubbings in tinfoil can be taken from a plaster-cast of the original indented slip, so that copies may be sent to different persons, all of whom can thus reproduce the sounds so long as their tinfoil copy remains intact. In using the P. to repeat sounds, the cylinder must be revolved at the same speed as at first, otherwise the pitch will be changed. For as sound is the result of air-vibrations at known intervals, if a speech spoken in a high key were reproduced slower at the repeating instrument, the result would be to convert a treble voice into a bass one, or *vice versâ*, while the lower speed would convert smartly-spoken words into a drawl.

PHONOMA'NIA. See Homicidal Mania.

PHO'SGENE GAS, known also as Oxychloride of Carbon or Chlorocarbonic Acid, is represented by the formula COCl, or more correctly by its double $(COCl)_2$. It is a colorless, suffocating gas, which is formed by exposing equal measures of carbonic oxide and chlorine to the direct action of the sun, when they combine and become condensed into half their volume. It does not possess any acid characters, but water decomposes it into carbonic and hydrochloric acids, as is shown by the equation $(COCl)_2 + 2HO = 2CO_2 + 2HCl$. This gas is of great interest in relation to the artificial production of Urea (q. v.) from inorganic matter.

PHO'SPHATES (in Physiology). The following phosphates* play an active part in the chemistry of the animal body.

Phosphate of Soda, which may occur under any one of the three forms $3NaO,PO_5$, or $2NaO,HO,PO_5$, or $NaO,2HO,PO_5$. All these salts are soluble in water; and the first two have an alkaline reaction, while the third is acid. By exposure of the second of these salts ($2NaO,HO,PO_5$) to a red heat, it is converted into what is termed *pyrophosphate of soda* ($2NaO,PO_5$), in which the phosphoric acid is obviously no longer tribasic, but bibasic; and by similarly treating the third of these salts ($NaO,2HO,PO_5$), we convert it into the so-called *metaphosphate of soda* (NaO,PO_5), in which the phosphoric acid is monobasic. It is in consequence of these changes under the action of heat, that the terms *pyrophosphoric* and *metaphosphoric* have been used as synonyms for *bibasic* and *monobasic phosphoric acids*. Phosphate of soda, in one or other of the above forms, occurs as a constituent of all the animal fluids and soft tissues of the body, but is especially abundant in the urine and the bile. There are reasons for believing that it is the second and third of these salts which occur as constituents of the animal body, although the first may possibly sometimes be found.

Pyrophosphate and metaphosphate of soda are often found in the ashes of animal fluids or tissues after the process of incineration, but they merely result from the action of heat on the two other salts. The following remarks on the derivation, elimination, and physiological importance of the phosphate of soda, are equally applicable to the corresponding salts of potash, which are always associated with them. The phosphates of the alkalies, which occur in the animal body, obviously owe their origin, either directly or indirectly, to the food; viz., directly, by being ingested as phosphates of the alkalies; or indirectly (within the system), by the action of phosphate of lime on salts of the alkalies. The elimination of these salts from the system is necessary, because they are being constantly supplied by the food; and this process is effected mainly by the kidneys and the intestinal canal. In the carnivorous animals, whose blood is much richer in phosphates than that of herbivora (the ash of the blood of the dog, for example, contains from 12 to 14 per cent. of phosphoric acid, while that of the ox or sheep does not contain more than from 4 to 6), these salts are carried off by the urine; but in consequence of the formation of free acids as products of the disintegration of the tissues, a portion of the base is abstracted from the originally alkaline phosphates, and a corresponding portion of phosphoric acid is liberated. The originally alkaline salt is thus rendered neutral or even acid; and the occurrence of the acid phosphate of soda, $NaO,2HO,PO_5$, in the urine is thus explained. In the herbivorous animals, on the other hand, the urine contains no phosphates, the whole of the phosphoric acid taken in their food being eliminated by the intestinal canal in the form of the insoluble phosphates of lime and magnesia. Although the general distribution of the phosphates of the alkalies in the nutrient fluids (there is 40 per cent. of them in the ash of the blood-cells; 28·4 per cent. of phosphoric acid and 23·5 of potash in the ash of cow's milk; and about 70 per cent. of phosphoric acid in the ash of the yelk of egg) is in itself an indication of their importance, the exact nature of their functions is not completely understood.

Liebig has specially drawn attention to the peculiar grouping of the acid and alkaline fluids of the animal body. The permanence of this grouping is chiefly maintained, especially in herbivorous animals, by the conversion, within the body, of alkaline and neutral phosphates into acid phosphates by the means already described. Moreover, all tissue-forming substances (the protein bodies) are so closely connected with phosphates, that they remain associated during the solution and subsequent re-precipitation of these substances; and the ash of developed tissues (such as muscle, lung, liver, &c.) always affords evidence that acid phosphates existed in the recent tissue; and, further, no exudation from the blood-vessels can undergo transformation into cells and fibres, or, in other words, become organized, unless, in addition to other conditions, phosphates are also present. Another very convincing proof of the share taken by the phosphates in the formation and functions of the tissue, is the fact, that although herbivorous animals take up a very small quantity of phosphates in their food, and although their blood is very poor in these salts, their tissues contain as large a proportion of phosphates as the corresponding parts of carnivora. Lastly, the fact, that one equivalent of the alkaline phosphate of soda ($2NaO,HO,PO_5$) possesses the property of absorbing as much carbonic acid as two equivalents of carbonate of soda, leads us to the belief, that the power of attracting carbonic acid, which the serum of the blood possesses, is due at least as much to the phosphate as to the carbonate of soda, and that, consequently, phosphate of soda plays an important part in the respiratory process.

Phosphate of Lime occurs in the organism in two forms, viz., as the neutral or basic phosphate, $3CaO,PO_5$, and the acid phosphate, $2CaO,HO,PO_5$. The neutral phosphate occurs in all the solids and fluids of the body, but is most abundant in the bones, in which it amounts to about 57 per cent.; and in the enamel of the teeth, in which it ranges from 80 to 90 per cent. It may at first sight appear inexplicable how a salt so perfectly insoluble in water as neutral phosphate of lime, can be held in solution in the animal fluids. In some fluids, as the blood, it is probably, in part at least, combined with albumen, with which it forms a soluble compound; while in other fluids, as the urine, it is held in solution by a free acid or by certain salts (as, for example, chloride of sodium), whose watery solutions are more or less able to dissolve it. If any proof is wanted of the functions of this salt in relation to the bones, it is afforded by the well-known experiment of Chossat, who showed that when too small a quantity of it is taken with the food, the bones lose more or less of their hardness and firmness, and fractures do not readily unite. Phosphate of lime, like the phosphates of the alkalies, is indispensable to cell-formation; and as a good illustration of this fact, it may be mentioned that in the mantle of the molluscs (where new cells for the formation of shell abound) this salt is far more abundant than in any other part of the body. Although by far the greater quantity of the phosphate of lime found in the body has doubtless pre-existed in the food, yet it is unquestionable, that a part of it is formed within the organism by the action of carbonate of lime on the phosphoric acid that is formed during the disintegration of the phosphorous-containing tissues, such as the brain, for example. In man and carnivorous animals, a certain portion of the phosphate of lime is eliminated by the kidneys, and the rest is carried off in the excrements; while in herbivorous animals the whole is carried off in the excrements. The acid-phosphate of lime is occasionally found in the urine of man and carnivorous animals, but it is of no practical importance. For a notice of the amount of earthy phosphates daily eliminated by the kidneys, the reader is referred to the article Urine.

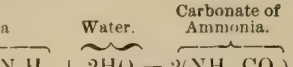
Basic Phosphate of Magnesia, $3MgO,PO_5$, is analogous, both in its chemical and physiological relations, to the corresponding salt of lime, with which it is always associated. The abundance of this salt in the seeds of the cereals, and in the other ordinary articles of vegetable diet, sufficiently explains its presence in the system. A far less amount of this salt, than of the corresponding lime-salt, seems to be required by the organism, as is shown by the relative quantities in which they occur in bone (57 of the former to 1·3 of the latter), and as is further indicated by the

* The means of distinguishing between the salts of tribasic, bibasic, and monobasic phosphoric acid, are given in the article Phosphorus.

fact, that, relatively, far more of this than of the lime-salt escapes intestinal absorption, and appears in the excrements.

The only phosphates remaining to be noticed are the *phosphate of ammonia and magnesia*, or, as it is sometimes termed, the triple phosphate, $2MgO,NH_4O.PO_5 + 2Aq$, which occurs in beautiful prismatic crystals in alkaline urine, and, indeed, in any specimen of urine that is beginning to putrefy, and the *phosphate of soda and ammonia*, which is occasionally found as a crystalline sediment in putrid urine.

PHOSPHA'TIC DIA'THESIS, in Medicine, designates the condition in which there is a tendency in the urine to deposit *white gravel*. As the deposit of lithates (see LITHIC ACID DIATHESIS) depends upon an excessive acidity of the urine, so that of the phosphates is determined by the opposite condition—namely, by deficient acidity, or by positive alkalescence. Alkalescence of the urine may occur from two distinct causes—viz. (1) from the presence of the carbonate of a fixed alkali (potash, or soda), or of alkaline phosphate of soda (see PHOSPHATES in Physiology); or (2) from the presence of the carbonate of the volatile alkali, ammonia, which is due to the decomposition of urea. This decomposition is due to the fermenting action of the mucus of the bladder on the urea, and is explained by the equation—



The white gravel which is deposited in the second of these conditions—viz., when the urine contains carbonate of ammonia, is composed of minute shining prismatic crystals of the triple phosphate of ammonia and magnesia, which formula is given in the article PHOSPHATES. This salt is formed as follows: Healthy urine contains phosphate of magnesia in a state of solution. If, however, the urine become alkaline from the decomposition of the urea, a portion of the ammonia combines with the phosphate of magnesia, and forms the triple salt which is insoluble in the urine, which has now become alkaline. With this triple phosphate, there is almost always an admixture of phosphate of lime ($3CaO,PO_5$) in the form of an amorphous precipitate. The tendency to deposit the mixed phosphates (triple phosphate and amorphous phosphate of lime) is especially observed in cases of disease or injury of the spinal cord, and in disease of the bladder, particularly in chronic inflammation of its mucous coat. Upon allowing urine of this kind, which is usually pale in color, to stand for some time, an iridescent film or pellicle generally forms upon its surface, which, when examined under the microscope, is found to consist mainly of the salts we have described. Such urine speedily becomes putrid, and evolves a strong ammoniacal odor.

The above is by far the most common form of the phosphatic deposits, but, as has been already stated, the urine may become alkaline from the presence of the carbonate of potash or soda; and then, no ammonia being present, in place of the triple salt, there is a deposition of amorphous phosphate of lime, or in rare cases, of a crystalline stellar phosphate, whose composition, according to Dr. Bence Jones, is represented by $2CaO,HO,PO_5$ (*Journ. of Chem. Soc.* vol. 15). In these cases, the urine is alkaline, pale, copious, slightly turbid, of low specific gravity, and of a peculiar odor. This urine makes reddened litmus paper *permanently* blue; while ammoniacal urine causes only a temporary change in the color of the same test-paper. As the urine cools, and sometimes even in the bladder, the white sand is deposited, occasionally giving the last portion of the excreted urine a milky appearance. During perfect health, the urine often becomes temporarily alkaline during the act of digestion (when the gastric juice is especially acid); but as a general rule, the tendency to alkalescence from a fixed alkali, and therefore to phosphatic deposits, is associated with general debility. These deposits occur for the most part in sallow, languid, unhealthy-looking persons, whose vital energies have been depressed by mental anxiety, by insufficient food, or by sexual excesses.

In both forms of alkaline urine, and therefore of phosphatic deposits, a generous diet and tonics, such as bark, wine, and the mineral acids (given before meals), are of great service; and opium is usually of great value, if judiciously administered. Small doses of benzoic acid, twice or thrice a day, with the view of restoring the acidity to the urine, and the occasional washing-out of the bladder with tepid injections, have been also found serviceable in the ammoniacal form of the disease.

PHOSPHORE'SCENCE. Strictly speaking, the term is applied to the phenomenon, exhibited by certain bodies, of remaining luminous in the dark for some time after being exposed to a strong light. In this sense, it is strictly analogous to, perhaps we should say, identical with, the heating of bodies by exposure to light or radiant heat. They absorb part of the energy of the vibrations which fall on them; it becomes motion of their particles; and is again radiated from them as light or heat. Certain preparations, such as Canton's Phosphorus (q. v.), indurated limestone, &c., possess this true phosphorescence in a very high degree. With the great majority of phosphorescent bodies, however, the duration of the phenomenon is very short, rarely more than a small fraction of a second. Becquerel, who has recently studied this phenomenon with great care, has invented a very ingenious instrument for the purpose, called a *phosphoroscope*. The body to be tried is placed in a small drum, which has an opening at each end. In this drum there revolve two discs, mounted on the same axle, and pierced symmetrically with the same number of holes. They are so adjusted, that when a hole in one disc is opposite to the hole in the corresponding end of the drum, the second disc closes the hole at its end of the drum, and *vice versâ*. Light is admitted by one of the holes in the drum, so as to fall on the object, and it is examined through the other hole. It is obvious that when the discs are made to revolve, the object is alternately exposed to light, and presented to the eye. By a train of multiplying wheels, these alternations may be made to succeed each other as rapidly as the observer pleases, and thus the object is presented in the dark to his eye as soon after its exposure to light as may be desired. Almost all bodies are found to be phosphorescent; for instance, some kinds of pink rubies, when exposed to sunshine in this apparatus, appear to glow like live coals in the dark. The phenomenon is, in fact, precisely that which was observed by Brewster and Herschel in quinine and certain crystals of fluor-spar, and thence called *Fluorescence*. Stokes was the first to give the true explanation of these facts, and he showed it to depend upon the change of refrangibility (i. e., color) which light suffers on being absorbed and then radiated by the fluorescent substance.

The green coloring-matter of leaves, a decoction of the bark of the horse-chestnut, and the common *canary* glass (colored with oxide of uranium), are bodies which exhibit this phenomenon very well. Perhaps the most striking method of studying the phenomenon is to receive in a darkened room the solar Spectrum (q. v.) on a sheet of white paper; and to pass over the colored spaces a brush dipped in a solution of sulphate of quinine with sulphuric acid. No change is produced on the less refrangible rays, but in the blue and indigo spaces, a strange change of color is at once apparent where the liquid has been spread. This appears more strongly in the violet, and vividly in the spaces beyond the violet, where rays fall which excite no luminous sensation in the eye. By this experiment, the visible length of the spectrum may easily be doubled. By using the electric light, which is peculiarly rich in these highly refrangible rays, a prism of quartz, which allows them to pass very freely, and various fluorescent substances, Stokes has obtained spectra six or eight times as long as those otherwise visible. The characteristic of all these rays is, that they are *less* refrangible than those from which they are produced. The entire phenomenon is identical in principle with Leslie's photometer, in which light was measured when changed into heat by absorption, in the colored glass of which one of the bulbs of his differential thermometer was formed.

Ordinary phosphorus (from which the phenomenon took its name) becomes luminous in the dark by slight friction; whence the common trick of drawing self-luminous figures on doors and walls with a stick of phosphorus, or an ordinary lucifer-match. A similar appearance is presented by putrescent animal matter, such as decaying fish, &c.; but these are effects of slow combustion, or chemical combination, and are not properly classed among the phenomena of phosphorescence. See LUMINOSITY OF ORGANIC BEINGS.

PHO'SPHORUS (symb. P, equiv. 31·, sp. gr. 1·826) is one of the metalloids, or non-metallic elements, although, in its combining relation, it is more closely connected with the metals arsenic and antimony than with any of the members of the sulphur-group, in which it is commonly placed.

This substance affords an excellent example of allotropy; that is to say, it may be made to occur under different forms presenting different properties. See ALLOTROPY.

Ordinary phosphorus and the red variety are the only important forms. We shall speak of them as phosphorus and red phosphorus respectively.

Phosphorus at ordinary temperatures is an almost colorless or faintly yellow solid substance, having the glistening appearance and the consistence of wax, and evolving a disagreeable alliaceous odor, which, however, is probably due to the action of the oxygen of the air upon it. It fuses at 111·5° into a colorless fluid; and if the air be excluded, it boils at 555°, and is converted into a colorless vapor of sp. gr. 1·826. If, however, it be heated to about 140° in the air, it catches fire, burns with a brilliant white flame, and is converted into phosphoric acid; and, indeed, it is so inflammable that it will catch fire at ordinary temperatures by mere friction. As the burns which it occasions are often severe and dangerous, great caution is required in handling it; and in consequence of the readiness with which it catches fire, and of its ten-

dency to oxidize when exposed to the air at a temperature higher than 32°, it is always kept in water, in which it is insoluble. It is slightly soluble in ether, but dissolves freely in benzol, in the fixed and essential oils, and in bisulphide of carbon; and by allowing its solution in one of these fluids to fall upon filtering paper, the finely divided phosphorus absorbs oxygen so rapidly as spontaneously to catch fire as soon as the solvent has evaporated. One of the most characteristic properties of phosphorus is that it shines in the dark, probably from the slow combustion which it undergoes; and hence its name from the Greek words *phos*, light, and *phoros*, bearing. Its power of forming ozone is noticed in the article on that substance. Taken internally, phosphorus is a very powerful irritant poison; and it is the active ingredient of some of the preparations employed for the destruction of vermin. Its fumes give rise to a peculiar form of necrosis of the jaw, which is very common amongst the makers of lucifer-matches, and is not followed, as in ordinary necrosis, by a formation of new bone.

Red phosphorus is prepared from the ordinary variety by heating the latter in a closed iron vessel to a temperature of 464°. It was discovered by Schrötter in 1845, and is a compact solid substance of a dark red color, and with a metallic luster. It differs much in its properties from common phosphorus, being devoid of odor, does not shine in the dark, undergoes no change when exposed to the air even for years, and cannot be set on fire by friction or percussion. Moreover, it is insoluble in all the solvents of common phosphorus, and is not poisonous. It bears heating to nearly 500° without taking fire, and has a specific gravity of 2·10. By using red instead of white phosphorus for lucifer matches, there is no risk to the health of the operatives. Safety matches ignite on a surface containing a mixture of red phosphorus and sulphide of antimony.

Phosphorus is not met with in nature in an uncombined state; but it occurs in rocks of various kinds and ages, and in some countries abundantly as apatite or phosphorite, both of which are composed of phosphate of lime. It is also found in the form of coprolites or the dung of extinct animals, and more rarely as wavellite (phosphate of alumina) and vivianite (phosphate of iron). In many volcanic rocks apatite is found in minute crystals or particles, and by the decomposition of these rocks it passes into the soil. From the soil, it is extracted by plants, which accumulate it (especially in the seeds of the cereals) in quantity sufficient for the wants of the animals which they supply with food. In the animal system, phosphate of lime forms 57 per cent. of the bones; phosphates of the alkalies, especially of soda, occur freely in the animal fluids; and in fibrine, albumen, and nervous matter, phosphorus is universally present, although we do not clearly know in what form of combination it occurs.

Phosphorus was originally discovered in 1669 by Brandt, a Hamburg chemist, who obtained it from urine. Gahn and Scheele were, however, the first to discover its presence in bone, and to employ that material for its preparation. The following are the leading steps of the method now usually employed in obtaining it on the large scale. Bones are burned to whiteness, and powdered; and this bone-ash is then mixed with sulphuric acid in such quantity as partially to decompose the phosphate of lime occurring in the ash ($3CaO,PO_5$) into insoluble sulphate of lime, and a soluble superphosphate of lime, whose composition is represented by the formula $2HO,CaO,PO_5$. The solution of the superphosphate is evaporated to a syrup, mixed with charcoal, and submitted to distillation in an earthen retort exposed to a red heat. Phosphorus rises in vapor, and is conveyed, by means of a bent tube, into water, in which it condenses in yellow drops. Two distinct processes take place within the retort. The first consists in the decomposition of the superphosphate of lime into bone-earth and hydrated phosphoric acid; while the second consists in the deoxidation, by means of the carbon, of the liberated phosphoric acid in phosphorus—a process accompanied by the evolution of hydrogen and carbonic oxide gases. After being pressed in a fused state through wash-leather, and further purified, it is forced into tubes, in which it is allowed to solidify, giving it the usual form of *sticks*. Sombrerite (see APATITE) is now largely substituted for bones in the manufacture of phosphorus.

Phosphorus forms with oxygen an oxide, P_2O (which is always produced in small quantity when phosphorus is burned in air, but is of no practical importance), and three acids—viz., hypophosphorus acid, PO, phosphorus acid, PO_3, and phosphoric acid, PO_5. Of these compounds, phosphoric acid is by far the most important.

Phosphoric acid in its anhydrous state, or *phosphoric anhydride*, as it is usually termed at the present day, is represented by the formula PO_5, and is obtained by burning phosphorus in a jar of perfectly dry atmospheric air or oxygen, when it is deposited in snow-white flakes at the bottom and on the sides of the jar, from whence it must be removed by means of a platinum spatula as quickly as possible, in consequence of its attracting moisture from the atmosphere, and placed in a perfectly dry flask. When dropped into water, it combines with it, and dissolves, evolving a considerable amount of heat, and emitting a hissing sound, as when red-hot iron and water come together. In consequence of its strong affinity for water, this anhydride is very useful in the laboratory as a desiccating agent.

There are three hydrates of phosphoric acid, each of which possesses the properties of a distinct acid—viz., a protohydrate (HO,PO_5), a deutohydrate ($2HO,PO_5$), and a tritohydrate ($3HO,PO_5$). These hydrates retain their characteristic properties when dissolved in water, and combine with one, two, or three equivalents of bases to form salts, according to the hydrate employed. In the salts formed by the first hydrate, the one equivalent of water is replaced by one equivalent of base; in those formed by the second hydrate, both equivalents of water may be replaced by two of base, or one equivalent of water alone may be replaced, while the other remains in the salt as basic water; while in those formed by the third hydrate, all three equivalents of water, or two, or only one, may be replaced by base, so that this acid forms three sets of salts. Hence phosphoric acid is what is termed a *Polybasic Acid* (q. v.). The following scheme may elucidate this remark: If M, M′, M″, are any three metals, whose oxides act as bases, the monohydrate HO,PO_5 forms the salt MO,PO_5, and is monobasic; the deutohydrate $2HO,PO_5$ forms the salts $MO,M'O,PO_5$ and MO,HO,PO_5, and is bibasic; the tritohydrate $3HO,PO_5$ forms the salts $MO,M'O$, $M''O,PO_5$, $MO,M'O,HO,PO_5$, and $MO,2HO,PO_5$, and is tribasic.

The occurrence of phosphoric acid (in a state of combination) in the three kingdoms of nature has been already noticed in our remarks on phosphorus. The discovery of the acid was made in 1740 by Marggraf; the discovery of its true chemical nature is, however, due to Lavoisier; and that of its various modifications and its polybasicity, to the investigations of our illustrious countryman, Graham.

Phosphorous Acid occurs both as an anhydride, PO_3, and as a hydrate, $3HO,PO_3$. *Hypophosphorous Acid* (3HO,PO) is only known in its hydrated condition, in which it occurs as a very acid, colorless, uncrystallizable syrup.

Phosphorus combines with hydrogen in three proportions to form phosphuretted hydrogen gas, PH_3; liquid phosphide of hydrogen, PH_2; and solid phosphide of hydrogen, P_2H. Of these, the first alone requires notice in these pages. There are various processes for obtaining the gas; one of the simplest being by boiling fragments of phosphorus in a concentrated solution of hydrated potash, in which case, hypophosphite of potash is formed, while phosphuretted hydrogen gas is extricated. The reaction is explained by the equation, $4P + 3(HO,KO) = 3(KO,PO) + PH_3$. The gas thus evolved is colorless, possesses a characteristic fœtid odor, and has the remarkable property of taking fire spontaneously in atmospheric air or in oxygen gas, and of resolving itself into anhydrous phosphoric acid and water—a phenomenon of which Professor Miller has given the following graphic description: 'If allowed to escape into the air in bubbles, each bubble as it breaks produces a beautiful white wreath of phosphoric acid, composed of a number of ringlets revolving in vertical planes around the axis of the wreath itself as it ascends; thus tracing before the eye, with admirable distinctness, the rapid gyratory movements communicated to the superincumbent air by the bursting of a bubble upon the surface of a still sheet of water. If the bubbles be allowed to rise into a jar of oxygen, a brilliant flash of light, attended with a slight concussion, accompanies the bursting of each bubble.'

There is reason to believe that *perfectly pure* phosphuretted hydrogen gas does not possess the power of igniting spontaneously, and that the self-lighting gas always contains a minute quantity of the vapor of the liquid phosphide (PH_2). The luminous phenomenon known as the *Will-o'-the-Wisp* has been referred to the natural evolution of the gas; there is, however, no scientific evidence in favor of this hypothesis.

Various compounds of phosphorous with sulphur, chlorine, iodine, bromine, &c., have been formed and investigated; but none of them are of any practical importance.

The medicinal uses of *phosphorus* and *phosphoric acid* have still to be considered. Phosphorus, dissolved in ether or oil, was formerly prescribed in very minute doses as a stimulant to the nervous system in certain conditions. It is, however, now rarely employed in medicine, at all events, in this country, in consequence of its poisonous properties. Several cases are on record in which children have been killed by sucking the phosphoric ends of lucifer-matches; and Christison relates an instance in which a grain and a half of phosphorus proved fatal.

The symptoms induced by this poison are those of acute inflammation of the stomach and bowels, and the only treatment that can be recommended is the administration of large quantities of mild demulcent fluids, such as milk and thin arrowroot, so as, if possible, to envelop the phosphorus, and exclude it from the action of the air in the intestinal canal; and of magnesia, with the view of neutralizing any phosphorous and phosphoric acids that may be formed.

Dilute Phosphoric Acid is included in the British Pharmacopœia, but is not very much employed. It may be prescribed in much the same cases as those in which sulphuric and nitric acids are employed, and is less likely to disturb the digestive functions, if employed for a long period, than the other mineral acids. The late Dr. Paris used to recommend it, when properly diluted, as the best acidulated drink for assuaging the thirst in diabetes. It may be prescribed in half-drachm doses.

PHO'TIUS, Patriarch of Constantinople in one of the most critical periods of the struggle of that see with the great pratriarchate of the West for supremacy in the entire church, was a member of a patrician family of Constantinople, and was born in the early part of the 9th century. From youth, he was distinguished by his abilities and learning; and having served in various important public offices, and especially on a diplomatic mission to Assyria (or more probably Persia), he secured the favor of the Emperor Michael, with whom P.'s brother was connected by marriage, and of the all-powerful Cæsar and favorite Bardas. The Patriarch Ignatius having incurred the displeasure of Bardas and of the emperor, a weak and profligate man, whose vices Ignatius tried in vain to correct, it was resolved to deprive him of the patriarchal dignity; and the attempt to induce him to resign having failed, he was deposed with much indignity, imprisoned, and sent into exile. P. although a layman, and hitherto engaged in secular pursuits, was appointed in his stead, hurried in a few successive days through all the stages of sacred orders, and finally installed as patriarch. A council of bishops, under the influence of the court (858), declared in favor of the deposition of Ignatius, and confirmed the election of P., and the latter communicated his election to the pope, Nicholas I., in a letter which carefully suppressed all these irregularities, and represented that he had reluctantly undertaken the office. Meanwhile, however, Ignatius had privately written to Rome, and the pope sent two legates to inquire and report on the facts. A new council was assembled (859), in which Ignatius was declared deposed, and was compelled to sign the act of abdication, and P was declared duly elected. The legates concurred, it was believed, under the undue influence of Bardas, in this sentence. But in so doing they had exceeded their power, which was merely to report to the pope; and Nicholas refused to acknowledge the sentence, and summoned the parties to a new hearing.

P., however, resisted; and a new cause of dispute having arisen in regard to the jurisdiction claimed by the see of Constantinople in part of the province of Illyricum and among the newly-converted Bulgarians, the council, which Nicholas called at Rome in 862, annulled the acts of that of Constantinople and of the legates, declared P.'s election uncanonical and invalid deposed and excommunicated him, and reinstated Ignatius in his see. Being supported, however, by the emperor, P. retained possession, and not only refused to yield, but retaliated on the pope by assembling a council at Constantinople in 867, in which the question was removed from the region of a personal dispute between the bishops to a controversy of doctrine and discipline between the churches of the East and West themselves. In this council, P. first brought forward distinctly certain grounds of difference between the churches, which, although considerably modified, afterwards led to their final separation. In all these doctrinal differences, the council condemned the Western Church, excommunicated Nicholas and his abettors, and withdrew from the communion of the see of Rome. During the life of the Emperor Michael, the authority of P. remained without further question; but on Michael being deposed and put to death by Basilius the Macedonian in 867, P., by that capricious exercise of imperial authority of which these times supply so many examples, was deposed, and banished to Cyprus, and Ignatius reinstated; soon after which, in 869, the council known as the eighth general council, at which Pope Adrian II.'s legates presided, was assembled at Constantinople. The whole case was revised. P. being convicted of fraud, forgery of documents, and uncanonical usurpation, was condemned and excommunicated, the rights of Ignatius established, and the intercommunion of the churches restored, From his exile at Cyprus, P. appealing successfully to Basilius, obtained his recall, and, on the death of Ignatius, was re-appointed to the patriarchate.

The pope of the time, John VIII., yielding to expediency, or deceived by false reports, acquiesced in the proceeding—a supposed act of womanish weakness, which, in the opinion of some, by obtaining for John *the feminine sobriquet Joanna*, was the origin of the fable of POPE JOAN (q. v.). P., in 879, assembled a new council at Constantinople, renewed the charge against the Western Church, and erased from the creed in the article on the PROCESSION OF THE HOLY GHOST (q. v.), the word *filioque*, which had been inserted by the Latin Church. The separation of the churches, however, was not completed till the time of Michael Cerularius. See GREEK CHURCH. P. did not die in possession of the see; he was deprived, and exiled to Armenia, by Leo, surnamed the Philosopher, the son and successor of Basilius, in 886, and died soon afterwards, probably in 891. The character of P. is, of course, differently represented by the Easterns and the Westerns, the latter of whom ascribe to him every excess of craft, violence, and perfidy. The Greeks, on the contrary, defend his memory. It is hardly possible, however, to doubt the substantial justice of the accusation made against him. The impression produced by a review of his chequered career, and of the more than equivocal proceedings with which his name is connected, is made more painful by the evidences of rare genius, and profound and cultivated literary judgment, which his works reveal. His chief remains are (1.) *Myriobiblon*, called also *Bibliotheca*, a summary review of the works which P. had read, with an epitome of the contents, and a critical judgment of their merits. The number of works thus criticised is no less than 279; and as many of these are now lost, the judgment and remarks of such a man are of great value for ancient literary history. (2.) A *Lexicon*, which was edited by Hermann, and afterwards by Porson (or rather from his manuscript by Dobree) in 1822. (3.) The *Nomocanon*, which is a collection of the acts and decrees of the councils up to the seventh ecumenical council, and the ecclesiastical laws of the emperors for the same period. (4.) Several minor theological treatises. (5.) A collection of letters, many of them extremely interesting and elegant. There is one in which, from his exile, he appeals to be permitted the use of his books, which, for beauty of composition, delicacy of sentiment, and the genuine eloquence of a scholar's love of learning, can hardly be surpassed in ancient or modern literature. A complete edition of his works is found in Migne's *Patrologiæ Cursus Completus*, in 4 vols., royal 8vo.

PHOTO-GLY'PHIC ENGRAVING. See PHOTOGRAPHIC ENGRAVING, PHOTOGRAPHY.

PHOTOGRA'PHIC ENGRAVING. Several ingenious attempts have been made to prepare engraved plates by photogenic action; the earliest of these dates as far back as 1827, which was six years previous to the introduction of the Daguerreotype process, and was the invention of M. Nicephore Niepce of Paris, who first discovered that thin plates of bitumen were curiously affected by light; he therefore coated metal plates with a thin layer of bitumen, of the kind called Jews' Pitch, and placed them in a camera obscura, so arranged that he could insure their exposure to the same image for several hours. The plate was then submitted to the action of oil of spike, which readily dissolved those portions not acted upon by the light, but exerted little action upon the remainder; the metal exposed by the solution of the bitumen was then acted upon by acid, which produced a complete etching-plate, the picture-part being protected by its bituminous varnish from the action of the acid. About ten years after, M. Fizeau invented another process; he took a Daguerreotype picture, and acted upon it with a mixture of nitric, nitrous, and hydrochloric acids, which, without affecting the silver where the metal was free from the photographic action, quickly attacked the dark portions of the picture in greater or less degree according to their intensity, and thus etched the picture in the plate. The action at first produced only a slight erosion, because a coating of chloride of silver was formed; but upon this being removed by a solution of ammonia, it was repeated until a greater depth was gained. This, at the utmost, was not very great, and never sufficient to print from; but he most ingeniously met this difficulty by coating the plate with a drying oil, which was carefully wiped from the surface, and left to dry in the engraved parts; afterwards, he electrotyped the level surface with gold until the necessary depth was obtained, after which the plate was boiled in a solution of caustic potash, which removed the varnish.

The plate in this state required a little of the engraver's art to touch it up, and remedy some defects inherent in the process; and then, to prevent injury to the soft metals—silver and gold—employed, an electrotype plate was taken for the printer's use. use. But these processes, notwithstanding their extreme ingenuity, never thoroughly succeeded, and have been abandoned for the more satisfactory inventions of Dr. W. H. Fox Talbot; these were patented in 1852 (No. 179) and 1858 (No. 875). By his first plan, a steel plate, such as is prepared for engravers, is first dipped into a solution containing acetic and sulphuric acids; it is then coated with a mixture containing a solution of fine gelatine and bichromate of potash. This is impressed with the image of a photographic negative by exposure in the copying-frame, and washed. The film of gelatine is previously yellow, but the action of the light through the light parts of the photograph change it dark brown, but the remainder is unaffected; consequently, a picture is produced of a light yellow color on a brown ground. The action of the light is to reduce the bichromate of potash, and, consequently, to render the gelatine combined with it insoluble; whilst those portions which have been protected from the action of the light by the dark parts of the negative, are still readily soluble in water, and can be removed by soaking: the insoluble

portion thus forms a raised picture, which is submitted to a solution containing bichloride of platina in certain proportions, with a little free acid and water, which etches out the exposed parts of the plate, and renders it fit for engraving from. In the same specification is added an ingenious method of giving to the whole picture the appearance of an engraving; it consists in spreading over the gelatinized plate, when nearly dry, a piece of very fine muslin, and evenly pressing it so as to leave an impression of the cross-lines of the textile material upon the surface. By his second specification, he alters the process so far as the washing is concerned, after obtaining the picture on the gelatinized plate, and thus obviates some injuries to which it was thereby rendered liable.

Instead of washing, the gelatinized surface is thinly but very evenly covered with finely-powdered copal or other resin, and the under-side of the plate exposed to sufficient heat to melt the resin, so as to form a thin varnish over the whole. The etching fluid is then poured on, and, notwithstanding the resin coating, it acts through to the metal, and eats in wherever the gelatine has not been rendered insoluble by the action of the bichromate of potash and the light. When sufficiently etched, it is washed in clean water, and the plate is freed from the resin and gelatine. Two modifications of this process are given in the Specification, to which the reader is referred for fuller particulars. Dr. Talbot calls his process *Photo-glyphic Engraving*. The same processes, with some modifications, applied to zinc constitute *Photo-zincography*, and to stone, *Photo-lithography* (q. v.), both of which are largely practised; and they have been brought to such extraordinary perfection, especially by the late Sir Henry James, Director of the Ordnance Survey, and by an eminent firm in Brussels—Messrs. Simonau, Toovey & Co.—that quite a new era is opened up in the art of engraving and printing.

These processes are particularly well adapted for copying maps and printed books, and Sir H. James has consequently turned it to a most profitable account in producing reductions of the large plans of the Ordnance Survey to the proper sizes of maps; and he has also published perfect fac-similes of Doomsday Book and other important documents. See under PHOTOGRAPHY.

PHOTO'GRAPHY (Gr. *phos*, light, and *grapho*, I write). From the following brief sketch of the history of this art, it will be apparent that its present advanced form has resulted from the combination of various discoveries in reference to the nature and properties of light made by investigators at different periods. Each inquirer has availed himself of the results obtained by previous students, adding to the common stock the results of his own investigations. The progress has been far more rapid than in most of the sciences which have been built up in a similar manner. Like other branches of chemistry, it owes its origin to the alchemists, who, in their fruitless researches after the Philosopher's Stone and *Elixir Vitæ*, produced a substance to which they gave the name of *Luna Cornea*, or Horn Silver, which was observed to blacken on exposure to light. This property of the substance constitutes the leading fact upon which the science of photography is based. More recently, the illustrious philosopher Scheele made experiments with the substance in question, with a view to determine the effects produced upon it by different rays in the solar spectrum. His words are these (published in 1777): 'Fix a glass prism at the window, and let the refracted sunbeams fall on the floor; in the colored light put a paper strewed with *luna cornea*, and you will observe that the horn silver grows sooner black in the violet ray than in any of the other rays.' Still more recently, the names of Wedgwood and Davy (1802), and of Niepce and Daguerre from 1814 to 1839, occur as followers in the path indicated by Scheele and the earlier savans; and in the early months of the year 1864, the attention of the Photographic Society of London was occupied by the endeavor to establish the authenticity and true photographic character of some pictures found in the library of Matthew Boulton, and believed to be true sun-pictures by James Watt, the celebrated engineer; thus offering great probability that the mind which produced the wonders of steam-power, had also been engaged in the same investigations which have resulted in the present more extensive development of photographic science.

Most of the experiments alluded to may be said to have been based upon the fact, that the salt of silver, called by the ancients *luna cornea*, and by modern chemists chloride of silver, is highly sensitive to the influence of light. But such observers must have been fully aware that this substance is not the only one affected by light, for it had been long noticed that the light of the sun does not fall upon any surface without leaving traces of its action thereon. It cannot be absorbed or reflected without in some way modifying the structure and properties of the exposed surface. Even the brick and stone of which our houses are built become blanched by its influence, and those portions on which the shadows of trees or other detached objects fall are perceptibly darker than those exposed to its full force; with the knowledge, therefore, of this all-pervading influence before their minds, the investigations of scientific photographers have been directed to the production of surfaces either of metal, paper, or glass, so imbued with chemical substances as to possess a maximum amount of sensibility to this subtle agent—light.

There seems but little doubt that some of the acute-minded men who investigated the phenomena of the influence of light must have made use of the beautiful invention of Baptista Porta of Padua, known as the Camera Obscura (q. v.); for the pictures of natural objects formed on the inner surface of this instrument would readily suggest its use in combination with the luna cornea. In the researches of a later period, the camera was used. The earlier attempts by its means failed, however, owing to the want of a power of fixing the images produced by the lens—i. e., of dissolving the unchanged *luna cornea*, without acting on the reduced silver of which the image was formed. That want having, by means of chemical investigation, been supplied, the science of photography has become firmly established in its principles, and the practice of it as an art is diffused all over the civilized world.

The honor of having been the first to produce pictures by the action of light on a sensitive surface is now very generally conceded to Thomas Wedgwood, an account of whose researches was published in 1802 in the *Journal of the Royal Institution*, under the title: 'An Account of a Method of copying Paintings upon Glass, and of making Profiles by the agency of Light upon Nitrate of Silver; with Observations by H. Davy.' In the experiments detailed in this communication, white paper and *white leather* were imbued with nitrate of silver, and exposed either in the camera obscura, or under the leaves of trees or wings of insects. The result was, that the shadows preserved the parts concealed by them white, while the other parts became speedily darkened. The misfortune was, that no attempts made either by Wedgwood or Davy to prevent the uncolored portions from being acted on by light (or, as we now say, to *fix* the picture), were successful. This operation was not effected in a thoroughly efficient manner until Sir John Herschel suggested the employment of hyposulphite of soda for that purpose. Many other fixing agents had been previously used, as ammonia, iodide of potassium, chloride of sodium, and bromide of potassium, suggested by Mr. Fox Talbot; none of these, however, were found equal to the salt proposed and successfully used by Sir John Herschel.

M. Niepce of Chalon-on-the-Saone was the first to enjoy the satisfaction of producing *permanent* pictures by the influence of solar radiations. This was accomplished in 1814, and the name chosen to designate his process was heliography—a name in some respects preferable to photography. It consisted in coating a piece of plated silver or glass with a varnish made by dissolving powdered asphaltum to saturation in oil of lavender, taking care that the drying and setting of this varnish be allowed to take place in the entire absence of light and moisture. The plate so prepared was then exposed in the camera obscura for a length of time, varying from four to six hours! according to the amount of light. A faint image only is at first visible, and this is afterwards developed and fixed by immersion in a mixture of oil of lavender and oil of white petroleum; the plate being finally washed with water, and dried. Light has little or no action on these heliographs; they should, however, be protected from moisture. M. Daguerre improved on this process, by suggesting the use of the resins obtained by evaporating oil of lavender, whereby a great increase of sensibility was secured.

Adopting date of publication as the best evidence of discovery, the next process offering itself for consideration is that for photogenic drawing by Mr. Henry Fox Talbot, communicated to the Royal Society on the 31st January 1839, just six months previous to the publication of Daguerre's process. It consisted in immersing carefully selected writing-paper in a weak solution of common salt, and drying it. After this, a dilute solution of nitrate of silver was spread over one side, and the paper again dried at the fire. When dry, it was fit for use, the sensitiveness being much increased by alternate treatment with saline and argentine solutions. Paper thus prepared yielded impressions in an incredibly short time, and nothing could be more perfect than the images it gave of leaves and flowers, the light passing through the leaves delineating every ramification of their nerves. Considerable improvement in point of sensibility was attained by Mr. Talbot in the following year, 1840, by the employment of iodide of silver on paper, as a foundation, to be washed over with a mixture of aceto-nitrate and gallo-nitrate of silver, just previous to exposure in the camera. Paper so prepared was so sensitive that an exposure of less than a second to diffused light was enough to produce an impression. After exposure and development, the picture was washed, and fixed by immersion in a solution of bromide of potassium.

Niepce and Daguerre accidentally discovered that they were conducting experiments of a kindred character, and shortly afterwards entered into a partnership. The former, however, dying in July 1833, a new deed of partnership was signed between his

son Isidore and M. Daguerre, which resulted in the publication, in July 1839, of the process known as the Daguerreotype. This was not done, however, until the French government had passed a bill, securing to M. Daguerre a pension of 6000 francs and to M. Isidore Niepce, the son of *the* Niepce, a pension of 4000 francs, both for life, and one-half in reversion to their widows. This handsome conduct on the part of the French government was based upon the argument, that '*the invention did not admit of being secured by patent, since, as soon as published, all might avail themselves of its advantages;* they, therefore, chose to enjoy *the glory of endowing the world of science and of art with one of the most surprising discoveries that honor their native land.*'

The discovery of the Daguerreotype may be said to have arisen from the dissatisfaction entertained by Daguerre with the insensibility of the bituminous surfaces of Niepce, which induced him to turn his attention to the salts of silver as a means of producing a higher degree of sensitiveness. This he attained by exposing a highly polished plate of silver (attached, for greater strength, to a copper plate) to the vapor of iodine, by which pure iodide of silver was formed on the surface. The plate so prepared was exposed in the camera obscura for a length of time (20 minutes), which was then considered very short. No *apparent* effect was produced on the plate, the image being a latent one, arising from a minute molecular disturbance caused by the impact of the actinic rays. The latent image was afterwards *developed* by exposing the plate to the vapor of mercury; and it is this development of a *latent* image, reducing as it did the time of exposure from hours to minutes, which truly constituted a new era in the science of photography. It is further due to Daguerre to state, that, while his processes for the purpose were imperfect, he still succeeded in fixing his pictures, although it was reserved for Sir John Herschel to announce the great suitability of the hyposulphites for dissolving the haloid salts of silver. The sensibility of the silver plate was still further increased by Mr. Goddard, who suggested, in 1839, the association of the vapor of bromine with that of iodine; while M. Claudet, in 1840, employed chlorine. It is a remarkable fact in connection with these discoveries, that the elder Niepce should, so early as 1820, have tried the treatment of silver plates with the vapors of sulphur and phosphorus.

But the progress of this interesting science received a very important impulse from a discovery, which at first scarcely appeared to have any connection therewith. In 1833, Braconnot gave, in the *Annales de Chimie*, an account of a new substance obtained by the action of nitric acid on starch, sawdust, linen, and *cotton-wool*. He named this substance Xyloidine; it was very combustible, and burned almost without residue. In 1838, Pelouze, in the *Comptes Rendues*, suggested its application in artillery. He says, 'Plunge paper in nitric acid (specific gravity 1·500), leave it in for two or three minutes, and wash: a kind of parchment is obtained, impermeable to moisture, and extremely combustible.' Dumas, in 1843, proposed the name Nitramidine, and suggested its use for fireworks. At a meeting of the British Association held at Southampton in the year 1846, Herr Schönbein, an eminent Prussian chemist, read a paper on the preparation of explosive cotton, a substance obtained by acting on ordinary carded cotton by a mixture of strong nitric and sulphuric acids. This explosive cotton was afterwards found to be soluble in ether; and the solution so prepared was named collodion by its discoverer, Mr. Maynard, who, in 1848, published in the *American Journal of Medical Science* the formula for its preparation. This ethereal solution having a certain proportion of alkaline iodides and iodide of silver added thereto, constituted the collodion first employed by Mr. Archer, who, although deserving the credit of having first arranged a practicable working process with collodion for its basis, without which photography could not have attained its present high position, says, in the second edition of his *Manual*, 'it is due to Le Gray to say that he was the first to publish an account of collodion as a photographic agent;' thus illustrating the candor with which Mr. Archer admitted his claim to be considered the first to suggest its value in photography. Mr. Fallon Horne and Mr. Fry materially assisted Mr. Archer in bringing his experiments to perfection. Although the announcement at the British Association in 1846, was to the effect that Schönbein had made cotton as explosive as gunpowder, no particulars were published. In April 1847, he obtained a patent; but in October 1846, Mr. Thomas Taylor had published a similar method to that patented.

By one of those singular freaks of fortune which sometimes occur, Daguerre succeeded in identifying his name with his process; but Mr. Archer was not so fortunate as to give his name to the process which he invented. A reference to the article COLLODION will show that (bearing in mind that glass perfectly cleaned forms the supporting medium) the sensitive surface is obtained by the conversion of the soluble iodides and bromides in the collodion film into iodide and bromide of silver by immersion in a solution of the nitrate of that base, and that it is exposed in the camera while still moist with adherent nitrate, the *latent* image so obtained being *developed* with a mixture of protosulphate of iron, acetic acid, and alcohol, *fixed* with hyposulphite of soda, and varnished.

In the Niepçotype or albumen process, glass plates of proper thickness and quality, and perfectly clean, are coated with Albumen (q. v), to which an alkaline iodide has been added. When perfectly dry, they are immersed in a solution of nitrate of silver, when an immediate decomposition takes place; iodide of silver being formed in the albumen film, and nitrate of potash or ammonia remaining in solution. The plate is then freely washed with water, dried, exposed, developed with gallic acid, and fixed with hyposulphite of soda.

A retrospective glance will show the reader that four processes have now been passed in review; and on a little consideration, it will be seen that one *principle* pervades the whole—viz., the production of a *latent* image by the action of light on *iodide* and *bromide* of *silver*, its subsequent *development* by suitable means, and the final removal of the unaltered portions of the sensitive film by a *fixing* agent.

Among these processes, the 'collodion' has achieved a well-merited distinction, and until quite recently, was so generally employed as almost entirely to exclude the others. Various modifications of this process have been from time to time suggested to meet the exigencies of landscape photography. It has already been stated that the collodion film is exposed while still moist with adherent nitrate of silver solution; and this method is especially applicable to the taking of portraits, where it is desired to reduce the time of exposure to a minimum; but for landscape purposes, it is by no means so imperatively necessary to curtail the time of exposure; and as the necessary apparatus and materials for sensitizing and developing a wet plate are somewhat cumbrous for field-work, it was suggested by the Abbé Despratz to wash off the free nitrate from the surface, and allow the film to dry in the absence of light. It was subsequently found that previous to drying, the plate should be immersed in a solution of albumen, tannin, malt, coffee, or almost any organic body, the object being to preserve a degree of porosity in the film.

In 1864, Syce and Bolton of Liverpool introduced a 'Dry Collodion Process,' different from all of the various modifications previously in use. Instead of forming a bromo-iodide of silver in the film by immersing a plate coated with collodion containing alkaline iodides and bromides in a solution of nitrate of silver, they added the silver salt to the collodion, and so formed an emulsion, in which the insoluble and sensitive salts remained in suspension. This was known as the collodio-bromide or emulsion process, and as wrought out and improved by Bolton and others, gradually superseded all other forms of dry process for landscape and architectural work.

Although the collodio-bromide was much more sensitive than any of its predecessors, it still left much to be desired, and many experiments were made with a view to remedy the defect. In 1871, Dr. Maddox published the first workable formula for the preparation of an emulsion, in which gelatine took the place of collodion; and in 1873, Mr. Kennett patented a method whereby the washed gelatino-bromide emulsion was converted into a dry pellicle that would keep indefinitely, and which simply required to be dissolved in water. Excellent results were obtained by this method, but it failed to attain popularity. Early in 1878, Mr. Charles Bennett published details of a method by which he had produced some marvelous results, and attained a sensitiveness infinitely greater than that of wet collodion. The results fairly surprised the general body of photographers, and at once awoke them to a sense of the value of the process. It was eagerly tried by almost every operator in the country, and in a year or two had almost entirely superseded wet collodion for portraiture in the studio, as well as for landscape and architectural work. A fairly lighted landscape may be got by an exposure of a small fraction of a second, and the development of the image is effected by simply immersing the plate in a weak solution of pyrogallic acid and ammonia, to which has been added a trace of bromide of potassium.

The object of the photographer at the present day, whatever may be the process he employs, is the production of a *negative*, an image in which the lights and shadows are reversed, the highest lights being represented by an almost opaque deposit, and the deepest shadows by almost clear glass. This is used as a *cliché* from which to print positive impressions, generally on paper coated with albumen and chloride of silver, but occasionally on compounds of carbon, gelatine, and bichromate of potass, and other substances.

PHOTO-LITHOGRAPHY is the application of photography to engraving on stone. A lithographic stone is coated with a mixture of water, gum-arabic, sugar, and bichromate of potash, dried in the dark, exposed in the camera, or under a negative. The effect of the luminous action is to render the gum almost insoluble. A solution of soap is then applied which serves the double

purpose by its decomposition of yielding a greasy printing-surface, and by its solvent action to remove those portions unacted on by light: its action being inversely proportionate to the extent to which the gum was fixed by the light. In this condition, the stone is freely washed with water, and when dry, receives a coating of printer's ink from the roller, which, by uniting with the soap, gives additional body to the picture. This process was patented by Mr. W. E. Newton; but, in common with others of a kindred character, the resulting pictures were invariably deficient in middle tint, possessing a degree of hardness unpleasant to the eye.

PHOTO-XYLOGRAPHY, the application of photography to wood-engraving. One process, patented by Mr. Newton, consisted, first, in rubbing into the wood-block a varnish, composed of asphaltum, ether, and lamp-black, to saturate the pores. Collodion was then poured on as in the ordinary Collodion process (q. v.). The surface was then sensitized, and exposed in the camera, the picture being developed in the usual way. The thickness of the united films was, however, found to interfere with the operations of the engraver.

W. Crookes, F.R.S., subsequently simplified the method of producing an impression on wood-blocks by rubbing them over with a mixture of oxalate of silver and water, and exposing under a negative. The advantage of this process was, that it did not require any treatment of the block for the purpose of fixing after exposure, as if kept from the *continued* action of light, the block would keep long enough for the engraver to work out the details with his tools. It is fair to assume, notwithstanding the ingenuity displayed in these processes, that some insuperable objection exists in both of them, since neither has been adopted to much extent.

PHOTO-MICROGRAPHY consists in the enlargement of microscopic objects, by means of the microscope, and the projection of the enlarged image on a sensitive collodion film. The manipulatory details are the same as in the Collodion process (q. v.), only that, on account of the delicate nature of the markings to be rendered, it is necessary to employ a collodion yielding what is termed a structureless film. The principle upon which the enlargement is effected is that of the conjugate foci. This branch of microscopic and photographic science has proved a useful aid in the study of the sciences of Botany, Physiology, and Entomology, by delineating, with unerring accuracy, woody fibre, ducts, starch granules, muscular fibre, blood discs, nerve papillæ, &c. Among the numerous experimenters attracted by this interesting study, Dr. Maddox is one of those who have attained especial renown; and by him, minute animalculæ, all but invisible by unassisted vision, have been magnified to a superficial area of three square inches, in which the most delicate details have been faithfully preserved. By reversing the arrangement necessary for these enlargements of microscopic objects, it will be seen that minute photographs of engravings, or other objects, may be produced which would require a microscope for their inspection. In this way communication was maintained, during the investment of Paris, when copies of letters and newspapers were inserted in quills, and fastened to carrier pigeons; and this is really by no means so difficult to accomplish as it may seem at first sight, since photographs no larger than a pin's head have been produced, including in that small space portraits of no less than 500 eminent men.

CELESTIAL PHOTOGRAPHY comprehends the application of photography to the automatic registration of celestial phenomena. The laborers in this field of scientific research have been numerous both in America and Europe; the name of Mr. Warren de la Rue, however, stands out so prominently before all others, that in the limited space at command, it is scarcely necessary to do more than notice the leading facts established by his researches. Not the least interesting of these is the demonstration of the sphericity of the moon by means of the stereoscope and lunar photographs, also the determination of the nature of many of the more obscure markings on its surface, by which elevations are clearly distinguished from depressions. The faculæ or spots on the sun's surface have also been photographed, and examined stereoscopically, by which they have been found to arise from elevations of the outer regions of the photosphere. Photographs have also been obtained of Lyra and Castor, and of the nebulæ in Orion. The instrument employed for the purpose is called a Photo-heliograph. Photography has also been extensively employed in connection with solar and stellar spectroscopy, and in the hands of Lockyer in England, Draper in America, and Vogel in Germany, has rendered much service to astronomical science.

PHOTO-GALVANOGRAPHY, a method of producing from a photograph an electrotype copper-plate in a state fit for printing. It was invented by Mr. Paul Pretsch of Vienna, and is dependent on the property which unaltered gelatine possesses of swelling up in water. In order that a plate should be fit for engraving, it is of course essential that it should have on its surface elevations and depressions corresponding to the lights and shadows of the picture. Accordingly, the first operation consists in coating a glass with a solution of gelatine and bichromate of potash, and when this is dry, exposing the same to light under a negative. In accordance with the above-named property of gelatine, it will be found, on applying water to the film, that the portion unacted on will swell up, while those parts upon which the actinic rays have exercised their full influence, will remain unchanged by the water. From the image thus obtained, a gutta-percha mould is prepared and its surface made conducting by means of levigated graphite or bronze-powder. Copper is then deposited thereon by the electrotype process, and the plate thus produced is printed from in the ordinary way.

PHOTO-GLYPHOGRAPHY is a process invented by Mr. Fox Talbot, for etching a photograph into a steel plate. It consists in coating the plate with a mixture of bichromate of potash and gelatine, and exposing under a negative. The effect of this treatment is to render the gelatine insoluble, just in proportion to the intensity of the light's action, after which a solution of perchloride of iron, of a certain definite strength, is poured over the film, which solution penetrates those parts unacted on by light, reaching the steel plate, and biting itself in, but is repelled by that portion of the gelatine rendered insoluble; the plate being thus protected from the action of the solvent. Because a dilute solution of perchloride of iron soaks into a film of gelatine more readily than a strong solution, it is very important that the etching fluid should possess that amount of dilution which has been found by practice to yield the best results.

See also PHOTOGRAPHIC ENGRAVING, POSITIVE PRINTING, CALOTYPE.

PHOTO'METER (Gr. *phos*, light; *metron*, measure), an instrument for measuring the intensity of light. The first who occupied himself in scientifically determining the intensity of light was Bouguer, but his investigations were far surpassed by those of Lambert, about 1760. The latter indicated an exceedingly simple and effective kind of photometer, which was afterwards constructed by Rumford. The instrument consists of a screen of thin paper placed vertically, and behind it, at the distance of a few inches, is placed a cylindrical stick, or any other similar body. When the intensity of light from two flames is to be compared, they are placed behind this stick in such a way that each casts a separate shadow of the stick upon the paper screen. The observer stands in front of the screen, and directs the removal of the two lights either to or from the stick, till the shadows which are cast upon the screen are equally obscure. The distance of each light from the shadow it casts on the screen is then measured; and the squares of these distances give the relative intensities of the two lights.

This photometer may also be modified by employing, instead of a cylindrical stick, a second screen parallel to the first, but of greater thickness, and having an aperture cut in its center. The two lights being then placed behind the second screen, and considerably apart, each casts a separate illumination through the aperture in the second upon the first screen, and the observer in front of the latter changes their relative distances till the illuminations appear to the eye of equal intensity. The calculation is the same as before. There are several other classes of photometers, which, however, do not deserve the name, as they depend upon the heating and chemical powers which generally accompany light, and not upon the intensity of its action on the organs of vision. Thus, Leslie's instrument is nothing more than a differential thermometer, while Saussure's and Landriani's depend upon the chemical effects of light. The chemical photometer of of Bunsen and Roscoe depends on the quantity of hydrochloric acid formed in a given time from the union of its gaseous elements under the influence of light. The Bunsen photometer, of which a modified form is commonly used in gasworks, is independent of chemistry, and consists mainly of a screen of thin writing-paper on a frame, with a spot of grease on it. When there are lights on either side of the screen, the spot will show dark on the side towards the weaker light. When the lights are equal, the spot is of the same shade as the surrounding paper, and the intensity of the light is calculated from their varying distance from the screen, the square of the distance showing the power of the lights. In the well-known photometer of Bouguer, as modified by Ritchie, the lights from the two sources in comparison are reflected so as to show side by side. The more powerful is moved away till the two reflections seem equal; then the calculation from distance is made as before. Very excellent work in celestial photometry has been done of late; in the observations recently made at Harvard Observatory, many very delicate photometers, some of them new in principle, were successfully employed. (See *Nature*, 1879.)

PHO'TOPHONE is the name of a comparatively simple apparatus which may be said to achieve the feat of transmitting articulate speech to a distance along a beam of light. It was first described in 1880 by Professor Graham Bell, known in connection

with the telephone, at the Boston meeting of the American Association; but already in 1878 its inventor had announced the possibility of 'hearing a shadow' by means of a similar agency. The success of the photophone depends on the peculiarities of the metal selenium. Crystalline selenium offers a high degree of resistance to the passage of an electric current; it is eminently sensitive to light; and the resistance is less when exposed to light than in the dark, being in some cases only a fifteenth in the light of what it is in the dark.

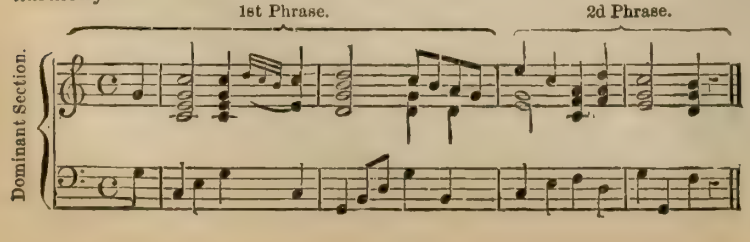
Founding on these peculiarities, Professor Graham Bell, his friends and assistants, devised some fifty forms of apparatus for so varying the transmission of light to prepared selenium as to produce audible sound. In the photophone found most serviceable, the transmitter is a plane mirror of silvered microscope glass or thin mica; the receiver, fixed at a distance without any connection, is a parabolic reflecting mirror, in the focus of which is placed a sensitive selenium 'cell,' connected in local circuit with a battery and telephone. When the apparatus is used, a strong beam of light is concentrated by a lens in the plane mirror; the speaker directs his voice against the back of this mirror, which is thrown into vibrations corresponding with those of the voice. The reflected beam of light, to which similar vibrations are also communicated, is directed through a lens to the receiving mirror, and creates in the selenium cell a rapidly intermittent current, which at the end of the telephone attached becomes audible again as vocal sound. When first described, the photophone had been used effectively with a distance of 230 yards (over a furlong) between transmitter and receiver. The rays of the oxyhydrogen light, or of an ordinary kerosene lamp, suffice for transmitting articulate speech. The loudest sounds obtained from the photophone were produced by means of a perforated disc, noiselessly revolving so as rapidly to interrupt the light in transmission.

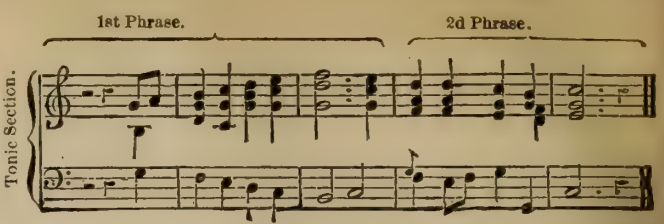
It was also found that a very audible sound could be procured from the selenium without the aid of telephone and battery. A beam of intermittent light will produce a strong musical note from the selenium. Further experiment showed that selenium is not the only substance thus sensitive to light. Still louder sounds than these obtained from the selenium directly, though not articulate, were got from diaphragms of hard india-rubber and of antimony; and sounds of varying intensity were given out by many other substances, including gold, silver, platinum, copper, zinc, lead, paper, parchment, and wood.

PHOTO-SCULPTURE, invented by M. Willème in 1867, is an ingenious use of photography to assist a sculptor in modelling portrait statues, or fac-similes and reduced reproductions of other statues. The subject stands in the center of a circular chamber, and is simultaneously photographed by no less than twenty-four cameras, arranged at equal distances round the chamber. The twenty-four photographs are subsequently made available in the sculptor's studio, where the clay model is arranged on a frame capable of being turned round. A magic lantern throws the outline of photograph No. 1 on a screen in front of the artist, who by means of a pantograph brings this outline to bear on the clay in its first position. The model is then turned round $\frac{1}{24}$th of a revolution, and the outline of photograph No. 2 is taken advantage of. Thus the modeller works his way, in twenty-four changes, round the model, and the likeness or fac-simile or reduced figure of the original is or should be complete. The method, which was also applied to the taking of medallions and the like, never came much into use, in spite of its ingenuity.

PHRAGMI'TES. See REED.

PHRASE, the name given, in Music, to the simple motives containing in themselves no satisfactory musical idea, which enter into the composition of every melody containing a perfect musical idea, e. g.,  The phrase most usually consists of two measures; in compound time, it may be comprised in one measure, and an extended phrase is one which contains three measures. In the more simple and regular forms of musical composition, two phrases unite to form a section ending in a cadence; and a perfect musical idea is formed of two such sections terminating, the first with the dominant, the second with the tonic harmony.





A little confusion has arisen from the use, by some musical writers, of the word phrase for what is here called a section.

PHRENI'TIS. See MENINGITIS.

PHRENO'LOGY is a Greek compound signifying a discourse on the mind, but is used in a more limited sense to mean a theory of mental philosophy founded on the observation and discovery of the functions of the brain, in so far as it is concerned in intellectual and emotional phenomena. Phrenology takes into view likewise the influence of all other parts of the body, and of external agents affecting these, upon the brain.

The founder of this system was Dr. Franz Joseph Gall (q. v.), who died in 1828. In Britain it has been amply expounded by his pupil Dr. Spurzheim (q. v.), by George and Andrew Combe (q. v.), by Dr. Elliotson of London, and others. In America, Dr. Charles Caldwell has been its ablest advocate. Gall's method of investigating the functions of the brain is that which, applied to other organs, has led to the discovery of their functions, but which had never before been systematically applied to the brain. When a physiologist wished to ascertain the function of any part of the body, he did not rest satisfied with examining its structure, and speculating on the purposes for which that structure seemed to be adapted. He observed what kind of function appeared during life as the invariable accompaniment of the presence and action of that particular part; and, by repeated and careful observation, he at last succeeded in discovering the function. The knowledge thus obtained was afterwards verified and completed by examination of the structure, and observation of the effects of its injury or diseases. To the adoption of this principle in studying the functions of the brain, Gall was led by observing at school the concomitance of a quick and retentive memory of words with a peculiar appearance of the eye, which he afterwards found to be caused by a large development of a particular part of the brain. At school, at college, and in many other places, and under the most different circumstances, the same concomitance of talent with development of brain came under his notice so frequently, as to suggest to him the probability that there might be discovered by the same method a connection of other talents and dispositions with other portions of the brain. It was by the diligent application of the method of inquiry which accident had thus suggested to him, and not, as some suppose, by the exercise of his imagination, that Dr. Gall was at last led to conclude, first, that the brain is an aggregate of many different parts, each serving for the manifestation of a particular mental faculty; and, secondly, that, *all other conditions being equal*, the size of each of these cerebral organs is a measure of the power of its function. These two propositions constitute the distinctive or fundamental principles of Phrenology. The first of them, however, is not new.

The impossibility of reconciling actual phenomena with the notion of a single organ of the mind has, for many centuries, suggested the probability of a plurality of organs in the brain. But the phrenologists hold that Dr. Gall was the first to *demonstrate* the fact, and to make any considerable progress in determining with what parts of the brain the various intellectual and emotional faculties and susceptibilities are connected.

That man, in his present state, cannot think, will, or feel without the intervention of the brain, is generally admitted by physiologists, and appears from even the fact that, by pressure applied to it, consciousness is at once suspended. That it is not a single organ is *à priori* probable from such considerations as these: 1. It is a law in physiology that different functions are never performed by the same organ. The stomach, liver, heart, eyes, ears, have each a separate duty. Different nerves are necessary to motion and feeling, and there is no example of confusion amongst them. 2. The mental powers do not all come at once, as they would were the brain one organ. They appear successively, and the brain undergoes a corresponding change. 3. Genius varies in different individuals: one has a *turn*, as it is called, for one thing, and another for something different. 4. Dreaming is explained by the doctrine of distinct organs which can act or rest alone. 5. Partial insanity, or madness on one point with sanity on every other, similarly points to a plurality of cerebral organs. 6. Partial injuries of the brain, affecting the mental manifestations of the injured parts, but leaving the other faculties sound, tend to the same conclusion. 7. There could be no such state of mind

as the familiar one where our feelings contend with each other, if the brain were one organ.

These are grounds for presuming that the brain is not single but a *cluster of organs*, or at least that it is capable of acting in parts as well as in whole. For this conclusion the phrenologists consider that they have found satisfactory proofs in numerous observations, showing that particular manifestations of mind are proportioned, in intensity and frequency of recurrence, to the size of expansion of particular parts of the brain—this law being subject to modification in the case of the brain, as in that of the muscles and other parts of the body, by differences of health, quality, exercise, &c.

If size of organ, *cæteris peribus*, is the measure of the vigor of function, it is of great moment in what region of the brain the organs are largest—whether in the animal, moral, or intellectual. On this preponderance depends the character. Two brains may be exactly alike in size generally, yet the characters may be perfect contrasts to each other.

It is held by phrenologists—1. That by accurate observation of human actions, it is possible to discover the strength of the dispositions and intellectual powers of men; 2. That the form of the brain can, in normal subjects not beyond middle age, be ascertained with sufficient accuracy from the external form of the head —the brain, though the softer substance, being what determines the shape of the skull; 3. That the organs or parts of which the brain is composed appear on its surface in folds or convolutions, which have a well-ascertained fibrous connection with the *medulla oblongata*, which unites the brain to the spinal cord; 4. That the brain being divided into two equal parts called *hemispheres*, in each of which the same organ occurs, all the organs are double, like the ears and eyes. See BRAIN. But when the term *organ* is used, both organs are meant.

It is true that where strength is most needful, the skull is thicker than at other places; but this is not overlooked by phrenologists, nor do they fail to warn observers against mistaking for signs of cerebral development the bony processes and ridges which serve for the attachment of muscles to the skull. See SKULL. They recognize also, as we shall see, the uncertainty often occasioned by the frontal sinus.

Besides the brain proper, there is a smaller brain, lying below the hinder part of the main brain, and called the *cerebellum*.

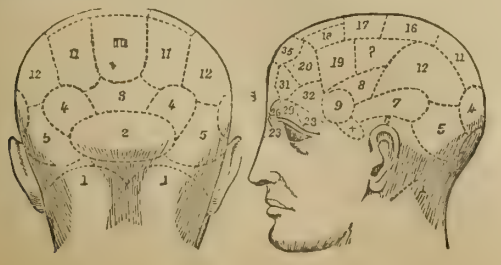
The brain is divided into the *anterior*, *middle*, and *posterior lobes*. The anterior lobe contains the organs of the intellectual faculties; the posterior lobe and lower range of the middle one are the regions of the animal propensities; while the moral sentiments are stated to have their organs developed on the top or coronal region of the head.

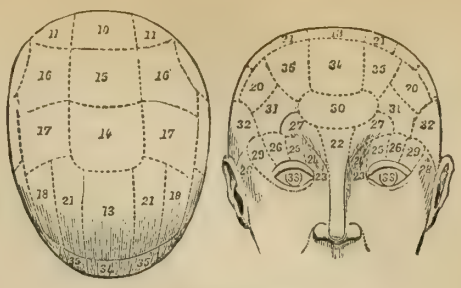
Phrenologists distinguish between *power* and *activity* in the mental faculties. Power, in whatever degree possessed, is *capability* of feeling, perceiving, or thinking; while activity is readiness and quickness in the exercise of power.

The powers of mind, as manifested by the organs, are called *faculties*. A faculty may be defined to be a particular power of thinking or feeling. A faculty is regarded as elementary or primary—1. When it exists in one kind of animal, and not in another; 2. When it varies in the two sexes of the same species; 3. When it is not in proportion to the other faculties of the same individual; 4. When it appears earlier or later in life than the other faculties; 5. When it may act or repose singly; 6. When it is propagated from parent to child; and 7. When it may singly preserve its soundness, or singly become deranged or extinct.

The faculties are usually divided by phrenologists into two orders—FEELINGS AND INTELLECT, or AFFECTIVE and INTELLECTUAL FACULTIES. The feelings are divided into two genera —the *Propensities* and the *Sentiments;* while the Intellectual embrace the *Perceptive* or *Knowing*, and the *Reflective Faculties*. This classification, however, is avowedly imperfect.

The following is a representation of the human head in four points of view, showing the positions of the cerebral organs, according to Mr. Combe:





AFFECTIVE.

I.—PROPENSITIES.

1. Amativeness.
2. Philoprogenitiveness.
3. Inhabitiveness or Concentrativeness.
4. Adhesiveness.
5. Combativeness.
6. Destructiveness.
   [Alimentiveness.]
   [Love of Life.]
7. Secretiveness.
8. Acquisitiveness.
9. Constructiveness.

II.—SENTIMENTS.

10. Self-esteem.
11. Love of Approbation.
12. Cautiousness.
13. Benevolence.
14. Veneration.
15. Firmness.
16. Conscientiousness.
17. Hope.
18. Wonder.
19. Ideality.
20. Wit, or Ludicrousness.
21. Imitation.

INTELLECTUAL.

I.—PERCEPTIVE.

22. Individuality.
23. Form.
24. Size.
25. Weight.
26. Coloring.
27. Locality.
28. Number.
29. Order.
30. Eventuality.
31. Time.
32. Tune.
33. Language.

II.—REFLECTIVE.

34. Comparison.
35. Causality.

1. *Amativeness*, or sexual love, is believed to have for its organ the cerebellum, or at least a portion of it. As the basis of domestic life, this faculty is of great importance, and its regulation has ever been one of the prime objects of moralists and legislators.

2. *Philoprogenitiveness*, or love of offspring, is generally strongest in the female. Its organ is one of the easiest to distinguish in the human head. Those who are flat and perpendicular there, instead of being delighted, are annoyed by children. The feeling is said to give a tender sympathy with weakness and helplessness in general. The most savage races must have affection for their young, or they would become extinct. The organ, like the other cerebral parts, may become diseased; and insanity on the subject of children often occurs.

3. *Inhabitiveness* (called by Mr. Combe *Concentrativeness*) has its organ immediately above the preceding. Dr. Gall did not discover its function; and Dr. Spurzheim, observing it large in persons attached to their native place, or any place in which they had long dwelt, called it *Inhabitiveness*. Mr. Combe thought it has a more extended sphere of action. He observed it large in those who can detain continuously their feelings and ideas in their minds; while the feelings and ideas of others pass away like the images in a mirror, so that they are incapable of taking systematic views of a subject, or *concentrating* their powers to bear on one point. The organ is stated as only probable, till further facts are obtained.

4. *Adhesiveness.*—The organ of this feeling was discovered by Gall, from being found very large in a lady remarkable for the warmth and steadiness of her friendships. It attaches men and gregarious animals to each other, and is the foundation of that pleasure which mankind feel in bestowing and receiving friendship, and in associating with each other. Acting with Amativeness, it gives constancy and duration to the attachment of the married. Generally speaking, Adhesiveness is strongest and its organ largest in woman.

5. *Combativeness.*—Dr. Gall discovered the organ of this propensity by a vast number of observations on the heads of persons fond of fighting. Dr. Spurzheim extended its function to *contention* in general, whether physical or moral. Those deficient in it show that over-gentle and indolent character which yields to aggression, is easily repelled by the appearance of difficulty and trouble, and naturally seeks the shades and eddy-corners of life.

6. *Destructiveness.*—The propensity to destroy is abundantly manifested by man and carnivorous animals, and when too strong or ill-regulated is the source of cruelty and wanton mischief. As a defensive power, it is of high utility. Anger, resentment, and indignation spring from it. A small endowment is one of the elements of a 'soft' character; while persons who have much

of it are generally marked by an energetic, and probably fierce and passionate character.

Alimentiveness and *Love of Life.*—Some of the recent phrenological works treat in this part of the order of the faculties, of a faculty of Alimentiveness, or the propensity to eat and drink, and also of another which follows—viz., Love of Life. The first being represented as no more than *probable*, and the second as only *conjectural*, they have no number allotted to them on the bust. The place assigned to Alimentiveness is marked by a cross on the side-view of the bust. Mr. Combe suggests that the organ of the Love of Life is probably a convolution at the base of the middle lobe of the brain, the size of which cannot be ascertained during life.

7. *Secretiveness* is the propensity to conceal, which in excess assumes the form of cunning. It helps animals both to avoid and to prey upon each other. In abuse, it leads to lying, hypocrisy, and fraud, and with Acquisitiveness disposes to theft and swindling. The organ is subject to disease, and cunning madmen are difficult to deal with. Disease here often leads to belief in plots and conspiracies formed against the patient.

8. *Acquisitiveness.*—The existence of a cerebral organ for the desire of property is held by phrenologists to prove that this is not, as many have thought, a derived or secondary tendency. It is what Lord Kames calls the 'hoarding appetite.' This explains the miser's desire to accumulate money, without regard to its use in the purchase of other enjoyment. When the organ is diseased, persons in easy circumstances are sometimes prone to pilfer everything of value, and often of no value, which comes in their way.

9. *Constructiveness* is the impulse to fashion and construct by changing the forms of matter. Many of the inferior animals possess it, as the beaver, bee, and birds. Physical nature consists of raw materials which Constructiveness prompts and enables man to adapt to his purposes.

10. *Self-esteem* is the source of that self-complacency which enhances the pleasure of life, gives the individual confidence in his own powers, and enables him to apply them to the best advantage. It is sometimes called proper pride, or self-respect, in which form it aids the moral sentiments in resisting temptations to meanness and vice. Its deficiency renders a man too humble, and the world takes him at his word, and push him aside. Its excess produces arrogance, selfishness, disobedience, and tyranny. Self-esteem becomes insane perhaps more frequently than any other faculty, and then shows itself in extravagant notions of self-importance. Such maniacs fancy themselves kings, emperors, and even the Supreme Being. The organ is generally larger in men than in women; and more men are insane from pride than women.

11. *Love of Approbation* is the desire of the good opinion, admiration, and praise of others. It is an excellent guard upon morals as well as manners. The loss of character, to those largely endowed with it, is worse than death. If the moral sentiments be strong, the desire will be for honest fame; but in meaner characters, the love of glory is a passion that has deluged the world with blood in all ages. Shamelessness is the effect of its deficiency, often observed in criminals. The organ oftener becomes diseased in women than in men, as in women it is more active than in the other sex generally.

12. *Cautiousness.*—The organ of this faculty is found large in persons much troubled with fears, hesitations, and doubts. Its normal character is well expressed by its name. When diseased, as it often is, the organ produces causeless dread of evil, despondency, and often suicide.

13. *Benevolence* is the desire to increase the happiness and lessen the misery of others. When strong, it prompts to active, laborious, and continued exertions, and, unless Acquisitiveness be powerful, to liberal giving to promote its favorite object. Unregulated by Conscientiousness and Intellect, Benevolence degenerates into profusion and facility. It often coexists with Destructiveness in great force; as it did in Burns, whose poem on a Wounded Hare expresses both feelings highly excited.

14. *Veneration* has for its object *whoever* and *whatever is deemed venerable* by the individual. One man venerates what another treats with indifference, because his understanding leads him to consider that particular object as venerable, while his neighbor deems it otherwise. But any man with a large endowment of the organ will have a tendency to consider others as superior to himself. Veneration is the basis of loyalty, and, having the Deity for its highest object, forms an element in religious feeling. So liable is its organ to disease, that high devotional excitement is one of the most common forms of insanity.

15. *Firmness* is the source of fortitude, constancy, perseverance, and determination; when too powerful, it produces obstinacy, stubbornness, and infatuation. The want of it is a great defect in character. The English soldier is more persistent than the French, although in courage and spirit they are equal.

16. *Conscientiousness* gives the love of justice, but intellect is necessary to show on which side justice lies. The judge must hear both sides before deciding, and his very wish to be just will prompt him to do so. Conscientiousness not only curbs our faculties when too powerful, but stimulates those that are too weak, and incites us to duty even against strong inclinations. The existence of Conscientiousness as an independent element in the human constitution, explains some apparent inconsistencies in human conduct—that a man, for instance is kind, forgiving, even devout, and yet not just. The organ is commonly larger in Europeans than in Asiatics and Africans; very generally, it is deficient in the savage brain. When it is diseased, the insanity consists in morbid self-reproach, belief in imaginary debts, and the like.

17. *Hope* was regarded as a primary faculty by Spurzheim, but was never admitted by Gall, who considered it as a function of every faculty that *desires*. Dr. Spurzheim answered, that we desire much of which we have no hope. It produces gaiety and cheerfulness, looks on the sunny side of everything, and paints the future with bright colors. When not well regulated, Hope leads to rash speculation, and, in combination with Acquisitiveness, to gambling, both at the gambling-table and in the counting-house. It tends to make the individual credulous of promised good, and often indolent.

18. *Wonder.*—Dr. Gall found the organ of this faculty large in seers of visions and dreamers of dreams, and in those who love to dwell on the marvelous, and easily believe in it. Persons who have it powerful are fond of news, especially if striking and wonderful, and are always expressing astonishment; their reading is much in the region of the marvelous, tales of wonder, of enchanters, ghosts, and witches. When the sentiment is excessive or diseased, it produces that peculiar fanaticism which attempts miracles, and (with Language active) speaks in unknown tongues.

19. *Ideality.*—The organ of this faculty was observed by Dr. Gall to be prominent in the busts and portraits of deceased, and in the heads of a great number of living, poets. This confirmed to him the old classical adage, that the poet is born, not made. He called it the organ of Poetry. The name of Ideality was given to it by Dr. Spurzheim. This faculty is said to delight in the perfect, the exquisite, the *beau-idéal*, the beautiful and sublime. The organ is usually small in criminals and other coarse and brutal characters, for it is essential to refinement. It prompts to elegance and ornament in dress and furniture, and gives a taste for poetry, painting, statuary, and architecture. A point of interrogation is placed on the bust on the back part of the region of this organ, conjectured to be a different organ, but one allied to Ideality. The existence of the faculty of Ideality is held by phrenologists to prove that the sentiment of beauty is an original emotion of the mind, and to settle the controversy on that subject. See ÆSTHETICS.

20. *Wit, or the Sentiment of the Ludicrous.*—The phrenological writers have discussed at great length, and with not a little controversy, the metaphysical nature or analysis of this faculty. We need not follow them into this inquiry, as most of them are agreed that by means of it we feel and enjoy the *ludicrous*.

21. *Imitation.*—Dr. Gall found the prominence of this organ accompanied by instinctive, and often irrepressible mimicry. The tendency to imitate is evidently innate; from the earliest years, it makes the young follow the customs and the manner of speech of those around them, and so preserves a convenient uniformity in the manners and externals of society. Celebrated actors always possess it strong, and by its means imitate the supposed manner, and even feel the sentiments, of their characters. Its organ is found large also in painters and sculptors of eminence. In its morbid states, the impulse to mimic becomes irresistible.

We now come to the Intellectual Faculties, or those which make us acquainted with things that exist, and with their qualities and relations. Dr. Spurzheim divided them into three genera—1. The External Senses; 2. The Internal Senses, or Perceptive Faculties; 3. The Reflecting Faculties.

The external senses, as generally received, are five in number—*Touch*, *Taste*, *Smell*, *Hearing* and *Sight*. There seem to be two more—namely, the *Sense of Hunger* and *Thirst*, and the *Muscular Sense*, or that by which we feel the state of our muscles as acted upon by force and resistance. Without this last sense, we could not keep our balance, or suit our movements to the laws of the mechanical world. Whether each sense has a special cerebral organ in addition to its external apparatus and nerves, is a question regarded by phrenologists as still undetermined.

22. *Individuality*, the first in the list of the perceptive faculties, is not easily defined. It is said to take cognizance of individual objects as such, e. g., a horse or a tree. Other knowing faculties perceive the form, color, size, and weight of the horse, but Individuality is thought to unite all these, and give the idea of a horse. It is regarded as the storehouse of knowledge of things simply *existing*. When it is strong, without being accompanied by reflecting power, the mind is full of facts, but unable to reason from them. After puberty, the size of the organ of Individuality, as well as of the neighboring organs of Size, Weight, Coloring, and

Locality—all situated behind the superciliary ridge of the skull—is often rendered doubtful by the existence of a hollow space, of uncertain width and extent between the two plates of the skull. This hollow is called the *frontal sinus;* and when it is large, there may be a great projection of the bone over the eyes, without a corresponding projection of brain within. When this part of the skull is flat, however, the organs must be *at least* as defective as the flatness indicates. Owing to the source of uncertainty here pointed out, and the smallness of the organs behind the eyebrows, the functions of those parts of the brain are not regarded as being so well ascertained as those of the larger organs, nor will a cautious phrenologist be too ready to pronounce them large.

23. *Form.*—When the organ of Form is large, the eyes are wide asunder. Dr. Gall discovered it in persons remarkable for recognizing faces after long intervals, and although perhaps only once and briefly seen. The celebrated Cuvier owed much of his success in comparative anatomy to his large organ of Form. Decandolle mentions that 'his [Cuvier's] memory was particularly remarkable in what related to forms, considered in the widest sense of that word; the figure of an animal seen in reality or in drawing never left his mind, and served him as a point of comparison for all similar objects.'

24. *Size.*—Every object has size or dimension; hence a faculty seems necessary to cognize this quality. The supposed organ is situated at the inner extremities of the eybrows, where they turn upon the nose. A perception of size (including distance) is important to our movements and actions, and essential to our safety.

25. *Weight.*—A power to perceive the different degrees of weight and force is likewise essential to man's movements, safety, and even existence. Phrenologists have generally localized the organ of that power in the part of the brain marked 25 on the bust.

26. *Coloring.*—The organ of this faculty is large in great painters, especially great colorists, and gives an arched appearance to the eyebrow; for example, in Rubens, Titian, Rembrandt, Salvator Rosa, and Claude Lorraine. In cases of color-blindess, it is found small. Many persons, though able to distinguish colors, have no perception of their harmonies: for this perception, a higher endowment of the faculty seems to be required.

27. *Locality.*—Dr. Gall was led to the discovery of this faculty by comparing his own difficulties with a companion's facilities, in finding their way through the woods, where they had placed snares for birds, and marked nests, when studying natural history. Every material object must exist in some part of space, and that part of space becomes *place* in virtue of being so occupied. Objects themselves are cognized by Individuality; but their place, the direction where they lie, the way to them, fall within the sphere of Locality. Its organ is large in those who find their way easily, and vividly remember places in which they have been. It materially aids the traveler, and is supposed to give a love for traveling. The organ was large in Columbus, Cook, Park, Clarke, and other travelers.

28. *Number.*—The organ of this faculty is placed at the outer extremity of the eyebrows and angle of the eye. It occasions, when large, a fulness or breadth of that part of the head, and often pushes downward the external corner of the eye. When it is small, the part is flat and narrow between the eye and the temple. Dr. Gall called the faculty *le sens des rapports des nombres* (the Sense of the Relations of Numbers), and assigned to it not only arithmetic, but mathematics in general. Dr. Spurzheim more correctly limits its functions to arithmetic, algebra, and logarithms; geometry being the products of other faculties, particularly Size and Locality. Dr. Gall first observed the organ in a boy who could multiply and divide, mentally, ten or twelve by three figures in less time than expert arithmeticians could with their pencils. Many such examples are on record.

29. *Order.*—The organ of this faculty is said to be large in those who are remarkable for love of method, neatness, arrangement, and symmetry, and are annoyed by confusion and irregularity. In savages, whose habits are slovenly, filthy, and disgusting, the organ is comparatively small.

30. *Eventuality.*—The organ is situated in the very center of the forehead, and when large, gives to this part of the head a rounded prominency. Individuality has been called the faculty of *nouns;* Eventuality is the faculty of *verbs.* The first perceives merely things that exist; the other, motion, change, event, history. The most powerful *knowing* minds have a large endowment of both Individuality and Eventuality; and such persons, even with a moderate reflecting capability, are the clever men in society—the acute men of business—the ready practical lawyers. The organ of Eventuality is generally well developed in children, and their appetite for *stories* corresponds.

31. *Time.*—Some persons are called walking time-pieces; they can tell the hour without looking at a watch; and some even can do so, nearly, when waking in the night. The impulse to mark time is too common, too natural, and too strong, not to be the result of a faculty; it is an element in the love of dancing, almost universal in both savage and civilized man.

32. *Tune.*—The organ of Tune is large in great musicians; and when it is small, there is an utter incapacity to distinguish either melody or harmony. The great bulk of mankind possess it in a moderate endowment, so as to be capable of enjoying music in some degree. Those in whom it is large and active, become in all stages of society, distinguished artists, exercising a peculiar power over their fellow-creatures, so as to rouse, melt, soothe, and gratify them at pleasure. But the gift, in this active form, is liable to be much modified according as it is accompanied by Adhesiveness, Combativeness, Ideality, Benevolence, Wit, and other faculties.

33. *Language.*—The comparative facility with which different men clothe their thoughts in words, and learn to repeat them by heart, depends on the size of the organ of Language, which is situated on the super-orbitar plate, immediately over the eyeball, and, when large, pushes the eye outwards, and sometimes downwards; producing in the latter case, a wrinkling or pursing of the lower eyelid. Verbal memory is strong or weak, without relation to the strength or weakness of the memory of things, forms, or numbers.

The Perceptive Organs are for the most part called into activity by *external* objects; but internal causes often excite them, and objects are then perceived which have no external existence, but which, nevertheless, the individual may believe to be real. This is the explanation of visions and ghosts, and of the fact that two persons never see the same spectres at the same time. Excess or disease in the organ of Wonder predisposes to belief in the marvelous and supernatural, and probably stimulates the Perceptive organs into action, when spectral illusions are the consequence.

34. *Comparison.*—Dr. Gall discovered the organ of this faculty in a man of science who reasoned chiefly by means of analogies and comparisons, and rarely by logical deductions. The middle of the upper part of his forehead was very prominent. The precise nature of the faculty has been much disputed among the Phrenologists, but they seem to agree that the perception of analogy depends upon it. Every faculty, we are told, can compare its own objects: Coloring can compare colors; Weight, weights; Form, forms; Tune, sounds; but Comparison can compare a color with a note, or a form with a weight, &c. Analogy is a comparison not of things, but of their relations.

35. *Causality.*—This is regarded as the highest and noblest of the intellectual powers. Dr. Spurzheim so named it from believing that it traces the connection between *cause* and *effect,* and recognizes the relation of ideas to each other in respect of *necessary consequence.* Some metaphysicians have held that we have no idea of cause, but see only sequence, or one event following another. See CAUSE. It is true that we do see sequence; but we have a *third* idea—that of power, agency, or efficiency, existing in some way in the antecedent, to produce the consequent. Whence do we get this third idea?—from a distinct faculty, Causality. It is a large ingredient in wisdom.

The phrenologists have chiefly confined their attention to the organs of the brain, and the various faculties of which these are the instruments. The former writers on mind—Reid, Stewart, Brown, and others—gave, on the contrary, their chief care to the mental acts called Attention, Perception, Conception, &c., which they considered as faculties. The phrenologist does not overlook the importance of this department of mental philosophy, but differs from the metaphysicians in considering perception, conception, memory, &c., as only *modes* in which the real faculties above-described *act.* This distinction is one of great importance.

According to the phrenologists, the faculties are not mere passive susceptibilities; they all tend to action. When duly active, the actions they produce are proper or necessary; in excess or abuse, they are improper, vicious, or criminal. Small moral organs do not produce abuses; but they are unable to prevent the abuse of the animal organs, as larger tend to do; thus small Benevolence is not cruel, but it does not offer sufficient control to Destructiveness, which then impels to cruelty. *Cæteris paribus,* large organs have the greatest, and small the least tendency to act—each faculty producing the feeling or idea peculiar to itself. In active constitutions, the brain partakes of the general activity, and comes more readily into play than where the constitution or temperament is lymphatic. Health and disease, exercise and inaction, nutrition and starvation, have also great influence in modifying both the power of the cerebral organs and their readiness to act. Moreover, when certain faculties have been much exercised for a series of generations in a family, they are apt to be manifested in greater strength and activity than where no such hereditary influence exists. Seeing that all the organs tend to action, each, it is concluded, must have a legitimate sphere of action, and be necessary for the welfare of man.

The PROPENSITIES and SENTIMENTS cannot be called into action by the will. We cannot fear, or pity, or love, or be angry, by willing it. But *internal* causes may stimulate the or-

gans, and then, whether we will or not, their emotions will be felt. Again, these feelings are called into action in spite of the will, by the presentation of their *external* objects—Cautiousness, by objects of terror; Love, by beauty, and so on. The excitability of the feelings, whether stimulated from within or without, is increased by activity of the temperament. Insanity is a frequent result of over-activity of the propensities and sentiments. These may be diseased and yet the intellect sound. The converse is also true. When an organ is small, its feeling cannot be adequately experienced. The will can *indirectly* excite the propensities and sentiments by setting the intellect to work to find externally, or conceive internally, the proper objects. Lastly, these faculties do not form ideas, but simply feel; and therefore have no memory, conception, or imagination.

The PERCEPTIVE and REFLECTING FACULTIES, or Intellect, form ideas, perceive relations, and are subject to, or rather constitute, the Will; and minister to the affective faculties. They may be excited by external objects and by internal causes. When excited by the presentation of external objects, these objects are *perceived*, and this *act* is called PERCEPTION. It is the lowest degree of activity of the intellectual faculties; and those who are deficient in a faculty cannot perceive its object.—CONCEPTION also is a mode of action of the faculties, not a faculty itself. It is the activity of the faculties from internal causes, either willed, or involuntary from natural activity.—IMAGINATION is Conception carried to a high pitch of vivacity.—MEMORY, too, is not a faculty, but a mode of action. There is no such thing as the *general* memory of the metaphysicians, but every intellectual faculty has its own memory. Memory differs from Conception and Imagination in this, that it recollects *real* objects or events which it has actually perceived, and adds the consciousness of time elapsed since they were perceived. The other named modes of action do not require realities or time.—JUDGMENT is, properly, the perception of adaption, fitness, and necessary consequence; this is a mode of action of the reflecting powers. In a certain sense, the Perceptive Faculties may each be said to possess judgment; as Coloring judges of colors; Form, of forms; Tune, of music. By the word 'judgment,' however, is meant right reasoning, sound deciding. To this, a proper balance of the affective faculties is essential. There can be no sound judgment where any of the feelings are excessive.—CONSCIOUSNESS is the knowledge which the mind has of its own existence and operations.—ATTENTION is not a faculty, but the application, or *tension*, of any or all of the intellectual faculties.—ASSOCIATION is the succession of ideas in the mind, each seeming to call up that which succeeds; so that in our waking-hours the mind is never without an idea passing through it. This is a state or condition of the faculties, not a faculty.—PASSION is any faculty in excess; Love is the passion of Amativeness in union with Adhesiveness and Veneration; Avarice, of Acquisitiveness; Rage, of Destructiveness.—PLEASURE and PAIN, JOY and GRIEF, also belong to each faculty, according as it is agreeably or disagreeably affected.—HABIT is the power of doing anything well, acquired by frequently doing it. But before it can be done at all, there must be the faculty to do it, however awkwardly.—TASTE was held by Mr. Stewart to be a faculty, and to be acquired by habit. It seems to be the result of a harmonious action of all the faculties.

Such is an outline of the system propounded by the phrenologists. So far as it shall be confirmed by the mature experience and observation of competent inquirers, the facts and principles which it unfolds must be of great practical value to mankind. The study of the mutual influence of the mind and body has ever been recognized by wise and observant men as one of high importance, though of great difficulty; and certainly, Gall and his followers have not only given a strong impulse to that study, but have thrown much light on the diversities of human character, and accumulated a large body of facts of a kind which had previously been too much overlooked. Much, it is admitted, still remains to be discovered. 'No phrenologist,' says Mr. Combe, 'pretends that Gall's discoveries are perfect; they are far from it, even as augmented and elucidated by his followers; but I am humbly of opinion that, in their great outlines, his doctrines are correct representations of natural facts. . . . The future of phrenology will probably exhibit a slow and gradual progress of the opinion that it is true and important; and only after this stage shall have been passed, will it be seriously studied as science. Hitherto this has not been done: the number of those who have bestowed on it such an extent of accurate and varied observation and earnest reflection as is indispensable to acquiring a scientific knowledge of chemistry, anatomy, natural philosophy, or any other science, is extremely small; and the real knowledge of it, on the part of such as continue, through the press and in public lectures, to oppose it, appears to me scarcely greater than it was in 1815 and 1826,' when it was ridiculed in the *Edinburgh Review*.

In considering the claims of phrenology, two questions should not be confounded. One is—How far the functions of the different parts of the brain have been established by observation of extreme instances of their large and small development?—the other, To what extent the facts so ascertained can be applied physiognomically in practice? Gall disclaimed the ability to distinguish either ill-defined modifications of forms of the skull, or the slighter shades of human character (*Sur les Fonctions du Cerveau*, iii. 41); nor, we believe, did he or Spurzheim ever pretend to estimate the size of *every* organ in a single brain. By attempting too much in these directions some of their disciples may have helped to prolong the incredulity with which phrenology is still widely regarded.

For the titles of numerous books on phrenology, see GALL (F. J.), Spurzheim (J. G.), and COMBE (G.); also an article in *The British and Foreign Medical Review*, vol. ix. p. 190. Of other important works bearing on, or criticising phrenology, we may mention Dr. Laycock's *Mind and Brain, or the Correlation of Consciousness and Organization* (2 vols. Edin. 1860); his article on Phrenology in the 8th ed. of the *Encyc. Brit.*; an article on Phrenological Ethics in the *Edinburgh Review* for January 1842, vol. lxxiv. p. 376; Aug. Comte's *Philosophie Positive*, tom. iii. (or Miss Martineau's transl., i. 466); Sir Benj. C. Brodie's *Psychological Inquiries*, Dialogue vi. (Lond. 1854); G. H. Lewes's *Biog. Hist. of Philos.*, p. 629 (Lond. 1857); Samuel Bailey's *Letters on the Philosophy of the Human Mind*, 2d Series, Letters xvi.—xxi. (Lond. 1858); and Professor Bain *On the Study of Character, including an Estimate of Phrenology* (Lond. 1861). Sir William Hamilton's objections, mostly published many years since, and which are now appended to his *Lectures on Metaphysics*, i. 404 (Edin. 1859), were discussed in the *Phren. Jour.*, vols. iv. and v., and are remarked on by Mr. Combe in his work *On the Relation between Science and Religion*, pref., p. xvii. (Edin. 1857).

PHRYGA'NEA. See CADDICE.

PHRY'GIA, a country in Asia Minor, the extent and boundaries of which varied very much at different periods of ancient history. In pre-historic ages it is believed to have comprised the greater part of the peninsula, but at the time of the Persian invasion it was limited to the districts known as Lesser Phrygia and Greater Phrygia—the former stretching from the Hellespont to Troas (inclusive), the latter occupying a central portion of Asia Minor. The inland boundaries of Lesser Phrygia are not well ascertained; but Greater Phrygia was bounded on the N. by Bithynia and Paphlagonia, on the E. by Cappadocia and Lycaonia, on the S. by the Taurus range, and on the W. by the maritime countries of Mysia, Lydia, and Caria. At a later period it was considerably reduced by the formation of Galatia (q. v.) and the extension of Lycaonia. P. was in general a high and somewhat barren plateau, though its pastures supported immense flocks of sheep, noted for the fineness of their wool, as indeed they still are. The most fertile part was the valley of the Sangarius, but the most beautiful and populous district was the southwest, at the base of the Taurus, where the Mæander and other streams had their rise. The mountains and streams yielded gold; Phrygian marble was anciently celebrated, and the cultivation of the vine appears to have been extensively carried on.

The origin of the Phrygians is one of the mysteries of ancient ethnology. Some think that they were settled at a very remote period in Europe, and that they emigrated from Thrace into Asia Minor; and Xanthus, Herodotus, and Strabo certainly speak of such a migration. Xanthus places it after the Trojan war; but if there be any truth in the tradition at all, it can only refer to a return of some tribes to the cradle of the race in the valley of the Sangarius, for the Phrygians were regarded as one of the oldest races (if not the very oldest) in Asia Minor.

Instead of seeking for their origin in Thrace, the best classical ethnologists seek for it in the neighboring highlands of Armenia, whence the Phrygians are believed to have spread at the period far before the dawn of authentic history over the greater part of the Peninsula, and thence to have crossed into Europe, and occupied the greater part of Thrace, Macedonia, and Illyria; while the mythic Pelops, who colonized the Peloponnesus, and gave it his name, was said by tradition to be a Phrygian. In both Greek and Latin poetry the Trojans are also called Phrygians, and the same name is applied to other nations of Asia Minor, such as the Mydonians and Mysians. In Thrace, too, many of the names of places were the same as in Troas; while it has now been demonstrated that the Armenian, Phrygian, and Greek languages are akin to each other, so that peoples speaking the two former tongues, like those speaking the latter, belong to the great Aryan branch of the human family. The Phrygians began to decline in power and number after the Trojan war. They were—if we can make anything like historic fact out of the mythic narratives of that early time—pushed out of Europe by the Illyrians in the north and the Macedonians in the south, while in Asia Minor the rise of the Semitic Assyrians also depressed and weakened them, by breaking up the integrity of their territory. The whole of the south coast of the peninsula was occupied by Semitic invaders; the

Lydians and Cappadocians were of Syro-Phœnician origin; and Strabo speaks of structures of Semiramis as far north as Pontus. Their language, manners, and religion even, underwent radical changes—hence the great difficulty experienced in ascertaining their original characteristics. After being subjugated by Crœsus, they passed, on the dissolution of the Lydian monarchy, under the sway of Cyrus; and it is only from this date that they are brought within the pale of positive history. Their country formed part of the empire of Alexander, and subsequently belonged to the Syrian Seleucidæ, to the kings of Pergamum, and to the Romans, who obtained possession of it, 133 B.C.

The Phrygians had not a warlike reputation among the ancients, but though in later times commonly described as indolent and stupid, yet, like negroes, they were of a mystic and excitable disposition. Their religious orgies, accompanied by wild music and dancing, are frequently mentioned by classic writers, and appear to have exercised a very material influence on Hellenic worship. Cybele, 'the great mother of the gods,' was the chief Phrygian divinity; others were Sabazius (Dionysus), Olympus Hyagnis, Lityerses, and Marsyas.

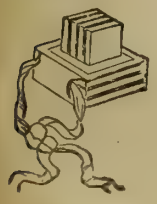
PHRY'NÉ, one of the most celebrated courtesans of antiquity, was the daughter of Epicles, and was born at Thespiæ in Bœotia. Her position in life was originally very humble, and she is said to have at one time earned a livelihood by gathering capers; but as the fame of her marvelous beauty spread, she obtained numerous lovers, who lavished gifts on her so profusely that she became enormously rich. In proof of this, the story goes that she offered to rebuild the walls of Thebes, if the citizens would allow her to place this inscription on them: 'Alexander destroyed them; Phryne, the courtesan, rebuilt them.' The Thebans declined the proposal. Her enemies accused her of profaning the Eleusinian mysteries. Summoned before the tribunal of the Heliasts, she was defended by the rhetorician Hyperides, one of her lovers, who, perceiving that his eloquence failed to convince the judges, threw back her veil, and displayed her naked shoulders and bosom She was immediately acquitted, and carried in triumph to the Temple of Venus. The famous picture of Apelles (q. v.)—the 'Venus Anadyomene'—is said to have been a representation of P. Praxiteles, also a lover of hers, employed her as a model for his 'Cnidian Venus.'

PHTHI'SIS. See CONSUMPTION.

PHULOW'DI, a town of India, in the Rajpoot state of Jodhpoor, in lat. 27° 8' N. Pop. 15,000.

PHULWARA TREE, See BASSIA.

PHYLA'CTERY (from Gr. *phylasso*, to guard), an amulet or charm worn by the Greeks against demoniac influences. Certain strips of parchment, inscribed with certain passages from the Scripture (Exodus xiii. 1—10, 11—16; Deuteronomy vi. 4—9, xi. 13—21), enclosed in small cases, and fastened to the forehead and the left arm (*Tefillin*)—also, in another form, to door-posts (*Mesusah*)—in use with the Jews, in imagined accordance with Exodus xiii. 9—16, &c., are also called in the New Testament phylacteries. The writing of these is in the hands of privileged scribes (*Soferim*) only, and many and scrupulous are the ordinances which they have to follow in the execution of this task. Only vellum of a very superior kind is to be used; the characters must be traced with the greatest care; no erasures or corrections are allowed; the lines and letters must be of equal length; &c. The case in which they are enclosed consists of several layers of calfskin or parchment. It may be observed, by the way, that not the wearing, but the exaggerated form of the phylacteries worn by some of the Pharisees, is inveighed against by Christ.



Phylactery.

PHYLLOSO'MA. See GLASS-CRABS.

PHYLLOXE'RA (Gr. *phyllon*, a leaf, and *xeros*, dry), a genus of insects of the order *Hemiptera*, sub-order *Homoptera*, the type of a family, *Phylloxeridæ*, allied to the *Aphis* (q. v.) and *Coccus* (q. v.) families. The *Phylloxeridæ* attach themselves to various plants, on the juice of which they feed, and which they often injure or destroy. *P. vastatrix* is the name given to an insect of this family, which, since 1865, has committed great devastation in the vineyards of France, and seems to have been imported from North America. Great numbers of this insect appear on the roots of the vine, and their puncturings are so numerous and incessant, that the roots can no longer supply nutriment to the plant, which accordingly fades and dies. The *P. vastatrix* has also been observed on the leaves of the vine. It measures, when fully grown, only about $\frac{1}{18}$d of an inch in length. It is provided with a long, slender proboscis, which lies in a groove in its under side. Yellow in summer, it becomes brown at the end of autumn. Another variety, the OAK P. (*P. quercus*), appears on the leaves of oak-trees.

PHYSA'LIA, a genus of *Acalephæ*, having an oval or oblong body, which consists in great part of an air sac, so that the creature floats on the surface of the sea, with numerous appendages of various kinds hanging from its under side. The shorter of these appendages are suckers, which are kept in constant motion for procuring prey, and which seem also to be employed in extracting nutriment from it, as the P. has no proper mouth nor alimentary canal. Among these shorter appendages, also, some seem to be devoted to the purpose of reproduction by germination. The longer appendages, which are extremely long—those of a P. five or six inches in length, being capable of extension to twelve or eighteen feet—are rope-like tentacles, possessing a remarkable stinging power, which is probably used for benumbing prey. It is a common trick with sailors to make a novice pick up a P., the beautiful colors of which always attract admiration. The stinging power is, however, such as not merely to produce local pain, but constitutional irritation.



Portuguese Man-of-War (*Physalis pelagica*).

It was at one time supposed that the P. has the power of expelling air from its bladder, and sinking at pleasure in the sea; but the observations of Mr. Bennett (*Gatherings of a Naturalist in Australia*) render it more probable that it always floats on the surface, and is driven about by the winds. The name *Portuguese Man-of-War* is often popularly given to the species of P., and particularly to *P. pelagica*. The *Physaliæ* inhabit the seas of warm latitudes, but shoals of them are occasionally driven to the British coast.

PHY'SALIS, a genus of plants of the natural order *Solanaceæ*, remarkable for the calyx, which becomes large and inflated after flowering is over, and incloses the ripened berry. The species are annual and perennial herbaceous plants and shrubs, natives of temperate and warm climates, and widely scattered over the world. The COMMON WINTER CHERRY (*P. alkekengi*) is a perennial, native of the south of Europe and great part of Asia, growing in vineyards and bushy places. It is not a native of Britain, but is pretty frequent in flower-gardens. The berries have a sweetish subacid taste; they are seldom eaten in Britain, but very generally in many parts of the continent of Europe. They are refrigerant and diuretic, and were formerly employed in medicine on account of these properties. The DOWNY WINTER CHERRY, or PERUVIAN GOOSEBERRY (*P. pubescens* or *P. Peruviana*), is an annual American species, densely clothed with down; with heart-shaped leaves, yellow flowers, and yellowish berries, which are eatable.



Love Apple (*Physalis edulis*).

PHYSE'TER. See CACHOLOT.

PHYSIC NUT (*Curcas*), a genus of plants of the natural order *Euphorbiaceæ*, having a 5-partite calyx, 5 petals, and 8—10 unequal-united stamens. The species are not numerous. They are tropical shrubs or trees, having alternate, stalked, angled or lobed leaves, and corymbs of flowers on long stalks; and notable for the acrid oil of their seeds. The COMMON P. N. of the East Indies (*C. purgans*), now also common in the West Indies and other warm parts of the world, is a small tree or bush, with a milky juice. It is used for fences in many tropical countries, and serves the purpose well, being much branched and of rapid growth. The seeds are not unpleasant to the taste, but abound in a very acrid fixed oil, which makes them powerfully emetic and purgative, or in large doses poisonous. The expressed oil, commonly called *Jatropha*

Oil, is used in medicine like croton oil, although less powerful; it is also used in lamps.—The FRENCH P. N., or SPANISH P. N. (*C. multifidus*), a shrub, native of the tropical parts of America, with many-lobed leaves, yields a purgative acrid oil, called *Oil of Pinhoen*. To this genus belongs the PINONCILLO (*C. lobatus*) of Peru, the seed of which is eaten when roasted, and has an agreeable flavor, although when raw it is a violent purgative. When an incision is made in the stem of this tree, a clear bright liquid flows out, which after some time becomes black and horney. It is a very powerful caustic, and retains this property for years.

PHY'SICAL GEOGRAPHY. See GEOGRAPHY.

PHYSI'CIANS, THE ROYAL COLLEGE OF (of London), was founded in 1518 by the munificence of Thomas Linacre, a priest and distinguished physician, who was born in 1460, and died in 1524. In 1518, through the influence of Cardinal Wolsey, he obtained from Henry VIII. letters-patent granting to John Chambre, himself, and Ferdinandus de Victoria, the acknowledged physicians of the king, together with Nicholas Halsewell, John Francis, Robert Yaxley, and all other men of the same faculty in London, to be incorporated as one body and perpetual community or college. They were permitted to hold assemblies, and to make statutes and ordinances for the government and correction of the College, and of all who exercised the same faculty in London and within seven miles thereof, with an interdiction from practice to any individual unless previously licensed by the President and College. Linacre was the first president, and held the office till his death in 1524. The meetings of the College were held at his house in Knightrider Street, which he bequeathed to the College, and which, until the year 1860, continued in the possession of that body. About the time of the accession of Charles I., the College, requiring more accommodation, took a house at the bottom of Amen Corner, which was subsequently purchased by Dr. Harvey, and in 1649 was given by him to his colleagues. This was the seat of the College till 1666, when it was destroyed by the great fire of London. A new College was then built in Warwick Lane, and opened in 1674 under the presidency of Harvey's friend, Sir George Ent; and here the meetings were held till 1825, when the present edifice in Pall-Mall East was opened under the presidency of Sir Henry Halford.

The reason for forming the incorporation, as set forth in the original charter, is 'to check men who profess physic rather from avarice than in good faith, to the damage of credulous people;' and the king (following the example of other nations) founds 'a college of the learned men who practise physic in London and within seven miles, in the hope that the ignorant and rash practisers be restrained or punished.' The charter further declares, that 'no one shall exercise the faculty of physic in the said city, or within seven miles, without the College license, under a penalty of £5;' that, in addition to the president, 'four censors be elected annually to have correction of physicians in London and seven miles' circuit, and of their medicines, and to punish by fine and imprisonment;' and that 'the President and College be exempt from serving on juries.' Four years later, in 1522—1523, an act was passed confirming the charter, and enacting that 'the six persons beforesaid named as principals and first-named of the said commonalty and fellowship, shall choose to them two men of the said commonalty from henceforward to be called and cleaped Elects, and that the same elects yearly choose one of them to be president of the said commonalty;' and further directing that, in case of a vacancy by death or otherwise, the surviving elects shall choose successors.

In 1540 an act was passed in which it was declared explicitly that 'surgery is a part of physic, and may be practised by any of the company or fellowship of physicians'—a doctrine which in later times has been totally repudiated by the collegiate body, who, until a few years ago, would not admit to their privileges a member of the Royal College of Surgeons, unless he formally resigned his surgical diploma. Other acts were passed in 1553, 1814, and 1858; the last known as 'the Medical Act,' providing for the granting of a new Charter to the College, which was obtained in 1862. Finally, in 1860, 'an Act to Amend the Medical Act' was passed, which repeals the provisions of the act of 1522—1523 as to the elects, and declares that the Presidency shall in future be an annual office, open to the Fellows at large, who shall also be the electing body. As at present constituted, the College consists of Fellows, Members, Licentiates, and Extra-Licentiates. The *Fellows* are elected from members of at least four years' standing, who have distinguished themselves in the practice of medicine, or in the pursuit of medical or general science or literature. The government of the College is vested in the President and Fellows only.

The present *Members* consist of persons who had been admitted, before 16th February 1859, licentiates of the College; of extra-licentiates who have complied with certain conditions; and of persons who have attained the age of 25 years, who do not dispense or supply medicine, and who, after being duly proposed, have satisfied the College 'touching their knowledge of medical and general science and literature,' and that they have 'been engaged in the study of physic during a period of five years, of which four years at least shall have been passed at a medical school recognized by the College.' No candidate is admissible if engaged in trade or connected with a druggist's business, or who even practises medicine in partnership with another practitioner, so long as the partnership lasts, or who refuses to publish, when required, the nature and composition of any remedy he makes use of. The *members* are alone eligible for the Fellowship. They constitute a portion of the corporation, in so far as they have the use of the library and museum, and the privilege of admission to all lectures; but they do not take any share in the government, or attend or vote at meetings. The examiners for the membership are the president and censors. The *Licentiates* are not members of the corporation; they have access to the museum, lectures, and reading-room, but are not allowed to take books away from the library; they may compound and dispense medicines for *patients under their own care;* and in their qualifications very much resemble those who have diplomas both from the College of Surgeons and the Apothecaries' Hall. They must be 21 years of age, and must have been engaged in professional studies for four years before being admitted to examination. The fee for admission as a Fellow is 30 guineas, exclusive of stamp-duty; the Member's fee is also 30 guineas, and the Licentiate's 15 guineas.

The following bye-laws of the College should be generally known. 1. No Fellow of the College is entitled to sue for professional aid rendered by him. This bye-law does not extend to Members. 2. No Fellow, Member, or Licentiate of the College is entitled to assume the title of Doctor of Medicine unless he be a graduate in medicine of a university. 3. No Fellow or Member of the College shall officiously, or under color of a benevolent purpose, offer medical aid to, or prescribe for, any patient whom he knows to be under the care of another legally qualified medical practitioner.

PHYSICIANS OF EDINBURGH, THE ROYAL COLLEGE OF, had its rise in 1617, in an attempt to incorporate the practitioners of medicine, and raise the standard of the profession. King James I. of England looked favorably on the proposal, and granted an order for its establishment; Cromwell in like manner issued a patent in its favor, but both were frustrated by the religious dissensions of the times, and it was not until 1681 that the body became incorporated under a charter from Charles II. A new charter with many important provisions was issued in 1861. To the Physicians belongs the honor of having suggested in 1725 the plan of an Infirmary in Edinburgh for the sick poor, which has developed into the present magnificent institution. From the first they undertook its medical charge gratuitously. The Royal Edinburgh Asylum for the Insane at Morningside was also first suggested by them in 1791. The College, which in 1879 had over 160 fellows, possesses a library of upwards of fifteen thousand volumes; also a valuable and interesting Museum of Materia Medica. An important arrangement was made in 1859 between the Edinburgh College of Surgeons (q. v.) and that of the Physicians, which had long been on hostile terms, making it competent for the two to combine, in order, by a joint examination, to give a double qualification, embracing medicine and surgery.

PHYSICS, or PHYSICAL SCIENCE (Gr. *physikos*, natural), comprehends in its widest sense all that is classed under the various branches of mixed or applied mathematics, natural philosophy, chemistry, and natural history, which branches include the whole of our knowledge regarding the material universe. In its narrower sense, it is equivalent to Natural Philosophy (q. v.), which, until of late years, was the term more commonly used in Great Britain, and denotes all knowledge of the properties of bodies as bodies, or the science of phenomena unaccompanied by essential change in the objects; while chemistry is concerned with the composition of bodies, and the phenomena accompanied by essential change in the objects; and natural history, in the widest sense, includes all the phenomena of the animal, vegetable, and mineral world. The application of the term *Physic* to a branch of this last—viz., the science of medicine—is peculiar to the English language.

PHYSIO'GNOMY (Gr.), the art of judging of the character from the external appearance, especially from the countenance. The art is founded upon the belief, which has long and generally prevailed, that there is an intimate connection between the features and expression of the face and the qualities and habits of the mind; and every man is conscious of instinctively drawing conclusions in this way for himself with more or less confidence, and of acting upon them to a certain extent in the affairs of life. Yet the attempt to reach this conclusion by the application of certain rules, and thus to raise the art of reading the human countenance to the dignity of a science, although often made, has never yet been very successful. Comparisons have been instituted for this purpose between the physiognomies of human beings and of

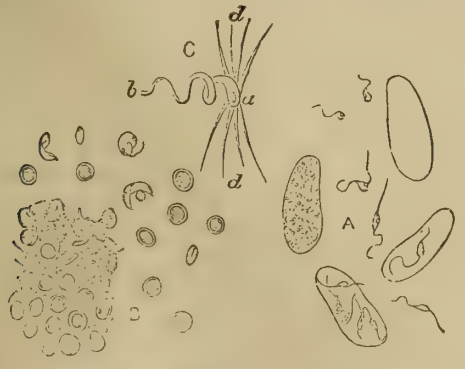
species of animals noted for the possession of peculiar qualities, as the wolf, the fox, &c. This was first begun by Della Porta, a Neapolitan, who died in 1615, and was afterwards carried further by Tischbein. The subject of physiognomy was eagerly prosecuted by Thomas Campanella; and later and more thoroughly by Lavater (q. v.).

PHYSIOGRAPHY, a term formerly used of a branch of mineralogy, was adopted by Professor Huxley as a convenient name for an exposition of the principles that underlie physical geography, and including the elements of physical science. P. is thus understood to involve a compendious discussion of gravitation, heat, the composition of the crust of the earth, the movements of the sea, the phenomena of the atmosphere, and many cognate subjects, treated in this work under separate heads.

PHYSIOLOGY (Gr. *physis*, nature; *logos*, a discourse) is the science which treats of the phenomena which normally present themselves in living beings, of the laws or principles to which they are subject, and of the causes to which they are attributable. It is therefore a branch of Biology, the science which investigates the nature and relations of living bodies. As dealing with *functions*, P. is distinguished from morphology, the branch of biology which takes cognizance of the structure of the parts or organs. According as it has to do with one or other of the two great groups of organic beings, Physiology is *Animal Physiology* or *Vegetable Physiology*. *General Physiology* includes the structure and chemical composition of bodies, though anatomy and histology precede Physiology in the order of the sciences. *Comparative Physiology* deals with the resemblances and diversities between the vital actions of various groups and species. *Special Physiology* treats of the vital phenomena of particular species, *Human Physiology* being, of course, restricted to the human subject. The functions expounded by P. are usually regarded as falling under three main heads, viz. those of (1) Nutrition; (2) Innervation; and (3) Reproduction. The principles of *Vegetable Physiology* are in this work treated under that head; the various portions of *Animal Physiology*, especially human, will generally be found discussed along with the anatomy of the organs concerned, under such heads as DIGESTION, CIRCULATION, RESPIRATION, NUTRITION; BRAIN, NERVOUS SYSTEM. SPINAL CORD, AUDITORY NERVE, EAR, NOSE, &c.; REPRODUCTION, and many others.

PHYTOLA'CCA, a genus of exogenous plants of the natural order *Phytolaccaceæ*. This order contains about 70 known species, half-shrubby and herbaceous plants, natives of warm parts of Asia, Africa, and America, and is nearly allied to the order *Chenopodiaceæ*, and to the *Polygoneæ*. The genus *Phytolacca* has for its fruit a berry with 8—10 cells, each cell one-seeded. *P. decandra*, the Poke or Pocan, a native of North America, now naturalized in some parts of the south of Europe, is sometimes cultivated for its young shoots, which, when blanched, are eaten like asparagus, though the leaves are acrid. The root is an emetic, and is applied externally for itch and ringworm. A preparation of the berries is used in rheumatism and syphilis, and for the adulteration of wine.—The young shoots of *P. acinosa* are boiled and eaten in the Himalayas, those of *P. octandra* in Cayenne, and a Chinese species has recently been introduced into British gardens under the name of *P. esculenta*.

PHYTOZO'A (Gr. *phyton*, a plant; *zoon*, an animal), also called *Antherozoids*, are minute bodies produced amidst a mucilaginous



Phytozoa:
(From Carpenter on the *Microscope*.)
A. Antherozoids of *Fucus platycarpus* (a sea-weed) some of them free, others still included in their antheridiol cells.
B. Cellular contents of an antheridium of *Polytrichum communi* (a moss), mature and discharging the antherozoids.
C. Antherozoid of *Pteris serrulata* (a fern) showing *a*, its large extremity; *b*, its small extremity; *d*, *d*, its cilia.

fluid in the antheridia of many cryptogamous plants (Algæ, Hepaticæ, Mosses, Ferns), which are either aquatic or delight in moist situations. In some many-celled antheridia of the higher cryptogamous plants, each cell is devoted to the production of a single phytozoon. When the antheridium is mature, and bursts, the phytozoa move for a short time by means of cilia—a provision, apparently, for their reaching the pistillidia, the spores contained in which—according to an opinion rapidly gaining ground among botanists—they are destined to fertilize. Great diversities exist in the phytozoa of different cryptogamous plants. The annexed figure will convey a better notion of them than any mere description. Cryptogamous plants, which as lichens, live in dry situations, have no phytozoa, although it is supposed that they have organs destined to the same purpose, but destitute of the power of motion by cilia.

PIACE'NZA, a city of Northern Italy, in the province of the same name, on the right bank of the Po, 2 miles below the confluence of the Trebbia with that river, and 36 miles west-north-west of the city of Parma. Beautifully situated on a fine plain, confined on the south by well-cultivated hills, the city itself is gloomy and desolate in appearance. Its streets are broad and regular—that called the *Stradone* is one of the most beautiful in Italy—but many of them are unfrequented and grass-grown. It contains numerous palaces, and about 50 churches. The cathedral, an edifice in the ancient Lombard style, founded in the 11th c., is famous for the richly curious and grotesque character of its internal decorations, for its numerous sculptures, its paintings, and for a number of frescoes of great grandeur, by Caraccio, Guercino, and others. The Church of Sant' Antonio, the original cathedral of P., was founded in 324 A.D., but has been several times rebuilt. Among the other principal buildings, are the Palazzo Farnese, founded in 1558, and once a sumptuous edifice, but which has been long in use as a barrack; the Palazzo del Commune, and the Collegio dei Mercanti are fine monuments of art. The principal square is the Piazza Cavalli, so called from the colossal bronze equestrian statues of the dukes Alessandro and Rannuccio Farnese. This town occupies by far the most important position, in a military point of view, in Italy—a fact which was fully appreciated by those who fortified it with solid walls and a strong castle, which, till 1859, were guarded by the Austrians. On being forced from the city by the war of 1859, the Austrians did not destroy the works, and the Italian government has strengthened and extended them by the formation of externally defended works, and of a formidable intrenched camp, which unites and protects the other works on the right bank of the Po. Manufacturers of silks, fustians, linens, hats, &c., are carried on to some extent. The population, which had almost kept stationary during the previous ten years, was 34,925 in 1881.

P., called by the Romans *Placentia*, on account of its pleasing situation, is first mentioned in 219 B.C., when a Roman colony was settled there. In 200 B.C., it was plundered and burned by the Gauls, but rapidly recovered its prosperity, and was long an important military station. P. was the western terminus of the great Æmilian road, which began at Ariminum on the Adriatic. In later history, it plays an important part as one of the independent Lombard cities.

PI'A MA'TER. See NERVOUS SYSTEM.

PIA'NA De' GRE'CI, a town of Sicily, 10 miles south-west of Palermo. It was the chief colony of the Albanians who settled in Sicily in the 15th c. Pop. 7500.

PIA'NO (Ital. *soft*), abbreviated *p*, is used in music to denote that the strain where the indication occurs is to be played with less than the average intensity of force. *pp*, or *ppp. pianissimo*, signifies very soft, or as soft as possible. In contra-distinction from *piano*, *forte*, abbreviated *f*, is used to denote a more than usual force; and *ff*, or *fff*, for *fortissimo*, a still greater degree of force. The gradual transition from *piano* to *forte* is indicated by the sign $<$; from *forte* to *piano* by the sign $>$.

PIANOFO'RTÉ (Ital. *piæno*, soft, and *forte*, loud), a stringed musical instrument, played by keys, developed out of the clavichord and Harpsichord (q. v.), from which the pianoforte differs principally in the introduction of hammers, to put the strings in vibration, connected with the keys by a mechanism that enables the player to modify at will the intensity of the sounds; whence the name of the instrument.

The idea of the pianoforte was conceived independently about the same time by three persons in different parts of Europe—a German organist of the name of Schröter; Marius, a French harpsichord-maker; and Bartolomeo Cristofali, a harpsichord-maker of Padua. Priority in point of invention (1714) is due to the Italian maker. Schröter's discovery was followed up in Germany by Silbermann of Strasburg, Spät of Ratisbon, Stein of Augsburg, and others. The first pianoforte seen in England was made at Rome by Father Wood, an English monk there. A few German manufacturers and workmen settling in London, gave an impetus to the new instrument. The English pianoforte has been brought to its present state of perfection by Broadwood, Stodart, Collard, Wornum, Hopkinson, and others. Erard and Petzold

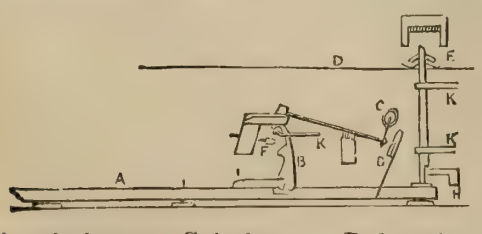
made many improvements in France; Germany has long been famous for its pianos; American makers have lately become well known. The compass of the early pianoforte was, like that of the harpsichord, 4 to 5 octaves, and has gradually increased to 6¾, or 7 octaves, or occasionally more.

The most natural of the various forms which the instrument assumes is that of the grand pianoforte, derived from the harpsichord, with the strings placed horizontally, and parallel to the keys. The strings are stretched across a compound frame of wood and metal, composed of bars, rods, and strengtheners of various kinds —appliances necessary to resist the enormous tension. This framework includes a wooden sound-board. The mechanism by which hammers are connected with the keys, is called the *action* of the instrument. In the earliest pianofortes, the hammer was raised from below by a button attached to an upright wire fixed on the back-end of the key. The impulse given to the hammer caused it to strike the string, after which it immediately fell back on the button, leaving the string free to vibrate. This was called the *single action*. As the hammer, when resting on the button with the key pressed down, was thus necessarily at a little distance from the string, the effectual working of this action required that a certain impetus should be communicated to the hammer to enable it to touch the string. Hence it was impossible to play very piano, and it was found that if the hammer was adjusted so as to be too close to the string when resting on the button, it was apt not to leave the string till after the blow had been given, thereby deadening the sound. This defect was remedied by a jointed upright piece called the *hopper*, attached to the back-end of the key, in place of the wire and button. When the key was pressed down, the hopper, engaging in a notch in the lower side of the hammer, lifted it so close to the hammer, that the lightest possible pressure caused it to strike; and at this moment, when the key was still pressed down, the jointed part of the hopper, coming in contact with a fixed button as it rose, escaped from the notch, and let the hammer fall clear away from the string.

To prevent the hammer from rebounding on the string, a projection called the *check* was fixed on the end of the key, which caught the edge of the hammer as it fell, and held it firmly enough to prevent it from rising. A necessary part of the action is the *damper*, which limits the duration of each particular note, so as to cause it to cease to sound as soon as the pressure is removed from the key. It consists of a piece of leather resting on the top of the string, and connected with the back-part of the key by a vertical wire. When any key is pressed down, its damper is raised off the string, so as to allow the sound produced to be clear and open; but immediately on the finger being lifted off the key, the damper-wire falls, and the damper again presses on the string, muffling and stopping the vibration. The whole range of dampers may, when required, be raised by the use of the damper pedal, so as to prolong the sound of one note into another.

One further frequent and important addition to the action may be alluded to. In the mechanism above described, the key must rise to its position of rest before the hopper will again engage in the notch of the hammer for another stroke; hence, a note cannot be repeated until time has been allowed for the full rise of the key. The *repetition action* is a contrivance, varying in different instruments, for getting rid of this defect, by holding up the hammer at a certain height while the key is returning.

Great difference of detail exists in the actions of different makers. Some are more complicated than others; but in all are to be found the same essential parts, only modified in shape and arrangement. The subjoined figure represents one of the simplest grand pianoforte actions now in use. A is the key, B the lever



which raises the hammer, C the hammer, D the string, and E the damper; F is the button which catches the lever after it has struck the hammer, G the check, H the damper pedal-lifter, I the spring, and K, K, K are rails and sockets.

Formerly, the strings of the pianoforte were all of thin wire; now, the bass-strings are very thick, and coated with a fine coil of copper-wire; and the thickness, strength, and tension of the strings all diminish from the lower to the upper notes. A grand pianoforte has three strings to each of the upper and middle notes, and now, generally, only two to the lower notes, and one to the lowest octave. When the soft pedal is pressed down, the hammers are shifted sideways, so as to strike only two strings instead of three, or one string instead of two.

Besides the grand, the kinds of pianoforte in use are the square, in which the strings are placed still in a horizontal position, but obliquely to the keys; and the upright, in which the strings run vertically from top to bottom of the instrument. The difference in form necessitates alterations in the details of the action, but the general principle is the same.

The pianoforte has in modern times attained a widespread popularity beyond that of any other musical instrument. It possesses nearly all the powers of expression of any otheir instrument; on no other except the organ can we execute such complete successions of harmonies; no other represents the orchestra so well, with the advantage that the various parts adapted to it are brought out by the same performer. In all cities of the civilized world, there are numerous manufacturers of the pianoforte, employing multitudes of workmen; and even in the secondary towns of Europe, the number of makers is daily increasing. In England, the manufacturers who have for some time past enjoyed the highest repute are Messrs. Broadwood, Collard & Co., and Erard; but other makers are rapidly approaching them in excellence. Till lately, the German makers adopted a much less perfect action than the English, producing a very different touch and tone; but they are now largely using the English action, which is spreading over the continent. Music for the pianoforte is written in two staves, and on the treble and bass cleffs. Many of the most eminent musicians have devoted themselves to composing for the pianoforte, and some composers of note, as Hummel, Czerny, Kalkbrenner, Chopin, Thalberg, Liszt, and Heller, have almost entirely confined themselves to that instrument. See Rimbault, *The Pianoforte* (1860); and Grove's *Dictionary of Music and Musicians*.

PI'ARISTS, called also familiarly *Scolopini*, or 'Brethren of the Pious Schools,' a religious congregation for the education of the poor, founded at Rome in the last year of the 16th century. The originator of this institute was a Spanish priest, named Joseph of Calasanza, who, while in Rome, was struck with the imperfect and insufficient character of the education which then prevailed, even for the children of the higher classes, and conceived the idea of organizing a body for the purpose of meeting this want, which the Jesuit Society had already partially supplied. The school which he himself, in conjunction with a few friends, opened, rapidly increased in number to 100, and ultimately to 700 pupils; and in 1617, the brethren who, under the direction of Joseph, had associated themselves for the work, were approved as a religious congregation by Paul V. (q. v.), who entered warmly into this and all other projects of reformation. In 1621, Gregory XV. approved the congregation as a religious order. The constitution of the order was several times modified by successive popes, down to the time of Innocent XI. Its field of operations has, of course, been confined to European countries; and at present it can reckon communities in Italy, Austria, Spain, Hungary, and Poland. In Italy, during the revolutionary wars, the P. received into their ranks many members of the suppressed Society of the Jesuits. In Spain, their establishments were spared, on the general suppression of religious orders in 1836. In Poland, eleven houses still were in existence in 1832. The number of members in Hungary is said to be about 400, and the order is also found in the German and Slavonic parts of the Austro-Hungarian Empire.

PIA'SSABA, or PIACABA, a remarkable vegetable fibre which, during the last twenty years, has become an article of much importance in this country. It is procured from Brazil, chiefly from the ports of Para and Maranham, and is produced by one or more species of palm. That which furnishes the greater part is the Coquilla-nut Palm (*Attalea funifera*); but Mr. Wallace states that much of it is procured from a species of *Leopoldinia*, which he has named *L. piassaba*. The fibre is produced by the stalks of the large fan-like leaves. When the leaves decay, the petioles or stalks split up into bundles of cylindrical fibres of a dark-brown color, and of a hard texture, varying in thickness from that of a horse-hair up to that of a small crow-quill. This material has been found of great utility in making brushes of a coarse kind, particularly those required to sweep the street; and for this purpose they have almost superseded birch-brooms, split whale-bone brushes, and other similar means for scavengers' work. The coarsest fibres are best for such purposes, and the finer ones are found very valuable for finer kinds of brushes.

PIA'STRE (Gr. and Lat. *emplastron*, a plaister; transferred in the Romanic languages to anything spread out or flattened, a plate, a coin), a Spanish silver coin which has been extensively adopted by other nations. It was formerly divided into 8 silver reals, and hence was termed a *piece of eight*, which name was invariably applied to it by the Bucaneers of the Spanish Main. The present Spanish piastre, commonly known as the *peso duro*, *peso fuerte*, or, briefly, *duro*, is the standard of the money system, and is equivalent to about 4*s*. 3*d*. of our money. It is divided into 20 copper reals (*reales de vellon*). In the Levant, the piastre

is called a *colonnato*, on account of the original coins, which were struck for use in Spanish America, bearing two columns on the reverse side.—The Italian piastre, or *scudo*, was an evident imitation of the Spanish coin, and was exactly equal to it in value.—The piastre, peso, or dollar in use in Mexico and Cuba, as well as in Chili, Peru, Uruguay, and other South American states of Spanish origin, have approximately the same value (4*s*. or 4*s*. 2*d*.) The Dollar (q. v.) of the United States of North America was adopted from the Spanish piastre, but is a fraction less in value, owing, it is said, to an error in the original estimate.

The coin known as the Turkish piastre is not an imitation, but is an independent national silver coin, which in 1753 was worth about 3*s*. 6*d*. sterling, but has since gradually and rapidly deteriorated, till at the present day it is equal to not more than 2⅛*d*. of our money.—The Egyptian piastre is worth about 2½*d*. sterling. Pieces of 2, 5, 10, and 20 piastres are struck in silver, and of 50 and 100 in gold; the piece of 100 piastres being in Egypt the exchange at par for £1 sterling.

PIATIGORSK (*Pjätigorsk*), a town in Caucasia, Russia, celebrated for its mineral springs. Though in the center of a bare and uninteresting plain, its situation on the slope of Mashùka, an isolated mountain upwards of 3000 feet high, gives it an imposing appearance, and the higher parts of the town command a noble panoramic view of Mount Elburz and the more distant Caucasus. The principal bath-houses are well sheltered, and are cleanly and comfortably fitted up. Pop. (1880) 13,600.

PIATRA, a town of Moldavia, 62 miles west-south-west from Jassy, on a branch of the Sereth. There are paper-mills here. Pop. about 20,000.

PIA'ZZA (more fully *P. Armerina*), a town of Sicily, 17 miles east-south-east from Caltanisetta. The chief trade is in corn, oil, fruits, and other agricultural produce. Pop. 16,000.

PIAZZI, GIUSEPPE, a celebrated astronomer, was born at Ponte in the Valteline, July 16, 1746. He was received into the order of the Theatins at Milan in 1764; and studied in that city, and subsequently in the houses of the same order at Rome and Turin. Summoned to the professorial chair of Philosophy at Genoa, he so alarmed the Dominicans by the freedom and boldness of his opinions, that he was removed to Malta, where, in 1770, he became Professor of Mathematics in the newly-founded university. On the breaking up of this seminary, he returned to Italy, and after teaching philosophy in the Nobles' College at Ravenna, he went to Rome, where he became Professor of Dogmatic Theology in the institution of San Andrea della Valle. He was transferred in 1780 to the chair of Mathematics in Palermo, where, with the aid of government, he established an observatory, which was put in working order in 1789. The first results of his observations were, the rectification of some errors in the estimation of the obliquity of the ecliptic, the aberration of light, the length of the tropical year, and the parallax of various heavenly bodies; these results were published in 1792. P. had now attained a European reputation, which was further heightened by his discovery, on the night of 1st January 1801, of a new planet, the first known of the great group of planetoids between Mars and Jupiter. P. was only able to give a description of it to some of the German and Italian astronomers, when it disappeared; Gauss (q. v.), however, rendered certain the fact of its being a planet. P. named it Ceres, after the ancient goddess of Sicily, to which country he was sincerely attached. In 1803, he published a map of the fixed stars, far superior to any before published, the result of ten years' observations: the work was crowned by the Institute of France. In 1814, appeared a new and more complete catalogue (containing 7646 stars), for which he was again rewarded with a prize from the French Institute. He also made researches into the nature of comets, and devoted the later years of his life to the improvement of public education in Sicily. He wrote a number of works, of which, besides the catalogues of stars above mentioned, the *Lezioni Elementari di Astronomia* (Palermo, 1817) is the chief. He also wrote many memoirs for the various scientific societies of Europe. P. died, 22d July 1826, at Naples.

PI'BROCH (*piobaireachd*, piping), music played on the bagpipe, which has a wonderful power in exciting the martial instincts and hilarity of the Highlanders. Its rhythm is so irregular, and its notes in the quicker parts so much jumbled together, that a stranger has difficulty in following the modulations or reconciling his ear to them. The earliest mention of the military music of the bagpipe is in 1594, at the battle of Balrinnes; indeed, prior to that period, the bagpipe can hardly be looked on as a national instrument of Scotland. There are appropriate pibrochs belonging to various clans and districts, but some of these may not be older than the beginning of last century. One of the oldest known pibrochs is called the 'Battle of Harlaw,' but it may be doubted whether it was contemporary with that event (1411). In the ballad account of that battle, there is mention of trumpets and horns, but none of the bagpipe; and the pibroch style of music has so obvious a relation to the bagpipe, that it is difficult to suppose that it preceded the use of that instrument. According to Sir Walter Scott, the connoisseurs in pipe-music affect to discover in a well-composed pibroch the imitative sounds of march, conflict, flight, pursuit, and all the current of a heady fight. Many remarkable instances have been recorded of the effect of the pibroch on the Highlanders. At the battle of Quebec, in April 1760, whilst the British troops were retreating in confusion, the pipers were ordered to strike up a favorite pibroch, and the result was that the Highlanders, who were broken, rallied the moment that they heard the music, and formed with great alacrity in the rear.

PI'CA. See MAGPIE.

PICA. See MORBID APPETITES.

PICA. See PRINTING.

PICARDY (PICARDIE), an ancient province in the north of France, was bounded on the W. by the English Channel, and on the E. by Champagne. The name does not occur till the 13th century. The capital of this province was Amiens. The territory now forms the department of *Somme*, and portions of the departments of *Aisne* and *Pas-de-Calais*.

PI'CCOLO (Ital. *flauto piccolo*, small flute), a flute of small dimensions, having the same compass as the ordinary flute, while the notes all sound an octave higher than their notation. In joyous as well as violent passages, this instrument is sometimes very effective in an orchestra.

PICCOLOMINI, one of the oldest and most distinguished families of Italy, was originally settled at Rome, but afterwards removed to Siena, and subsequently obtained possession of the duchy of Amalfi. It has produced numerous celebrated *littérateurs* and warriors, one pope (PIUS II.), and several cardinals. One of the most distinguished in the history of this family was OTTAVIO P., the first Duke of Amalfi, born in 1599, and fifth in direct descent from Pope Pius II. He early entered the Spanish military service, and after taking part in the Milanese campaigns, was sent as captain with a Florentine cavalry regiment to aid Ferdinand II. against the Bohemians. As a cavalry leader, he distinguished himself; and from the regiment of cuirassiers under his command issued the death-dealing bullet to Gustavus Adolphus. In 1634, he was placed under the orders of Wallenstein, who took a great fancy to him, and confided to him his secret designs against the emperor; P.: however, communicated these designs to the emperor, and received, as a reward for his fidelity, a part of Wallenstein's estates. During the remainder of this year, he was actively engaged against the Swedes, and greatly distinguished himself in the first battle of Nordlingen. In the following season he was sent with 20,000 troops to aid the Spaniards in the Netherlands, where the French and Dutch were carrying all before them.

P. speedily drove out the French, but his success against the Dutch was not so marked. He was withdrawn by the emperor in 1640 to stay the Swedes, who, under Baner, were threatening the hereditary possessions of Austria; and his success against these invaders in Bohemia and the Palatinate, though damped by the defeat inflicted on him in Silesia by Torstensohn, induced the king of Spain to entreat the emperor to send him again to the Netherlands to take the command of the Spanish troops. But his success was not nearly so decisive as before, the prestige of the Spanish infantry having been completely destroyed by the great Condé at Rocroi (19th May 1643). P., however, was again successful against both the French and Dutch till 1648, when he was anew summoned to Germany to encounter the victorious Swedes; but after a brief campaign, the peace of Westphalia (1648) put an end to his career. He was created a field-marshal by the emperor, and was sent as plenipotentiary to the Congress of Nuremberg (1649), and soon after was raised to the high dignity of a prince of the empire. The king of Spain conferred upon him the order of the Golden Fleece, and bestowed upon him in fief the duchy of Amalfi, which had previously belonged to his family. P. died at Vienna, 11th August 1656, leaving no children; his son Max, who figures in Schiller's *Wallenstein*, is only a poetical fiction. His fame as a warrior and general is somewhat tarnished by his cruel treatment of a number of Hessian and Luneburger prisoners in 1640.

PICHEGRU, CHARLES, a French general, was born 16th February 1761, at Arbois, in the department of Jura, France. Though of humble parentage he succeeded in gaining admission to the college of his native town, where, and subsequently at Brienne, he received a thorough education. He was specially distinguished in mathematics, and had some thoughts of devoting himself to teaching as a profession; but the advice of Father Perault induced him to enter an artillery regiment in 1783, and he had risen to the rank of a lieutenant when the Revolution broke out. P. became an ardent democrat; joined the army of the Rhine, and by his brilliant soldierly qualtities soon attracted gen-

eral attention. In 1793, he became commander-in-chief of the army, and in conjunction with the army of the Moselle under Hoche, repeatedly defeated the Austrians, took from them many important towns, as Gemersheim, Spire, Worms, &c., and established himself in the Palatinate; while, after the arrest of his coadjutor Hoche, his success at the head of the combined Rhine and Moselle armies was not less decided. The rapidity and boldness of his manœuvres, when he took the command of the army, of the north, in 1794, disconcerted the allies; and before long they were compelled to retreat beyond the Meuse. After a brief respite, P. crossed this river, driving the British before him; and by February 1795, had completed the conquest of the Dutch towns and provinces, ending the campaign by capturing the enemy's fleet (which had been frozen in). He next visited Paris, and while there, suppressed an insurrection of the faubourgs (1st April 1795); but soon afterwards returned to the army, which was now opposed to the Austrians on the western frontier, and for some time displayed his usual skill and energy, crossing the Rhine in the face of the enemy, and capturing Mannheim, the chief fortress, on its banks.

But the anarchy which he had found at Paris, combined with the flattering promises and bribes held out to him by the Prince of Condé, converted P. into a secret partizan of the Bourbons. His remissness, the unwonted folly and awkwardness of his military manœuvres, though prearranged with the Austrian generals, was not suspected till he suffered himself to be shamefully defeated at Heidelberg, and then retreated, leaving Jourdain (q. v.) without support, thus compelling the latter also to retire. The suspicions of the Directory were now aroused, and being confirmed by the seizure of P.'s correspondence, he was immediately superseded by Moreau (q. v.), and retired to his native town, where he lived till 1797, when he was elected one of the council of Five Hundred. He soon became president; but continuing his intrigues with the Bourbons, he was arrested, and subsequently transported to Cayenne. Escaping in July 1798, he made his way to Surinam, whence he sailed for England. He now entered heart and soul into the Bourbon conspiracy along with George Cadoudal (q. v.), the two Polignacs, De Rivière, and others, the primary object being the assassination of the First Consul. The conspirators secretly reached Paris, and there P. attempted to persuade Moreau, who was also a royalist, to join with them, but without success. But the plans of the conspirators were soon known to the police; and an intimate friend of P., with whom he resided, sold the secret of his retreat to the police for 100,000 crowns. P. was surprised in his sleep, and carried off naked to the Temple, where he was found dead in his bed on the morning of 6th April 1804. The Royalists have endeavored to fasten a charge of private assassination on Napoleon, but it is more generally believed that P. strangled himself.

PICHI'NCHA, an extinct or dormant volcano in the west cordillera of the Andes, in Ecuador, about ten miles north-west of Quito. It is of irregular form, and is 15,924 feet in height. Around the crater are two other peaks of nearly equal elevation. There have been five eruptions since the Spanish Conquest, the last in 1660. That in 1566 covered Quito with three feet of ashes and stones. P. was one of the many peaks of the Andes of Ecuador ascended in 1879–80 by Mr. Edward Whymper.

PICHLER, KAROLINE, a German novelist, was born in 1769 at Vienna. Her maiden name was Greiner. In 1796, she published her first work, *Gleichnisse* (1800). The success which attended the appearance of *Olivier* (1802), *Leonora*, and *Ruth* encouraged her to try a more ambitious line of composition. In 1808 appeared *Agathokles*, which, according to some critics, is the best of her novels. In this work, she endeavored, in opposition to the views expressed by Gibbon, in his *History of the Decline of the Roman Empire*, to depict the ennobling effect of Christianity on the human mind. At the suggestion of Hormayr and other literary friends, who had been struck by the success with which she threw herself into the spirit of the times of which she wrote, she turned her attention to the task of popularizing the German history, with the view of fostering a more general feeling of patriotism. Among her best works of this kind, which appeared between 1811 and 1832, and the earlier of which preceded Scott's greatest historical novels, we may instance *Grafen von Hohenberg* (Leip. 1811); *Die Belagerung Wien's von* 1683 (Wien, 1824); *Die Schweden in Prag* (Wien, 1827); and *Henriette von England* (Wien, 1832); while of her social novels the following are among the most popular: *Frauenwürde* (Wien, 1808); *Die Nebenbuhler* (Wien, 1821); and *Zeitbilder* (Wien, 1840). She died at Vienna in 1843. Her dramas were failures, and in her novels there is not a little tedious diffuseness, a remark which applies with equal truth to her autobiography, which appeared at Vienna in 1844 under the title of *Denkwürdigkeiten a. m. Leben*, and formed part of the edition of her collected works, published at Vienna in 1845 in sixty volumes.

PI'CKET, in Military Language, has several significations. It applies to a stake shod and sometimes ringed with iron, driven into the ground, and used to sustain ropes, which mark off sections in a camping-ground, or for tying horses to. These pickets are four or five feet long. Short pickets about eight inches long are employed as anchors for the ropes extending tents.—In Fortification, pickets are pointed stakes for pinning gabions together and to the ground; also, when pointed at both ends, and laid close together, of different lengths, and in a position inclined towards the front, they form a powerful obstruction to the advance of a storming-party, having a great effect in breaking a line of soldiers.—*Picket* was formerly a military punishment, where the culprit was held by the raised arm in such a position that his whole weight fell on one foot, which was supported on a picket with a blunt point. The time the man thus stood was proportioned to the offence. The punishment became after a few moments, extremely painful: it has long been discontinued on sanitary grounds.—The word *picket*, when applied to a small guard of men, is ordinarily written *Piquet* (q. v.).

PICKLES. Although the term *pickled* is applied to animal substances, such as beef, pork, fish, &c., preserved in salt, yet pickles are generally understood to be the various parts of vegetables preserved in vinegar. The process employed is first to wash the articles intended for pickles in clean cold water, and afterwards to soak them for a few days in a strong solution of salt in water. They are next taken out, and if fruits or roots, dried in a cloth; but if vegetables, such as cauliflower, &c., they must be well drained, and then placed in the vessels intended to hold them, a few peppercorns, or any other spice which is suitable, being sprinkled in from time to time. When the vessel is so far filled that it will hold no more, boiling vinegar is poured in until it is quite full, and tightly covered up. Many persons prefer to boil the spices, of whatever kind used, in the vinegar; and some add the vinegar cold to such vegetables or fruit as are of a naturally soft substance, because, except in the case of green walnuts, and one or two other fruits, extreme softness is objectionable in pickles.

When the materials to be pickled are naturally green, as in the case of gherkins or small cucumbers, French beans, &c., it is considered very desirable to preserve their color as much as possible; and it is sometimes very successfully accomplished by steeping vine, cabbage, spinach, or parsley leaves in the vinegar, by which their color is imparted through the vinegar to the pickles. But this requires great care and patience, more, indeed, than is generally thought worth applying to it, and dealers consequently resort to very reprehensible methods of coloring their pickles, such as boiling the vinegar in copper vessels, and thereby forming an acetate of copper, which is green; or even directly adding that salt to the pickles. Many serious accidents have resulted from the presence of this poison.

The principal pickles made in this country are *cabbage*, almost always made from the red variety; to this is frequently added slices of beet-root, which are an agreeable addition, and improve the color. The celebrated Spanish pickle is a mixture of the red cabbage and slices of the large Spanish onion. Some housewives, in their efforts to outrival their neighbors, add a little cochineal to improve the color. The spices considered most suitable for pickled cabbage are white and black peppercorns, ginger and mace.—*Cauliflowers*. Only the flower portion, with its white branches, is used, and in other respects they are treated as cabbage.—*Gherkins*, or very young cucumbers. These require the same spices as the cabbage; but much care is required to keep as well as possible their green color. This pickle is the one which British cooks and housewives most pride themselves upon making well; and almost every one has some particular plan for its preparation. A very much approved method is to soak the gherkins in a brine, composed of six ounces of salt to the quart of water for twenty-four hours, then drain or dry in a cloth, place them in jars, and pour in the pickle, composed of vinegar, with an addition to each quart of one ounce salt, black peppercorns a quarter of an ounce, one ounce of ginger slightly bruised, one or two blades of mace, and a dozen bay-leaves. After soaking two days, they are set on the fire until they simmer, and then replaced in the jars, which must be well corked, and covered with skin, to exclude the air.—

French Beans.—The young green pods are prepared in the same way as gherkins.—*Onions and Eschalots* are carefully peeled, and, after two days' steeping in brine, covered with boiling vinegar, to which the spice, usually black pepper corns, has been added. A small variety of onion, called the silver-skin, is generally used.—*Walnuts*.—These are gathered green, and so tender that a pin can easily be pushed through them: they are useless when the shell has begun to form. They require at least a week's steeping in the brine. The vinegar must be poured on them boiling hot. The spices used are peppercorns, mace, ginger, and sometimes a little garlic and cloves.—*Mushrooms* are sometimes pickled only in brine, and

are very useful for gravies, &c., in winter-time. They are also preserved in vinegar, and must be washed in salt and water quickly, and then boiled in vinegar, to which, besides the spices, a small quantity of salt is added.—*Nasturtiums.* The young green fruit or seeds of the Nasturtium plant, or greater Indian Cress (*Tropæoleum nasturtium*), make a most excellent pickle, which is an admirable substitute for the foreign capers in sauces for various dishes, and alone is an agreeable pickle.—Several kinds of mixed pickles are made, the chief of which is one called *Picalilly*, or 'Indian Pickle,' which consists of a mixture of cucumber, cauliflower, &c., with a considerable quantity of mustard-seed and flower of mustard used as a spice, which gives it a bright yellow color.

Of the foreign pickles imported from other countries, we have the unopened buds of the beautiful plant *Capparis spinosa*, called *Capers;* olives, pickled both in brine and vinegar, but chiefly in the former—both from Southern Europe. From tropical countries, every variety of the capsicum—green shoots of bamboo—and the fruit of the mango, which is much esteemed wherever it is known, notwithstanding a turpentine flavor, which is not agreeable at first. Besides these, there are numerous other pickles of less importance, almost every soft part of wholesome vegetables being adapted for this mode of preparation. Pickles generally are considered provocatives to appetite, and if used judiciously, and made properly, are wholesome and agreeable additions to our food.

PI'CO, one of the Azore Islands, stands midway between the eastern and western extremities of the group, a few miles south-east of Fayal. It is 45 miles long, and 5 miles in average width; area about 225 square miles; pop.—the descendants of Portugese—about 30,000. It is traversed by a volcanic ridge, which rises 7613 feet high in the Peak (Pico), whence the name of the island. See AZORES.

PICO, GIOVANNI, DELLA MIRANDOLA, an Italian philosopher and theologian, whose genius is decidedly inferior to the reputation he once enjoyed, was the son of the sovereign prince of Mirandola and Concordia, and was born 24th February 1463. At the age of 14, he was sent to the university of Bologna, and after spending some years there, visited the principal schools of Italy and France, everywhere distinguishing himself by the extraordinary facility with which he mastered the most difficult branches of knowledge. His linguistic acquisitions embraced Latin, Greek, Hebrew, Chaldee, and Arabic, besides Italian and French; he was familiar with the different phases of the scholastic philosophy, and he was also versed in mathematics, logic, and physics. At the age of 23, he returned to Rome, when Innocent VIII. was pontiff, and immediately sought an opportunity of showing his learning in the most striking manner, by publicly posting up no fewer than 900 theses or propositions in logic, ethics, physics, mathematics, theology, natural and cabalistic magic, drawn from Latin, Greek, Jewish, and Arabic writers, offering to maintain an argument on each against all the scholars of Europe, and undertaking to pay the expenses of those who came from a distance. P. presumptuously entitled his theses *De Omni Re Scibili* (On Everything that can be Known), and Voltaire sarcastially added, *et de quibusdam aliis*, which addition is as true as it is witty. P. had several encounters with notable scholars, and is reported to have come off victorious on every occasion. But his very success was the cause of misfortune. The church appointed a committee to report on the propositions of the young prince, and the result was that several of them were condemned as 'heretical,' although the author was acquitted of any heretical intentions.

P. now withdrew from Rome, and after a short time settled in Florence, where he austerely devoted his whole time to the composition of polemical treatises against Jews and Mohammedans, and to the refutation of judicial astrology. Among his closest friends were Politian and Ficino. He died 17th November 1494, at the early age of 31. A complete edition of his works was published at Bologna in 1496; it has since been frequently reprinted. The principal are *Heptaplus, id est de Dei Creatoris Opere sex Dierum Libri Septem*,, an allegorical explanation of Creation as recorded in the Book of Genesis; *Conclusiones Philosophicæ, Cabalisticæ et Theologicæ*—these are the famous propositions which excited so much ferment at Rome; *Apologia Concordiæ Comitis; Disputationes adversus Astrologiam Divinatricem Libri* xii.; *Aureæ ad Familiares Epistolæ; De Hominis Dignitate.* P. is a happy illustration of the immediate effects produced in literature by the 'revival of letters;' he is full of a specious kind of universal learning, zealous and enthusiastic, but destitute of originality, depth, or creative power. 'He was,' says M. Matter, 'a prodigy of memory, elocution, and dialectics, but neither a writer nor a thinker.'

PICOTEE. See CARNATION.

PICRIC ACID. See CARBAZOTIC ACID.

PICROTO'XINE ($C_{10}H_6O_4$) is the active principle of *Cocculus indicus*, from which it may be extracted by boiling alcohol, or by water containing a little hydrochloric acid. It crystallizes in colorless prisms. This substance is extremely poisonous, one-third of a grain being sufficient to kill a cat in ten minutes.

PICTOU', a thriving seaport on the north coast of Nova Scotia, on the north shore of an ample and perfectly protected harbor, 85 miles in direct line north-north-east of Halifax. Lat. of light-house, 45° 41′ N.; long. 62° 40′ W. It stands in a fertile and well-cultivated district, with extensive coal-mines and quarries of building-stone in the vicinity. It exports building-stone, dried fish, and potatoes. Commerce is rapidly increasing; ship-building is vigorously carried on in Pictou. The mean summer temperature is 63° 52, and the mean temperature for the year is 42°·09. Population (1881) 3403.

PICTS, the ancient inhabitants of the north-eastern provinces of Scotland. Everything connected with the history of the P. has been made matter of controversy, and it is not easy to ascertain the truth, where the information given by early writers is so scanty, and where most modern authors seem only to have looked for materials to support a favorite theory.

It will be unnecessary to enter on an examination of the name itself. The 'Picti' of the Romans probably represented a word by which the nation was known in its own language, as well as the barbaric custom to which the well-known expression of Claudian, 'nec falso nomine Pictos,' bears reference. Of much more importance is the inquiry regarding the origin and language of the Picts. This is what, among Scottish antiquaries, has been emphatically called 'the Pictish question;' respecting which the best-known and most amusing, and certainly not the least useful discussion, is that between Jonathan Oldbuck and Sir Arthur Wardour, in the sixth chapter of *The Antiquary*. The disputants can hardly even now be said to be agreed; but the prevailing opinion is, what sound criticism always pointed to, that the P. were a Celtic race—perhaps the first known inhabitants of Northern Britain, and (as some hold) to be identified with the Caledonians of the Roman writers. At the time when they became generally spoken of under the name of P., they occupied the whole territory north of the Firth of Forth, except the western portion, which had been colonized or subdued by the Scots, another Celtic nation, whose chief seat was in Ireland—the proper and ancient Scotland. The southern boundary of the P. was the Roman province of Valentia, embracing the territory between the two Roman walls. At a later period, when Britain was abandoned by its imperial rulers, the boundaries of the various nations occupying the northern part of the island may be traced with considerable distinctness.

Making allowance for partial changes at various times, these boundaries may be held to be the following: The Pictish territory extended along the whole sea-coast from the Firth of Forth to the Pentland Firth. It was bounded on the west by the country of the Scots, which extended along the western coast from the Firth of Clyde to the modern Ross-shire; but the precise line between the two nations cannot be ascertained. The country of P. was bounded on the south by the Firth of Forth and the province of Lothian, then possessed by the English; while the country of the Scots had for its southern boundaries the Firth of Clyde and the kingdom of Cumbria, held by the independent Britons.

The Pictish nation consisted of two great divisions, called the Northern and Southern P., the boundary between them being the mountain range known afterwards as the Grampians. These divisions seem at some time to have been ruled by different princes, at other times to have been under one sovereign. The P. were converted to Christianity at different periods. The Southern P. received the faith from St. Ninian, Bishop of Candida Casa, early in the 5th century. This is mentioned by Bede, and the fact itself has never been doubted; but controversy, as usual, has been busy with the details. The point in dispute is the situation of the P. who owed their conversion to Ninian (q. v.). A careful examination of the statements of Venerable Bede, and the fuller but less trustworthy narrative of Ailred of Rievaux, will show that the Southern P., converted by Ninian, had their seat north of the Forth; that they were, in fact, the great division of the Pictish nation occupying the country between the Firth and the Grampians. The labors of Ninian were carried on and completed by teachers whose names are well known to the readers of ecclesiastical history—Palladius, Serf, Ternan, and others. The Northern P. owed their conversion to a teacher of higher renown—St. Columba (q. v.). The life of that abbot, from his leaving Ireland in 563, to his death in 597, was chiefly spent in converting the Northern Picts. Their ruler at this time was Brude, son of Mailcon, whom Bede styles a very powerful king. His chief residence was on the banks of the Ness, and there Columba baffled and confuted the heathen Magi in the manner recorded by his biographer Adamnan.

It is impossible to ascertain the precise character of the superstitions held by the P. before their conversion. Those whom Adamnan calls Magi, are by some modern writers styled Druids,

and their religion is said to have been a species of Druidism—whatever that may be held to mean.

Brude, the first Christian king of the P., died in 586. Catalogues are preserved, of more or less authority, of the sovereigns who succeeded him. It is impossible to reconcile the discrepancies of these lists, which probably contain the names of princes who reigned at the same time in the northern and southern divisions of the kingdom. The limits of the Pictish territories continued much the same till the middle of the 7th c., when a portion of the southern province was subdued by Oswy, king of Northumbria. In the beginning of the reign of Oswy's son and successor, Egfrid, the P. made an attempt to recover the territory which had been wrested from them. It was unsuccessful; and the power of the English was so firmly established, that the conquered province was erected into a diocese separate from Lindisfarne, the seat of the bishop being fixed at Abercorn. Encouraged by the success which had attended his enterprises, Egfrid seems to have contemplated the subjugation of the whole Pictish kingdom. He advanced northwards with his army; Brude, son of Bili, king of the P., retreating before him. The English sovereign passed the Tay, and the P. made a stand at Nechtansmere, supposed to be Dunnichen, in Angus. A conflict ensued; the English were utterly defeated, and their king was slain. The consequences of this battle, which was fought on the 20th of May 685, were very important. The P. recovered the whole territory which they had lost, and even subdued for a time a portion of the proper Northumbrian kingdom.

The next Pictish prince whose name calls for special notice is Nectan, son of Dereli, who succeeded about the year 710. He cultivated learning to some extent, and aspired to the position of an ecclesiastical reformer. The Pictish Church held precisely the same doctrines as the English; but it differed in various points of ritual, the most important of which related to the proper time of keeping Easter. The king applied for advice to Ceolfrid, Abbot of Jarrow, and the answer, which is addressed 'To the most Excellent Lord, and most Glorious King, Nectan,' is preserved among the works of Venerable Bede. Encouraged by this epistle, he summoned a council of his clergy and nobles, and enjoined them to observe the English usages. The royal command met with a ready obedience. He had also applied to the Abbot of Jarrow for architects to build a church of stone in the Roman fashion, which he proposed to dedicate to St. Peter. We are told by Bede that the architects were sent, but have no further information on this interesting subject. The plans of the king were probably interrupted by dissensions among his people; and the entire assimilation of the ecclesiastical institutions of Northern Britain to those of England was postponed for four centuries.

The most active of all the Pictish sovereigns was Hungus, son of Urgust, who succeeded in 730, and reigned for thirty years. He was engaged in constant wars with the Scots, the Britons, and the English, in which he was generally victorious. After his death, the kingdom began to decline. The history of its latest period is involved in impenetrable obscurity; all that we know for certain is the final result. Various princes claimed the crown, and held possession of portions of the kingdom. But the most powerful competitor was Kenneth, son of Alpin, king of the Scots, who was descended, in the female line, from the ancient sovereigns of the P., and was probably the true inheritor, according to the peculiar law of succession which is said to have existed among that nation. Kenneth was acknowledged as king in 843, and fixed his residence at Forteviot in Stratherne, the capital of the Pictish kingdom.

A famous passage from Henry of Huntingdon has often been quoted, in illustration of the supposed utter destruction of the P., of their princes, their race, and their language. It is referred to in that sense at the close of the following sentences of a work written some time before, but only published in the year 1864. 'The Pictish vessel is seen in the distant horizon; she approaches rapidly, till you clearly distinguish the crew upon the deck; but before you are near enough to hear their voices, she sinks, the waters close over her, and the wreck never can be raised. The total extinction of the Pictish language renders any further inquiry impossible. The acumen and criticism of the 19th century cannot advance beyond the homely wisdom of the 12th century.'—Sir Francis Palgrave's *History of Normandy and England*, vol. iv. p. 294.

The impression conveyed by such words is an erroneous one. The Pictish princes still continued to reign in the persons of Kenneth and his descendants. They were kings of the P. in reality and by race, as much as James I. and his successors were kings of England. The princes did not cease in the one case more than in the other to be sovereigns of the larger kingdom, because they had previously ruled in the lesser one. Neither did the nation of the P. cease to exist. They dwelt as before in their own land; their old capital was the capital of the new kingdom; and Pictavia is spoken of by the chronicles long after the accession of Kenneth, and long before Scotia became identified with Northern Britain, or ceased to be the ordinary name for Ireland. Undoubtedly, through the influence of the kings, and perhaps of the clergy, whom the later Pictish princes had held under an oppressive bondage, the Scots became the predominant race, and finally gave their name to the united kingdom and nation. Neither did the language of the P. cease to be spoken. It continued, as before, to be the dialect of the north-eastern provinces, till, first in the extreme north, it yielded to the Scandinavian invader, and afterwards—more than two centuries subsequently to the accession of Kenneth—it began to recede slowly before the Teutonic tongue of English and Flemish colonists.

The same process which destroyed the Celtic language of the Pictish people, destroyed also the Celtic language of the British kingdom of Cumbria. The subject of the Pictish language has been of late thoroughly discussed by Mr. Skene in his *Four Ancient Books of Wales*. In addition to *Peanfahel*, the sole Pictish word formerly known, Mr. Skene has discovered four other distinct words, besides a number of syllables entering into proper names; and from all these he deduces the opinion that Pictish 'is not Welsh, neither is it Gaelic; but it is a Gaelic dialect partaking largely of Welsh forms.' More specifically, he holds that Pictish, as compared with Gaelic, was a *Low* dialect—that is, differed from Gaelic in much the same way that Low German differs from High.

The chief ancient authorities for the history of the P. are Adamnan's *Life of St. Columba*, edited by Dr. Reeves; the *Ecclesiastical History* of Venerable Bede; the *Life of St. Ninian*, by Ailred of Rievaux, in Pinkerton's *Ancient Lives of Scottish Saints;* the Pictish Chronicle, in the appendix to Innes's *Critical Essay on the Ancient Inhabitants of Scotland*, and in the appendix to Pinkerton's *Inquiry into the History of Scotland;* and the *Irish Annals*, edited by O'Conor. The best modern works on the subject are Innes's *Critical Essay*, and his *Civil and Ecclesiastical History of Scotland;* Pinkerton's *Inquiry;* Chalmers's *Caledonia*, vol. i.; Ritson's *Annals of the Caledonians, Picts, and Scots;* Mr. Grub's *Ecclesiastical History of Scotland*, vol. i.; a dissertation in Garnett's *Philological Essays;* and Mr. W. F. Skene in his *Four Ancient Books of Wales;* and in *Celtic Scotland* (2 vols., 1875—1877).

PICTS' HOUSES, the name popularly given in many parts of Scotland to the rude underground buildings, more commonly and accurately called EARTH-HOUSES (q. v.). The name is often



Pict's House at Kettleburn, Ground-plan.

given also to a more advanced class of buildings of the same kind, found in the more northern counties of Scotland. The ground-plan of one of these at Kettleburn, in Caithness, explored and described by the late Mr. A. H. Rhind, of Sibster, is figured in the accompanying woodcut. The outmost circle represents the extreme limits of the mound which covered the structure; *a*, a bounding wall, three feet thick, and three feet high, rudely built of large unshaped stones; *b*, an inner wall, four or five feet high; *c* and *d*, fragments of walls faced outwards; *e* and *f*, passages leading to the inner chambers; *g*, *h*, and *i*, passages leading to smaller side chambers; *k*, a wall within the wall of the chamber *s; m*, a chamber, so ruined that its walls could not be traced all round; *n*, a large boulder, which, being difficult to remove, had been built over; *o*, a chamber containing a regularly built well (between *p* and *p*), nine feet deep, and roofed over. The whole walls were built without mortar. The objects found within them were remains of animals and shell-fish, fragments of pottery, and implements of stone, bone, horn, bronze and

iron. The name of Picts' Houses is also occasionally given in the north of Scotland to rude stone structures above ground.

PICTURES are now protected by the law in a manner similar to books, the copyright of which belongs to some individual. By the act of 25 and 26 Vict. c. 68, if the author of any painting, drawing, or photograph in which there shall be subsisting copyright, after selling the same, or if any one, without the consent of the proprietor for the time being, repeat, copy, colorably imitate, or otherwise multiply for sale, hire, exhibition, or distribution, or cause this to be done, or knowingly import into the United Kingdom, or sell, &c., such copies, he shall forfeit to the proprietor of the copyright a sum not exceeding £10, and the copies and materials shall belong to such proprietor. Moreover, if any person affix a mark, monogram, or initials of a person who did not execute or make such work, to paintings, drawings, or photographs, or fraudulently sell, exhibit, or offer such for sale, such person shall forfeit £10, or double the price of the thing sold, &c., and all spurious copies and imitations become forfeited to the real owner. This statutory protection to artists and owners of pictures, engravings, and photographs extends to the United Kingdom.

PI'CUS AND PI'CIDÆ. See WOODPECKER.

PIE, a well-known culinary preparation, consisting of a crust of dough or pastry, enclosing either meat or fruit, and baked in the oven. The origin of the word is very obscure. There are two kinds of pies, one in which a dish is used, as in cases where much juice or gravy has to be retained; the other, without the dish. The latter are called raised pies, and a particular kind of paste is required; which is made with hot lard and water, and must have sufficient consistency to stand up. When moulded into the form or case of the pie, it is filled with meat, usually game, and baked. This kind of crust is not usually eaten, with its contents as it is considered unwholesome, it therefore merely serves as a case for the enclosed viands.

PIEDMONT, or PIEMONT (Fr. *pied*, foot, *mont*, mountain), an Italian principality, which now forms the north-west part of the kingdom of Italy, is enclosed mostly by natural boundaries, having on the N. the Pennine Alps, on the W. the Graian and Cottian Alps, on the S. the Maritime Alps and Genoa, and on the E. the Ticino and the duchy of Parma. It includes the former duchy of Montferrat, which lies in its south-eastern corner, what was the Sardinian portion of the old duchy of Milan, and contains 11,750 English square miles, with a population (1881) of 3,070,379. The mountain ranges which form its boundary on the north, west, and south, attain, in various places, a great elevation above the sea; the Col de Tende, Monte Viso, Mont Cenis, Mont Iseran, Mont Blanc, Mont St. Bernard, Mont Cervin, Monte Rosa, and the Simplon, being all on the boundary-line. As to its general character, the country is partly mountainous, partly hilly, and much diversified with hill and dale; the ranges which traverse the country being spurs from the alpine boundary, and converging towards the central tract, through which flow the Po and its chief tributary the Tanaro. The valleys which separate these ranges are all watered by rivers which take their rise in the Alps, and pour their supplies into either the Po or the Tanaro according as they come from the north and west, or from the south. The amount of the water-supply in the country may be imagined when it is considered that in P. the Po receives no fewer than 10 tributaries on the left, and 6 on the right, all of them of considerable size, and some of them, as the Tanaro and Dora Bactea, worthy of being classed as rivers. The valleys of the Po and Tanaro are exceedingly rich and fertile, producing abundant crops of grain, pule, hemp, chestnuts, olives, and many kinds of fruit. Maize and barley are the chief cereals, the former being the ordinary article of food to the inhabitants, while abundant herds of swine are fed upon the latter. The climate is mild in winter; but in summer, especially on the level country east of the Dora Baltea and the Tanaro, the heat is scorching, and this portion would be rendered a perfact sandy desert, were it not for the complete system of irrigation, which supplies moisture to more than half a million of acres, and renders the eastern districts the granary of the country.

So valuable is the privilege of using the water of rivers as a means of irrigation, that a considerable tax is levied upon it. The other products of P. are wine and silk, which are produced in great abundance, especially silk, which is the best in Italy, and is generally exported raw. The chief manufactures are silk, linen, woollen, and cotton goods, hosiery, paper, leather, cutlery, various fermented liquors, glass, and iron. The inhabitants are active and industrious, and mostly belong to the Roman Catholic religion, but are more tolerant than in other parts of Italy. The Vaudois or Waldenses (q. v.), have from time immemorial inhabited the wild vales at the foot of the Cottian Alps, in the western corner of the principality. Many of the Piedmontese, like the Swiss and Tyrolese, spend their youth and early manhood in traveling through other countries as dealers in engravings, jewelry, and other articles of merchandise, and returning with a small hoard, spend the rest of their days in comfort in their native land.

P., in the 10th c., was possessed by the marquises of Susa, Ivrea, Montferrat, and Saluzzo; and it was not till when, a century afterwards, the marquisate of Susa passed into the House of Savoy, that the latter, then counts of the Maurienne (the south portion of Savoy), gained a footing in the country. At the commencement of the 12th c., the possessions of the House of Savoy were divided, and the lines of Savoy and P. formed; but they were again united, in 1416, by Amadeus VIII. (afterwards Pope Felix V.), who, in the following year, obtained from the Emperor Sigismund the title of Duke of Savoy, which they exchanged for that of king in 1684. During the Spanish War of Succession, P. was increased by the addition of the provinces of Alessandria, Valence, Lomellino, and the Val di Sesia (1703), by Tortona and Novara in 1735—1736, and by Vigevanase and Bobbio in 1743. In 1796, it was seized by the French, and parcelled out into six departments, five being incorporated with France, and one with the kingdom of Italy; but after the fall of Napoleon, the House of Savoy recovered possession of it. See ITALY, SARDINIA, SAVOY. Since 1860, the name P., as a provincial designation, has been disused; and P. proper is now divided into the provinces of Alessandria, Coni or Cuneo, Novara, and Turin.

PIEDIMO'NTÉ D'ALI'FÉ, a town of South Italy, 20 miles north-by-east of Caserta, at the base of the Apennines. Cotton-mills employ 1500 hands. There are copper-mines in the vicinity. Pop. about 6000. Piedimonte is the name of several smaller towns and villages in Italy and Sicily.

PIE'DRA BLANCA, a town of the Argentine Republic, South America, 20 miles south-west from Catamarca. Pop. 10,000.

PIE'POWDER COURT, in England, an ancient court held in fairs and markets to administer justice in a rough and ready way to all comers, called also the Court of Dusty Foot (Fr. *pied poudreux*). Its jurisdiction seems to have been confined mostly to petty vagabonds, pedlers, and other wanderers. The court has long been obsolete, the only jurisdiction of that kind being now merged in the court of Petty Sessions (q. v.).

PIER, the block of solid wall between doors, windows, &c.; also a solid mass of masonry built to receive the arch of a bridge. The term is also used synonymously for the Pillars (q. v.) of a church; thus we speak of nave-piers, &c.

PIERCE, FRANKLIN, the fourteenth President of the U. S. of America, was born in Hillsborough, New Hampshire, November 23, 1804. His father, General Benjamin Pierce, was a soldier of the war of independence, and governor of New Hampshire. Franklin P. was educated at Bowdoin College, Maine, and was an officer in a college military company, in which his biographer, Nathaniel Hawthorne, was a private. He spent his first vacation in teaching a country school, studied law with Levi Woodbury, governor and senator, was admitted to the bar in 1827, became speaker of the State House of Representatives in 1829, and was elected to the 33d congress, a democrat of the school of Jackson. In 1837, he was elected to the U. S. senate, of which he was the youngest member. He declined the office of Attorney-General offered him by President Polk, and refused the nomination for governor of New Hampshire; and at the commencement of the Mexican war, volunteered as a private, but was appointed brigadier-general, and led his brigades in the battles of Contreras and Churubusco.

In 1852, in consequence of the conflicting claims of the leaders of the Democratic party at the Baltimore Convention, he was nominated as a compromise candidate for the presidency, against General Scott, the Whig nominee, and received the votes of all but four states. He appointed an able cabinet, including Jefferson Davis as Secretary of War. During his administration, the Missouri Compromise was repealed; the treaty for reciprocity of trade with the British American colonies was made, and a treaty with Japan; and the Kansas difficulties which then arose, with the growing animosity between the North and South, led to secession, and the war of 1861. At the close of his term of office in 1857, he traveled in Europe, and, having no sympathy with the party which subsequently came into power, he took no part in politics. He died in 1869.

PIERCED, in Heraldry, a term used to indicate that a charge is perforated so as to show the field beneath it. The aperture is presumed to be circular, unless some other form, as square-pierced or lozenge-pierced, be specified in the blazon.

PIERRE, JACQUES HENRI BERNARDIN DE ST., a celebrated French writer, was born at Havre, 19th January 1737. He received his education at Caen and Rouen, and afterwards entered the government department of civil engineers. On his dismissal from this service in 1761, he wandered about the continent for several years, endeavoring to realize his dream of a republican colony. He returned to France in 1766, and soon after obtained

a commission as engineer for the Mauritius; but after a residence of three years in the island, he returned to Paris. At this time he wrote the story of *Paul et Virginie*. The little book, with its passion, its simplicity, its tenderness, achieved an immense success, and has been translated into almost every language. St. P. passed through the storms of the Revolution in safety, and was lucky enough to secure the patronage of Napoleon. He died 21st January 1814. Besides *Paul et Virginie*, he wrote other tales, essays, and several plays.

PIERS PLOWMAN, or rather *The Vision of William concerning Piers the Plowman*, is a remarkable poem by William Langland or Langley, who was born, apparently in Shropshire, about 1332, was educated for the church, and died in London near the end of the century. The *Vision*, a powerful poem in vigorous alliterative verse, describes a series of nine dreams, in certain of which a person called Piers the Plowman appears. Under allegorical covering, the *Vision* exposes the manifold corruptions of the state, of the church, and of existing social arrangements. From the forty-three MSS. which remain, it is evident that the poem, originally written about 1362, was repeatedly revised, altered, and extended, and that it continued to occupy the author all his lifetime.

PIETÀ′ (an Italian word signifying *piety*, in the sense in which that term indicates or includes affection for relatives), the name given in the language of art to representations of the Virgin Mary embracing the dead body of her son. It is a counterpart to the *Madonna* with the infant Jesus in her arms. The one affords an opportunity for the representation of the purest joy and highest motherly love; the other of the utmost pain and grief. The pietà has long been a favorite subject, not only with painters, but with sculptors.

PIETERMARITZBURG, capital of Natal (q. v.), 50 miles from the coast. Pop. about 7000.

PI′ETISTS, a designation given since the end of the 17th c. to a religious party in Germany, which, without forming a separate sect, is distinguished not only by certain peculiarities of religious opinion, but also by the manner in which these are manifested. The peculiar character of their religion is very generally denoted by the term *pietism*, which is frequently employed with reference to the same tendencies of opinion, feeling and conduct, wheresoever and whensoever exhibited. Pietism may be regarded as consisting in an exaltation of the importance of religious feeling, and of the practical part of religion, with a corresponding depreciation of doctrinal differences, and a contempt for outward ecclesiastical arrangements; and has been more or less strongly developed from time to time in all sections of the church, a tendency towards it always existing in a large class of earnestly religious minds.

In the church of the middle ages, this tendency was displayed in an endeavor to attain to a superior spirituality and purity by means of a religious contemplation and asceticism, and many, consequently, embraced a monastic life. The Reformers, adopting the Augustinian doctrines, rejected this mode of seeking deliverance from indwelling sin, and proclaimed the efficacy of faith in the sacrifice of Christ. But the controversies which arose among them, and increased among their successors, gradually gave a too exclusively doctrinal and polemical character to the sermons and writings both of the Lutheran and Calvanistic divines, particularly in Germany, and a reaction ensued, not in favor of the Church of Rome, but in favor of a religion of feeling and good works, or of the heart and life. Disgust at the sectarian bitterness and exclusiveness which prevailed, led even to an undervaluing of disputed points; and thus the *Pietism* of Germany was generated and developed. The origin of it is referred to a work entitled *Vom wahren Christenthume*, by John Arnd, published in 1605; to the *Invitatio Fraternitatis Christi* of John Val. Andreæ, published in 1617, both of them Lutherans; and to the writings of Cocceius, a Calvanist. But its fuller development is unquestionably to be ascribed to Spener (q. v.), in the latter part of the 17th c., and to his friends and disciples. The name *Pietists* was first given in contempt to certain young *docents* in Leipzig, who began in 1689 to give prelections on the New Testament both to students and citizens, and to addict themselves much to a meditative mode of life. Spener had held meetings of a somewhat similar kind in his own house when preacher at Frankfurt-on-the-Maine, and in his writings had urged the necessity of a reform in the Protestant church and theology. He and his followers dwelt much upon the importance of studying the Scriptures rather than the symbolical books, upon the unfitness of any unconverted or unregenerated person for the office of the ministry, upon the right and duty of the laity to take part in the exercises of Christian assemblies, and upon the necessity of a practical rather than a systematic religion.

But many of the more extreme Pietists carried their antipathy to the doctrinalism and the established services of the church to a degree that alarmed the theologians of the old school, the high and dry Lutherans, or German 'moderates,' who accused Spener and his disciples, not without reason of a tendency to make all goodness and virtue consist in mere religious feeling, or pious sentimentalism; to represent the divine grace as operating in too sudden and abrupt a manner; to exaggerate the value of good works; to depreciate the value of learning and of clear intellectual perception in the study of Scripture; and to indulge in a strictness of judgment upon the religious character of the ordained clergy, tending to sectarianism, and indeed incompatible with ecclesiastical unity. The weapons of argument, however, were not the only weapons employed against them. The docents were compelled to give up their prelections, and finally to leave Leipzig; the meetings for mutual edification were suppressed by the government as disorderly conventicles; and Francke (q. v.), the most distinguished of the Leipzig docents, having gone to Erfurt, was prevented from lecturing, and quickly compelled to retire. Spener's influence, however, procured a refuge for his friends in the newly founded university of Halle, and Francke obtained a professorship there. Halle became thenceforth the source of new religious influences, and, indeed, of a new religious life to Germany. The Pietists, although spiritually exclusive—disposed to regard themselves as the 'chosen of God,' and to look down on all others as 'children of the world,' or even of the devil—did not attempt to form a separate sect. To do them justice, they were as far as possible from being ecclesiastically ambitious; all their desire was to excel in 'labors of love,' and to cultivate feelings of intensest piety.

The rise of the Wolfian or Rationalistic theology, the spread of that sort of sceptical anti-clerical philosophy which flourished for a while under the name of *Aufklärung* (Enlightenment), exercised an injurious and depressing influence on Pietism; yet through all the long obstinate warfare maintained against the doctrines of the church by the Rationalists during the last half of the 18th, and the most part of the 19th c., Pietism continued to number some adherents; and it can hardly be doubted that it is to the Pietists, and not to the Lutheran dogmatists, that Germany is in a great measure indebted for that revival of religious faith and feeling which, begun with the great Schleiermacher—himself trained up under pietistic influences—has since widely diffused itself through her biblical scholars and theologians. The patriotic enthusiasm called forth by the insolent conquests of the French, naturally allied itself to pietistic tendencies, for in Germany, the triumphs of Napoleon even as *emperor* were looked upon as the triumphs of revolutionary, republican, and infidel principles; and after the general restoration of peace, the statesmen and upper classes, especially in Prussia, believing that political security could only be obtained by a return of the populace to the simple, obedient, and unquestioning piety of earlier times, countenanced this party in the church; and amiable tea-drinking societies of devout men and women were formed to distribute tracts, and to inoculate the radical and heathen masses with pietistic sentiments. But this attempt to use 'piety' for reactionary political purposes sullied its purity, and alienated from it the very parties whom it wished to influence. Still, however, Pietism exists as a distinct element in the religious life of Germany, and now, as ever, its strongholds are Prussia (Berlin, Silesia, Wupperthal), Hesse, and Würtemberg.

PIE′TRA-DU′RA, a name given to the finest kinds of Florentine mosaic-work, in which the inlaid materials are hard stones, such as jasper, carnelian, amethyst, agate, &c. The real pietra-dura work dates as far back as the 16th c., about 1570; and from that time to the present, has been almost confined to Florence, where a government *atélier* has existed ever since the beginning of the 17th c., which was originated in order to supply decorations for the Capella Medicea. It is sometimes called *Pietre Commesse*, and Lavoro di Commesso. In the inferior kinds, which are sold in Italy, and are manufactured now pretty extensively in Derbyshire and other parts of Britain, pieces of colored sea-shells are used instead of the harder and more valuable colored stones.

PIETRAPE′RZIA, a town of Sicily, six miles south-east from Caltanisetta, on a lofty height. Pop. 10,000.

PIEZO′METER (Gr. *piezo*, I press; *metron*, a measure), an instrument for measuring the compressibility of fluids. Oersted's (q. v.) instrument, the first by which the compressibility of water was satisfactorily determined, consisted of a cylindrical glass jar, into the neck of which a narrower cylindrical tube of glass, open at both ends, was firmly fixed. In this tube worked an air-tight piston by means of a screw. In the interior of the jar was placed a bottle, whose neck was drawn out into a long capillary graduated tube, and alongside this bottle was suspended a cylindrical tube, closed at the top, but open at the bottom. When the compressibility of any liquid was to be determined, the instrument was adjusted in the following manner: the bottle inside was filled almost to the top of the capillary tube with the fluid, and being replaced inside the jar, the latter was completely filled with water up to the piston in the neck. The liquid in the submerged bottle, then under pressure of the water above it, fell slightly in

the capillary tube, being kept from contact with the water by an air-bubble, the motion of which up or down, according as the pressure was less or greater, served as an index for reading off the graduation. The suspended tube alongside being at first only filled with air, the water rose in it to some extent, and by graduations on the tube it was made to indicate the pressure in atmospheres or parts of atmospheres.

Pressure was now applied to the water in the jar by screwing down the piston; the compressed water communicated the pressure to the liquid in the bottle and to the air in the suspended tube; the descent of the air-bubble in the former indicating the amount of diminution in bulk the liquid had undergone (the capillary tube being graduated in inches and parts of inches, and each inch of tube being known to contain a certain fraction of the contents of the bottle), while the ascent of the water in the suspended tube showed the amount of pressure which had been applied.

PIG. See Hog.

PIGEON (Ital. *pigione, piccione,* or *pipione,* from *pipiare,* Lat. *pipire,* to peep or cheep), a name sometimes applied, like Dove (q. v.), to all the species of *Columbidæ* (q. v.), and sometimes almost restricted to those still included by ornithologists in the genus *Columba;* having a bill of moderate length, hard, and a



1, Ring Dove, Cushat, or Wood-pigeon ; 2, Biset, or Wild Rock Pigeon ; 3, Collared Turtle.

little arched at the point, the base of the upper mandible covered with a soft thick skin, in which the nostrils are pierced; the feet with toes divided to the base, and formed both for walking and perching; the wings rather large and pointed; the tail of moderate length, and generally square at the end. The species of this group are numerous, and occur in almost all parts of the world. Some of them build their nests in trees, and some in holes of rocks; they lay only two eggs at a time, but breed twice or oftener in a year, and both the male and the female take part in incubation. The original of all the varieties of the DOMESTIC P. is now almost universally believed to be the ROCK P. or ROCK DOVE (*C. livia*), the *Biset* of the French, a bird of extensive geographical range, being found as far north as the Farōe Islands, and on many parts of the coasts of Europe, Asia as far as Japan, and the north of Africa, breeding in crevices of rocks, and often within caverns which open on the sea. It swarms in prodigious numbers in some of the rocky islands of the Mediterranean; and even on the British coasts, great numbers are found in some localities, particularly in the Orkneys and Hebrides. Its food consists partly of molluscs and other small animals, partly of grain and seeds; and it often makes unwelcome visits to the corn-fields of its vicinity.

In a wild state, this bird exhibits great uniformity both of size and plumage; being not quite twelve inches in length from the tip of the bill to the end of the tail; the prevailing color bluish-gray, in some parts with green and purple reflections, two broad and distinct bars of black across the closed wings; the lower part of the back white; the tail deep gray, with a broad black bar at the end; the bill blackish-brown ; the legs and toes reddish-orange.—Until recently, naturalists very generally confounded this species with the STOCK DOVE or SMALLER WOOD P. (*C. œnas*), a species which inhabits woods, and generally builds in trees, preferring the hollows of old decaying trees or the tops of such as have been pollarded and have become bushy—whence the name *Stock* Dove. In some of the open parts of England, however, it makes its nest in rabbits' burrows or other holes in the ground. It is rather larger than the Rock P.; its prevailing color is bluish gray, in some parts passing into pale gray, but nowhere into white; the wings destitute of bands; the sides of the neck with green reflections; the breast purplish red. It congregates in large flocks in autumn and winter. It is partially migratory in some parts of Europe; a summer visitant of the northern regions. In Britain, it is found only in the southern parts of the island. Its geographical range includes great parts of Europe and Asia, and the north of Africa. It feeds on beech-mast, acorns, grain, pulse, &c., and sometimes resorts to turnip-fields to eat the tender tops. Its voice is very different both from that of the Rock Dove and that of the Ring Dove.

Its flesh is of very fine flavor.—The RING DOVE, WOOD P., or CUSHAT (*C. palumbus*), is the most common British species, and is diffused over great part of Europe, either as a permanent resident or a summer bird of passage, although it is not found at all in some of the most western regions; and occurs also in the temperate parts of Asia, and the north of Africa. Its soft loud *coo* is one of the pleasant intimations of the approach of spring. It inhabits woods, and builds its nest among the branches of high trees. It is the largest of the British species, being about seventeen inches in entire length. It feeds on green corn, young clover, turnip-tops, grain, pulse, acorns, &c. Where it abounds, its voracity is often very injurious to the farmer. It is gregarious in winter. It is inconsiderable estimation as an article of food; but it is very shy and wary, not easily approached by an inexperienced sportsman.—These are all the British species of pigeon. Our limits quite preclude us from noticing almost any other. The RING-TAIL P. (*C. Caribbea*) may be mentioned as a West Indian species, much valued for the richness and delicacy of its flesh, which is reckoned one of the greatest luxuries of that part of the world. The BALL-PATE or WHITE-HEADED P. (*C. leucocephala*) is another large and fine species plentiful in the West Indies. It migrates to the *Keys* of Florida in summer.—The DOUBLE-CRESTED P. (*C. dilopha*) is a large species, inhabiting the north of Australia and warmer regions to the northward, remarkable for its crest, which consists of two parts, one on the back of the head, and another of lax recurved feathers springing from the forehead, and even from the base of the bill.

Only one species of P. has been truly domesticated, and having long been so, it has undergone many remarkable changes, and there are numerous varieties or breeds; some of them, exhibiting very strange peculiarities, and known as *fancy pigeons,* being carefully preserved and tended by pigeon-fanciers. Pigeon-fancying is nowhere carried further than in London, where there are many persons who give great part of their time to it, and whose pigeons are their chief delight. The prices of such fancy pigeons as are deemed most perfect of their kind, are very high. The ordinary domestic pigeons, kept for profit as a kind of poultry, differ from the wild rock dove chiefly in color, in which they are often very unlike it, although a tendency always manifests itself to return to the original colors, and the bars on the wings are apt to reappear in the progeny even of what may be called the most artificial varieties. Of these may be mentioned, as among the most interesting, the Rough-footed P., having the feet feathered; the Jacobin, which has a range of feathers inverted over the head, and extending down each side of the neck, as a hood; the Fantail, or Fan-tailed Shaker, in which the number of the tail-feathers is greatly increased, and the bird has the power of erecting its tail like that of a turkey-cock, whilst it has also a peculiar vibratory motion; the Tumbler, so called from tumbling in the air in its flight, and further characterized by a very short bill; and the Pouter or Cropper, which has the power of blowing up its crop to an extraordinary degree, so that the head seems fastened on the top of an inflated bladder. The Carrier P. (q. v.) is regarded as a variety of the Common Pigeon.

The law regarding pigeons is stated in the article DOVECOT. For the profitable keeping of pigeons, it is necessary to have a properly-constructed dovecot, divided into cells, a cell for each pair, each cell sixteen inches broad, by twelve from front to back, and the door towards one side, so that the nest may not be seen from without; a slip of wood in front of each cell for the birds to sit and coo on. The dovecot must be placed at such a height as to be out of the way of rats and other depredators; and must be frequently cleaned, otherwise it may probably be deserted by its occupants. It ought to be painted white, that color being very attractive to pigeons, and contributing to retain them when a new dovecot is established, in which there is often found to be not a little difficulty. Pigeons begin to breed at the age of nine months, and breed every month except in very cold weather. The male and female continue faithful to each other from year to year, a circumstance noted by Pliny and others of the ancients, and evidently, as well as their somewhat demonstratively manifested affection, a reason of the poetic references often made to the dove.

PIGEON PEA (*Cajanus*), a genus of plants of the natural order *Leguminosæ*, suborder *Papilionaceæ*, of which, according to some botanists, there is only one species (*C. flavus*), a native of the East Indies, but much cultivated also in the West Indies and in Africa; according to others, there are two species, *C. flavus*, with flowers entirely yellow, the pod marbled with dark streaks, and two or three seeds in each pod; and *C. bicolor*, called CONGO PEA in the West Indies, the pulse of which is much coarser, and is used chiefly by negroes. The finer kind is nearly equal to the Common Pea. This kind of pulse is very much used in tropical countries. The plant is a shrub (*Cytisus cajan* of Linnæus) about eighteen inches high. It is half-hardy in the south of England. In tropical countries, the plants stand and are productive for several years. They throw off their leaves annually, and reproduce them along with their flowers. The P. P. is one of the most valuable of the tropical kinds of pulse. It grows either on rich or poor soils. It is called *Doll* and *Urhur* in the East Indies. The name P. P. is West Indian.

PI'GMENTS. See PAINTS.

PIKE, PIKEMAN. Previously to the use of the bayonet, infantry of the line of battle—that is, the heavy-armed troops—were from the earliest times armed with pikes or spears. The Macedonians carried pikes 24 feet long; those of modern warfare averaged 12 or 14 feet. They were of stout wood, and tipped with a flat iron spearhead, which sometimes had cutting edges. As a defence against cavalry, the pike, from its length and rigidity, was of great value; but though it long survived the introduction of gunpowder, that event was really fatal to it. For success with the pike, especially in offensive war, a depth of several men was essential, and this depth rendered the fire of artillery peculiarly fatal. The pike is now superseded by the bayonet on the end of the musket.

PIKE (*Esox*), a genus of malacopterous fishes, including all the species of the family *Esocidæ*, as restricted by Müller, and characterized by an elongated body, covered with scales, a depressed head, and broad blunt muzzle, with very large mouth, abundantly furnished with teeth of various sizes on the jaws, palatine bones, and vomer; no adipose fin; and the dorsal fin placed very far back over the anal fin. The species are not numerous; they are all inhabitants of fresh waters in the northern hemisphere. Only one is found in Europe, the COMMON P. (*E. lucius*), a native also of Asia and North America. It is very generally diffused over Europe, and is abundant even in its most northern regions; and is now abundant in lakes, ponds, and slow rivers in all parts of the British Islands, although it is supposed not to be truly indigenous to them, but introduced. The statement, which has been often made, however, that it was introduced in the reign of Henry VIII., is certainly erroneous, as there is evidence of its existence in England at a much earlier date. Edward I., graciously regulating the price of commodities for his subjects, fixed the price of the pike higher than that of the salmon, and ten times higher than that of the turbot and the cod, from which we may perhaps infer its comparative rarity at that period. Some of the waters in the fenny districts of England are peculiarly adapted to pike, which are there found in very great quantity, and of superior quality.

The P. is of a dusky olive-brown color on the upper parts, becoming lighter and mottled with green and yellow on the sides, and passing into silvery white on the belly; the fins brown; the larger fins mottled with white, yellow, and dark green. The tail-fin is forked. The P. grows to a large size, occasionally attaining a weight of sixty or seventy pounds, although the stories of pikes much larger than this are liable to suspicion. The excessive voracity of the P. has long been proverbial. No animal substance which it can swallow, and which is capable of being digested, seems to be unpalatable to it; and no animal large enough to attract its attention, and which it can master, escapes being devoured. Mr. Jesse mentions an instance of eight pike, of about

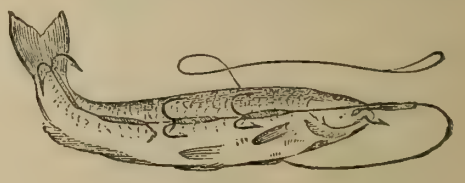


Pike, or Jack (*Esox lucius*).

five pounds' weight each, consuming nearly 800 gudgeons in three weeks; and one of them devoured four roach, each about four inches in length, in rapid succession, and seized the fifth, but kept it in his mouth for about a quarter of an hour before swallowing it. The P. readily attacks a fish of its own size, and preys freely on the smaller of its own species. Frogs are frequent prey; water-rats and ducklings are sometimes devoured. A large P often takes possession of a particular hole in the bank of a river, from which it issues to seize any creature that may pass. —The P. spawns in the beginning of spring, for that purpose ascending narrow creeks and ditches, in which it is very easily caught by nets. Large quantities are caught at the spawning season in Lapland, and dried for future use. The P. grows very rapidly when the supply of food is abundant, reaching a length of 8 to 10 inches in its first year, 12 to 14 in the second, 18 to 20 in the third, and afterwards increasing for a number of years at the rate of about four pounds every year. A young P. is sometimes called a *Jack* or *Pickerel*. The name *Luce* (Lat. *lucius*) is still known as an English name of the pike. The Scotch name is *Gedd*, a name similar to those in the Scandinavian languages.

The flesh of the P. is much esteemed, but that of pikes of moderate size is reckoned superior to that of small, or of very large ones.

The P. is not only caught by means of nets, but by the rod, by set lines, and by *trimmers* or *liggers*, which may be briefly described as floats with lines attached to them, the line being so fastened that the bait swims at a proper depth, and that some yards of line run out when the bait is taken. The floats are sometimes made of wood or cork, sometimes of bundles of rushes, sometimes of bottles. In angling for P., various baits are used, such as a minnow, par, or other small fish, a portion of a fish, &c., and sometimes an artificial fly is employed with great success,



Pike Spinner

made of two large hooks tied together, and adorned with two *moons* from a peacock's tail. The angler unaccustomed to the P. must be cautioned as to the manner of the taking the hook from its mouth, as any rashness may lead to severe laceration of his hand by its teeth. P. may be fished any time from May to February inclusive, except when it is actually freezing. The best month is considered to be November; the P. are then in the best condition. One of the most approved tackles for angling for the P. is the *Spinner*, baited with a small dace, bleak, gudgeon, or par of about two ounces, as represented in the figure given above. The mode of using it is thus described in Bailey's *Angler's Instructor:* 'Having cast your bait as far as possible, allow it, if you are fishiug in a pond, or lake, or deep water, to sink a little, say two feet, then wind away at a brisk rate, holding your rod on one side rather low; if no run, wind out and throw again, but this time wind brisk four or five yards, then all of a sudden stop a moment, then off again, doing so three or four times in one cast. I have often found this a good plan. If you still have no run try another throw and wind brisk as before, but occasionally giving your rod a sharp but short twitch.' See also Stonehenge's *British Rural Sports* (London, 1875).

Other species of P. are found in the lakes and rivers of North America, as *Esox estor*, which is sprinkled with round blackish spots, and *E. reticularis*, which is marked with a net-work of brownish lines.

The Gar-fish (q. v.) is sometimes called the Sea Pike. The same name is also given to certain large voracious fishes of warm seas, belonging to the perch family.—The Saury P. is noticed in a separate article.

PIKE-PERCH (*Lucioperca*), a genus of fishes of the perch family, having two dorsal fins, of which the first has strong spiny rays, but resembling the pike in its elongated form, large mouth, and formidable teeth. The muzzle is not, however, broad and depressed, as in the pike. Several species are known, of which one (*L. sandra*) is common in the Danube, and in most of the rivers and lakes of the north-east of Europe, extending westward to the Oder and the Elbe, although not found in Italy, France, or Britain. It is highly esteemed for the table, and its introduction into British rivers seems particularly desirable. Salted and smoked, it is a considerable article of trade in some parts of Europe. It is a fish of rapid growth, and attains a weight of 25 or 30 pounds. The fish readily takes the minnow and the artificial fly. It is called *Sander*, *Sandel*, or *Sandat*, in some parts of Germany; *Nagmaul* in Bavaria; and *Schill* at Vienna.—Another species (*L. Americana*), much resembling it, of a greenish-yellow color, is found in the lakes and rivers of North America.

PIKE'S PEAK, a peak of the Rocky Mountains, Colorado, U.S., 75 miles south of Denver (q. v.), discovered by General Pike, U.S.A., in 1806. Its height is 14,151 feet, and it commands a view, of 100 miles' radius, of a rugged, mountainous country, containing many lakes, and the sources of four great rivers—the Platte, Arkansas, Rio Grande, and Colorado of California. In 1858, large deposits of gold were discovered here; and during the first four years after the discovery, there were shipped more than £6,000,000 in gold. It abounds in rich gold-bearing quartz. The mining country is 5000 feet above the sea, with a dry climate. An important high-level observatory, from which both meteorology and astronomy profit, has been established near the summit of the mountain.

PILA'STER, in Classical Architecture, a square pillar, sometimes standing free, but usually attached to a wall, from which it projects ⅓th, ¼th, or other definite proportion of its breadth. Greek pilasters, or antæ, were of the same breadth from top to bottom, and had different capitals and bases from those of the orders with which they were associated. The Romans gave them a taper like the columns, and the same capitals and bases.

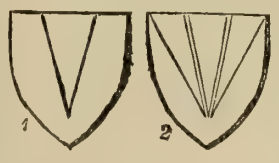
PI'LAU, or PILAW, a dish common in India, Turkey, Egypt, and Syria, consists generally of rice, but occasionally some animal food is added. It is sometimes seen at tables in this country, prepared for those who have been accustomed to it abroad. The correct method of preparing it is to boil the rice for twenty minutes, with sufficient water to soak it thoroughly, and swell the grains to their utmost, taking care not to break them by making them too soft; it is then drained, and gently stirred with butter, pepper, and finely-chopped onions, and served up. This is the way in which the pilaus of the poorer classes are prepared; but for the tables of the more wealthy, fowls, lamb, mutton, shreds of ham or bacon, variously cooked, but always much broiled or roasted, are placed on the top of the rice, and served up with it. In India, very numerous and elaborate receipts are in use.

PI'LCHARD (*Clupea, pilchardus*, or *Alausa pilchardus*), an important fish of the family *Clupeïdæ* (q. v.), referred by some naturalists to the same genus with the Herring (*Clupea*), and by others to the same genus with the Shad (*Alausa*). The P. is nearly equal in size to the herring, but rather thicker, and the lines of the back and belly are straighter; the scales are also larger and fewer; and the dorsal fin is rather further forward. The mouth is small, and in the adult fish destitute of teeth; the under jaw longer than the upper. The upper part of the body is bluish-green; the sides and belly silvery white; the cheeks and gill-covers tinged with golden yellow, and marked with radiating striæ; the dorsal fin and tail dusky.

The P. is an inhabitant of more southern seas than the herring. It used to be found most plentifully on the coasts of Devon and Cornwall, but has of late been deserting these seas; and now the Cornish fishermen ply their craft successfully off the Irish coast, near Skibbereen (where the season is July). The P. is also found on the coast of France, Spain, and Portugal. Like the herring, it was formerly supposed to be a migratory fish; but, as in the case of the herring, this opinion has now been relinquished; and the shoals of pilchards which are seen on the coasts are believed merely to issue from deeper waters near at hand, for the purpose of spawning. The spawning season of the P. begins early in summer; but on the coasts of Devonshire and Cornwall, the principal fishery is in August and September. Pilchards are caught either with drift-nets or sean-nets, but principally with sean-nets. By means of one or more seans, each 360 feet long and 36 feet deep, a shoal is enclosed; the bottom of the net is then drawn together by a peculiar contrivance, and the pilchards are taken out at low water by small bag-nets. Prodigious numbers are sometimes enclosed in a single sean. Twenty-four millions and a half are said to have been taken at once from a single shoal, which, however, may have been spread over several square miles. The approach of a shoal of pilchards is known by the rippling of the water, and the sea-birds hovering above, and is often watched for and marked from the shore. In some years the quantity taken in the P. fishery on the English coast is enormous, and the capital invested in it in Devonshire and Cornwall is probably not much under £1,000,000. The English P. fishery is regulated by several acts of parliament, the first of which are of the days of Elizabeth. Great quantities of pilchards are annually exported to the West Indies and elsewhere. Those intended for exportation are pickled, and packed in barrels by means of great pressure, by which oil is expressed to the amount of three or four gallons from a hogshead of fish. The oil, with the blood and pickle with which it is mingled, is generally used for manure. A favorite Devonshire dish is a pie made of pilchards, with their heads protruding from the crust. It is now generally admitted that the P. and the sardine are identical, and a Cornish Sardine Company has been started for preparing pilchards, like sardines, in oil. It is said that the Cornish sardines cannot be distinguished from those imported from France.—A great number of boats are employed in the P. fishery in and near the estuary of the Tagus.—The P. is known in Scotland as the *Gipsy Herring*.

PILCOMAY'O, a river of South America, whose course has not as yet been thoroughly explored, draws its waters from the Bolivian Andes, and is formed by the confluence of two rivers, the Suipacha and the Pilaya. Of these head-waters, the south one, the Suipacha, rises in the mountains immediately south of Potosi; while the northern branch, the Pilaya, drains the valleys around Chuquisaca. These streams unite in lat. about 21° 35′ S., to form the P., which flows in a general direction south-east crosses the Bolivian frontier, waters the north-east region of the Argentine Confederation, and falls into the Paraguay a few miles below Asuncion. It is at least 1200 miles in length; but its waters are much spent in lagunes on its course, so that it adds no great volume to the waters of the Paraguay. It is navigable for about 500 miles; but numerous hordes of hostile Indians render navigation perilous. Before entering the Paraguay, it divides into two arms of which the northern is called Araguay-Guaso; and the southern, which is again divided into two branches, the Araguay-Mino. The mouths of the P. are narrow, deep, and much obstructed by water-plants.

PILE, in Heraldry (from Lat. *pilum*, a javelin; or from the *pile* or stake used in the construction of a bridge), an ordinary, or, according to some heralds, a subordinary, in the form of a wedge, issuing generally, as in fig. 1, from the middle chief, and extending towards the middle base of the shield. It is said that a pile should occupy one-third of the breadth of the chief, or, if charged, double that breadth. When a pile is borne issuing, not from the middle chief, but from some other part of the bounding-line of the shield, this must be specified in the blazon. Three piles are sometimes borne conjoined in point, as in fig. 2. A pile *transposed* is one whose point is upward.



Pile.

PILE-BRIDGE, a bridge of which the piers are built with piles. These may be either temporary wooden structures, in which wooden piles, driven into the ground, serve also as piers, or they may be permanent bridges, with iron cylinders forming the piles below the surface, and piers above. See PILES.

PILES are usually squared logs of wood used in engineering operations, such as dams, bridges, roads, &c. They are sharpened at the point, and, if necessary, protected with iron points, to enable them to cut through the strata they encounter as they are driven into the ground. When used for coffer-dams, or such temporary purposes, they are placed close together, and driven firmly into the earth; the water is then pumped out, and the piles form a dam, to enable workmen to lay foundations of piers, &c. When the force of the water round the dam is great, two rows of piles are driven in all round, and the space between the rows filled with clay, and puddled. Piles are also used for permanent works, when they are driven through loose soil till they reach a firm bottom, and thus form a foundation on which buildings, roads, &c., may be placed.

Cast iron is frequently used for piles, which are cast hollow. Wharf-walls are sometimes built of piles; they are then cast with grooves on the sides, into which cast-iron plates (forming the walls) are fitted.

A kind of pile has been invented by Mr. Mitchell, which is of great use in very loose and shifting substances. It is called the screw-pile, and consists of a long shaft (of wrought iron), with a broad cast-iron disc, of a screw form at the lower end. These piles are especially useful for light-houses, beacons, &c., which have to be placed on sands. They are fixed by means of capstans, which give them a rotatory motion. Common piles are driven in by machines called *pile-drivers*. In these, a heavy weight (or monkey) is raised to a considerable height between two guides, and then let fall on the head of the pile. The application of steam to these drivers has made them very powerful engines—Nasmyth's steam-hammer being a well-known instance.

In 1843, Dr. L. H. Potts obtained a patent for a new kind of pile, which consists of hollow tubes of iron, from which the sand, &c., within them is removed by means of an air-pump, and the pipes are then sunk.

In recent railway bridges, cylinders have been much used to form both piles and piers. They are of cast iron, and made in pieces (of about six feet in height), which are applied one on the top of another. The sand or gravel is removed from the inside of the first laid, which thus sinks down; another cylinder is placed above it, and the same process continued till it also has sunk sufficiently; and so on, cylinder over cylinder, till a solid foundation is reached. The requisite number of cylinders is then piled up to form the pier above ground.

PILES, or HÆMORRHOIDS, are small tumors, situated either within or on the verge of the anus. They consist of folds of mucous and sub-mucous membrane in an inflamed, infiltrated, or permanently thickened condition, and usually contain enlarged veins. There are several varieties of these tumors. Sometimes the pile is mainly composed of a little knot of varicose veins in the sub-mucous tissue; in this case it is readily emptied, by pressure, of the fluid blood contained in it, which, however returns when the pressure is removed. Sometimes the blood in a dilated vein coagulates, forming a solid tumor surrounded by tissues, thickened in consequence of inflammation; or the tumor may consist of a kind of erectile tissue formed by an abnormal condition of the vessels of the mucous membrane; this variety is especially liable to bleed. These tumors are divided into *bleeding* and *blind* piles, according as they are or are not accompanied with hæmorrhage; and into *internal* and *external* piles, according as they are within or without the sphincter muscle of the anus.

The following are the general symptoms of this affection. The patient, after having experienced for a varying time a feeling of heat, fulness, and dull pain about the lower part of the bowel, becomes conscious of a sensation as if there were a foreign body in the anus; and on examination after an evacuation, discovers a small tumor, usually about the size of a grape, which either remains outside, or is retracted, according as it originated without or within the sphincter. This tumor gradually increases, and others form around it, until a mass at length results as large as a pigeon's egg, or larger. In its ordinary *indolent* state the tumor has little sensibility, and occasions comparatively little annoyance; but when it is *inflamed* (from strangulation of the sphincter muscle, or from any other cause), it is exquisitely tender to the touch, and is the seat of burning and stinging sensations, rendering the evacuation of the bowels (and sometimes of the bladder also) difficult and painful. In women, an inflamed pile may cause pain in the back, irritation of the womb, with mucous discharge, and many other anomalous symptoms. In severe cases, the patient can neither stand nor sit with comfort, and only finds relief in a horizontal position.

Piles may be caused by any circumstances which cause congestion in the lower bowel, such as luxurious and sedentary habits of life, pregnancy, and such diseases of the liver as tend to check the return of blood from the veins of the rectum. Moreover, anything that causes irritation of the rectum, such as acrid purgatives and especially aloes, dysentery, inflammation of the prostate gland, &c., may cause piles. But of all causes, constipation is probably the most frequent; it operates in producing them partly by the pressure of the accumulated and hardened fæces upon the veins carrying the blood away from the rectum, and partly by the straining and irritation such fæces occasion during their evacuation.

In the treatment of piles, it is expedient to relieve the congested state of the lower bowel by one or two doses of sulphate of magnesia, and a cooling vegetable diet, after which the continued use of mild laxatives should be resorted to. A teaspoonful of an electuary, consisting of an ounce of confection of senna, half an ounce of cream of tartar, and half an ounce of sulphur, if taken in the middle of the day, usually acts gently about bedtime, which is far the best time for the bowels of patients of this kind to act, as the parts irritated by the passage of the evacuation become quieted during the night. In long-standing cases, in which there is general relaxation of the mucous membrane, the confection of pepper in doses of a drachm may be given thrice daily with advantage, or a scruple of common pitch may be taken at bedtime in the form of pills or in capsules. Amongst the milder forms of local treatment must be mentioned (1) the injection of the rectum with cold water both before and after the motion; (2) washing the anus with yellow soap and water after each evacuation; (3) the application of gall ointment or of other astringents; and (4) the injection of astringent lotions, as, for instance, of sulphate of iron, in the proportion of a grain to an ounce of water. If these fail, recourse may be had to pressure by means of instruments specially devised for the purpose; to the application of strong nitric acid, which, in the case of internal piles, affords the most speedy and effective means of relief (the operation must, of course, be performed by a surgeon, and if the parts cannot be protruded, the acid must be applied through the speculum); to ligature; or, in the case of external piles, to excision. When the piles are inflamed, leeches to the anus (but not applied directly to the tumors) are sometimes required; but the inflammation generally subsides under the influence of rest in the horizontal position, fomentations, poultices, and low diet.

The treatment of the hæmorrhage that frequently accompanies piles requires a few words. If the bleeding is moderate in quantity, and has continued for some time without inducing weakness or any other bad symptom, it is not expedient to interfere with it. When, however, it obviously requires checking, the effect of cold water injected into the rectum, as already recommended, should be tried, and, in case of its failing, astringent injections should be had recourse to. At the same time, the patient should remain in the horizontal position, and take the medicines usually prescribed for internal hæmorrhage, amongst which may be especially mentioned oil of turpentine, in doses of twenty drops three or four times a day, or ergot of rye in divided doses to the extent of a drachm daily. In rare cases, it is necessary to tie a vessel, or to touch it with a red-hot wire (through the speculum), or to plug the anus.

PI'LEUS. See FUNGI.

PILEWORT. See RANUNCULUS.

PI'LGRIM (Ital. *pellegrino*, Lat. *peregrinus*, 'a visitor of foreign lands'). A pilgrim is one who visits, with religious intent, some place reputed to possess especial holiness. The early Christians, like the Jews and the pagan Gentiles, regarded certain places with special religious interest; above all, the Holy Land, and particularly the scenes of the Passion of our Lord at Jerusalem. St. Jerome (Ep. xliv.) refers the practice of visiting Jerusalem to the discovery of the Holy Cross by St. Helena. He himself was a zealous pilgrim; and throughout the 4th, 5th, and 6th centuries, pilgrims habitually undertook the long and perilous journey to the Holy Land from almost every part of the West. Other sacred places, too, were held to be fit objects of the same visits of religious veneration. The tombs of the apostles Peter and Paul, and of the martyrs in the catacombs at Rome, are so described by St. Jerome (*Commentar. in Ezekiel*). St. Basil speaks in the same terms of the tomb of the Forty Martyrs; and the historian Theodoret tells of not only visiting such sanctuaries, but of hanging up therein, as offerings, gold and silver ornaments, and even models of hands, feet, eyes, &c., in commemoration of the cures of diseases supernaturally obtained as the fruit of these pious visits.

The PILGRIMAGE, however, pre-eminently so called, was that of the Holy Land; and even after Jerusalem had been occupied by the Saracens, the liberty of pilgrimage, on payment of a tax, was formally secured by treaty; and it was from the necessity of protecting pilgrims from outrage, that the well-known MILITARY ORDERS (q. v.) had their origin. The CRUSADES (q. v.) may be regarded as a pilgrimage on a great scale; the direct object being to secure for the Latin Christians immunity of pilgrimage. On the other hand, the final abandonment of the Crusades led to a great extension of what may be called domestic pilgrimage, and drew into religious notice and veneration many shrines in Europe, which, after the lapse of time, became celebrated places of pious resort. The chief places of pilgrimage in the West were: in Italy —Rome, Loretto (q. v.), Genetsano, Assisi; in Spain—Compostella, Guadalupe, Montserrat; in France—Fourvieres, Puy, St. Denis; in Germany—Oetting, Zell, Cologne, Trier, Einsiedeln; in England—Walsingham, Canterbury, and many others of minor note. The pilgrim commonly bound himself only by a temporary vow (differing in this from the palmer), which terminated with the actual visit to the place of pilgrimage, or at least with the return home, and by which he was bound for the time to chastity and to certain other ascetic observances. The costume consisted of a black or gray gabardine, girt with a cincture, from which a shell and scrip were suspended, a broad hat, ornamented with scallop-shells, and a long staff. Many abuses arose out of these pilgrimages, the popular notions regarding which may be gathered—although, probably, with a dash of caricature—from Chaucer's *Canterbury Tales*. Pilgrimages, which have always subsisted in Italy, Spain, Southern Germany, and Switzerland, had gone much into disuse in France during and since the Revolution. In late years, however, pilgrims have resorted in large numbers, not only to the ancient sanctuaries of Notre Dame de la Garde, de Fourvieres, de Puy, &c., but also to La Salette, Lourdes, Paray-le-Monial, and Pontigny. In 1873 and 1874, organized parties of pilgrims on a very large scale from France, Belgium, England, the United States, &c., visited the sanctuary of Paray-le-Monial, the place at which the vision of Marie Alacoque, which gave rise to the devotion to the Sacred Heart of Jesus (q. v.), is recorded to have taken place. In 1874, 500 English pilgrims visited Pontigny. Numerous pilgrimages have also been held in Belgium.

PILLAR, a detached support like a column; but its section may be of any shape, whereas the column is always round. Pillars have been used in all styles of architecture, and their forms and ornaments are usually amongst the most characteristic features of the style. The Greek and Roman pillars (or columns) are the distinguishing elements in the various orders. In Gothic architecture, also, the pillars are of different forms at the various epochs of that style. First, in the Norman period, we have plain massive pillars, square, circular, and octagonal, frequently ornamented with zigzag ornaments, spiral bands, &c., on the surface (fig. 1). As vaulting progressed, the system of breaking the plain surface, and giving to each portion of the vaulting a separate little column or shaft to support it, was introduced. This was

done either by attaching shafts to the circular pillars, or by cutting nooks in the pillar and setting little shafts in them, thus: *a*, *b*, fig. 2.

In the Early Pointed Style a plain circular or octagonal pillar, with a number of small shafts attached around it, is a favorite arrangement, thus: *c*, *d*, fig. 2.

In this style, the attached shafts are very frequently banded to the main pillar at different heights, and they are some times made of a finer material, such as Purbec marble. In the Dec-



Fig. 1.—Norman Clustered Pillar.

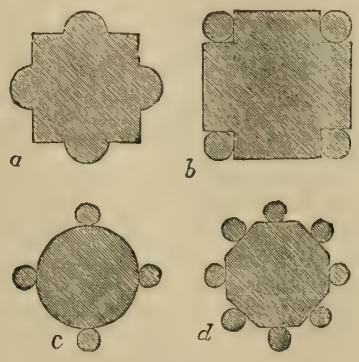


Fig. 2.

orated Style the pillar is of a lozenge form, and not so much ornamented with detached shafts as with mouldings; plain, circular, or octagonal pillars, however, are used in this, as in all the styles. The mouldings and shafts are usually filleted; and some of the mouldings run up into the arch without any cap. In Perpendicular the same idea is further carried out; the mouldings become thinner, and are more frequently run up into the arch without caps. See FLAMBOYANT.

PILLAR SAINTS—called also 'STYLITES' (Gr. from *stylos*, a column), 'Pillarists,' 'Holy Birds,' 'Air Martyrs,' and several similar names—a very remarkable class of anchoretical Ascetics (see ASCETICISM), chiefly of Syria, who, with a view to separating themselves more completely from earth and fellow-men, took up their abode on the tops of pillars, on which they remained without ever descending to earth, and exposed to all the variations of a Syrian climate. The earliest of them, and the most celebrated, Simeon (called also Simon) the Stylite, had been a monk, and had lived, in the beginning of the 5th c., in extreme seclusion in his monastery for nine years, without ever moving from his narrow cell. Increasing in enthusiasm, he withdrew to a place about 40 miles from Antioch, where he built a pillar, on the top of which, only a yard in diameter, he took up his position. From this pillar he removed to several others in succession, each higher than its predecessor, till at last he attained to 40 cubits, or about 60 feet, in height. In this mode of life he spent 37 years, his neck loaded with an iron chain, and his lips engaged in constant prayers, during the recitation of which he bent his body so that his forehead touched his feet. His powers of fasting were no less marvelous; he is said to have frequently limited himself to a single meal in the week, and during the forty days of Lent abstained entirely from food. The fame of his sanctity brought crowds of pilgrims from the most distant countries, even Britain itself, to see him; and the admiration of his austerities is said to have converted many pagans and Saracens to the church. In trial of his virtue, through the test of humility, some neighboring monks reproaching him with vanity, and the love of novelty in this extraordinary mode of life, ordered him to come down from his pillar. Simeon prepared without hesitation to comply, and the compliance was accepted as an evidence of his perfect humility and holiness of purpose. It is said that in consequence of an ulcer which was formed on one of his legs, he was obliged for the last year of his life to remain on his pillar upon one foot. In this position he died in 460, aged 72 years.

A disciple of Simeon, named Daniel, succeeded to his reputation for sanctity; and to his mode of life, which he maintained for 33 years, in the still more trying climate of the shores of the Bosporus, about 4 miles from Constantinople. The marvels of Daniel's career are still more startling. He was sometimes almost blown by the storms of Thrace from the top of his pillar. At times for days together he was covered with snow and ice. How he sustained life, what nourishment he took, was a mystery even to his disciples. The emperor at length insisted on a covering being placed over the top of the pillar, and Daniel survived till the year 494. In Syria there were many pillar saints as far down as the 12th c.; but in the west, Daniel is all but a solitary example. A monk named Wulfailich, near Trier, attempted the pillar-life in the 6th c., but the neighboring bishops compelled him to desist, and destroyed his pillar.

PILLIBHI'T, or PHILLIBIT, a town of India, in the North-west Provinces, 28 miles N.E. by E. from Bareilly. P. is a place of considerable trade. Pop. 30,000.

PI'LLNITZ, a palace and ordinary summer residence of the royal family of Saxony, in a beautiful situation seven miles south-east of Dresden. The grounds are finely diversified, and the walks ascend to the summits of hills, of which one is nearly 1000 feet high. P. acquires a historic interest from the meeting of princes held in the castle in August 1791, when the Declaration of Pillnitz was framed, according to which Austria and Prussia agreed to declare the circumstances of the king of France (then a prisoner in the Tuileries, after his ineffective flight to Varennes) to be a matter of common interest to the sovereigns of Europe, and to express the hope that common cause would be made for his restoration. The emperor and the king of Prussia were resolved to use force in order to effect this result; but any immediate interference on their part was rendered unnecessary by Louis's acceptation of the constitution as modified by the National Assembly, after which he was again placed on the throne.

PI'LLORY, an engine for the public punishment of criminals, disused in Britain since 1837; but previous to that time commonly employed, as it also was in France and Germany. It consisted of a stout plank fixed like a sign-board on the top of a pole, the pole being supported on a wooden platform elevated above the ground. Above, and parallel to this plank another of similar dimensions was placed in a similar position with respect to the pole, and fixed to the former by a hinge, being thus capable of being moved upwards from it, or closed upon it, when necessary. A large circular hole is cut, with its center in the line of junction of the two planks, and two corresponding holes of smaller size are formed, one on each side of it; the large hole is for receiving the neck, and the two smaller the wrists. When a criminal is to be placed in the pillory, he is made to mount and stand upon the platform; the upper of the two hinged planks is raised to allow the culprit's neck and wrists to be inserted in their proper grooves, and then brought down into its place, and fastened by a padlock, or in some other way. See for illustration the wood-cut to the article OATES, TITUS. The pillory seems to have existed in England before the Conquest, in the form of the stretch-neck (an instrument by which the neck only was confined), and was originally intended according to the 'Statute of the Pillory' (51 Hen. III. c. 6), for 'forestallers, users of deceitful weights, perjury, forgery, &c.,' and all such dishonorable offences. Its use was exclusively confined to this class of offenders till 1637, when restrictions were put upon the press, and all who printed books without a license were put in the pillory. From this time it became the favorite mode of punishing libelers (or those who were considered to be such by the government), authors and publishers of seditious pamphlets, or of strictures on the government; and many eminent men were accordingly from this time put 'in and on the pillory,' among whom may be mentioned Leighton, Lilburn, and Warton the printers, Prynne, Dr. Bastwick, Daniel Defoe, &c.

The insufficiency of the pillory as a means of inflicting a definite amount of punishment was now apparent, for to those who were popular favorites it was no punishment at all, while those who were objects of popular dislike were ill-used to such an extent as occasionally to cause death. The sufferers above mentioned being popular favorites, or having at least a numerous class of supporters, were shaded from the sun, fed, and otherwise carefully attended to; while the encouragement, applause, and sympathy of the crowd around converted the intended punishmeut into a triumph; but such men as Titus Oates, and the class of offenders including perjurers, swindlers, polygamists, &c., who were objects of popular hatred and disgust, were pelted with rotten eggs (the favorite missile), garbage, mud, sometimes even with more dangerous missiles. In 1814 the celebrated naval hero Lord Cochrane (see DUNDONALD, EARL OF) was sentenced to the pillory, but the governmeut of the day was not prepared to brave the consequences of such an act, and the sentence was not carried into effect. In France the pillory was anciently called *pilori*, and in recent times *carcan*, from the iron collar by which the criminal's neck was attached to the post; but punishment by this mode was abolished in that country in 1832.

PILLS are the most generally convenient and popular of all forms of medicine. They are formed from masses of a consistence sufficient to preserve the globular shape, and yet not so hard as to be of too difficult solution in the stomach and intestines. This form is especially suitable for (1) all remedies which operate

in small doses, as metallic salts; (2) those which are designed to act slowly and gradually, as certain alteratives; (3) those which are too readily soluble when exhibited in other forms; (4) substances whose operation it is desirable to retard until they have reached the lower intestines, as in certain pills for habitual costiveness; (5) bodies whose specific gravities are too inconsiderable to allow their suspension in aqueous vehicles; and (6) fetid substances: while it is unsuitable for (1) medicines which require to be given in large doses; (2) deliquescent salts; (3) fluid or semi-fluid substances, such as oils, balsams, &c., which require a very large proportion of some dry powder to render them sufficiently tenacious to form into a mass; (4) substances so insoluble, that when exhibited in solid form they pass through the intestinal canal unaltered, as extract of logwood (Paris's *Pharmacologia*, 9th ed. p. 550).

Many substances, such as vegetable extracts, may be at once formed into pills without any addition; but most substances require the addition of a material termed an excipient, for converting it into a pill-mass. The excipients in most common use are bread-crumbs, hard soap, extract of liquorice, mucilage, syrup, treacle, honey, castor oil, and conserve of roses. From the property of preserving pills for a long time in a properly soft state, the most valuable excipient is the conserve of red roses; and, perhaps, next to it treacle is the most valuable excipient, as it does not undergo any change by time, but maintains a proper consistence, and preserves the properties of vegetable powders unimpaired for years. It is common to place pills in some fine powder, to prevent them from adhering to each other, and to conceal their taste. For this purpose liquorice powder, wheat flour, starch, and magnesia are generally used in this country, and lycopodium on the continent. Pills retain their moisture and activity far longer in small bottles than in the ordinary pasteboard boxes. The ordinary weight of a pill is five grains; if it much exceeds that weight, it is too bulky to swallow conveniently if it consist of vegetable matter. It is very common to meet with patients who express their inability to take this form of medicine. If, however, they practise with a small globular mass, towards which they feel no repugnance, as a pellet of bread or a currant, placing it on the back of the tongue, and gulping it down with water, they will soon get over the difficulty.

PI'LOT, is a person specially deputed to take charge of a ship while passing through a particular sea, reach, or dangerous channel. The intricacy of almost all coast navigation renders it impossible that any navigator, however skilful, can be master of all the waters to which he may have to sail his ship; and the risk of failure, through ignorance of local dangers, is therefore avoided by transferring the direction of her course to some one perfectly acquainted with the spot. The man to whom so much is intrusted must be a responsible person, and therefore in all countries qualified sailors are officially licensed to act as pilots in their districts, and they are granted the monopoly. The origin of the word pilot is uncertain; but is probably taken from or nearly identical with the Dutch *pijlloot*, which is compounded of *peilen*, to sound the depth, and the root which appears in D. *lootsman*, O. E. *lodesman*, and signifies to lead, direct. Pilot thus means one who conducts a vessel by sounding. The laws of Wisby, promulgated at least as early as the 14th c., and subsequently incorporated in nearly every maritime code, render it compulsory on the master of a ship to employ a pilot when sailing near a coast.

The British laws relating to pilots were revised and consolidated by the act 16 and 17 Vict. c. 129. Certain fees are established in proportion to the distance and responsibility; and the master of every vessel, above 50 tons, passing up the Channel or the Thames, or *vice versâ*, is required to accept the services of the first pilot tendering, provided he shows his license as a proof of qualification. Except in matters of discipline, the command of the vessel is then vested entirely in the pilot, who can have the sails, steering, &c., of the ship carried on entirely at his discretion until the limit of the pilot's district is passed, except that the captain resumes his powers when the question of taking up ground in a harbor is concerned. The fees vary with the draught of the ship and the distance; as specimens, may be cited the highest and lowest in the London district: a ship drawing 22 feet of water is piloted from Orfordness to Blackwall for £27, 12*s*.; a ship drawing not more than 7 feet is guided from Gravesend Reach to Long Reach for 9*s*. 3*d*.

Pilots are associated in guilds called Brotherhoods, of which the principal are the Brotherhood of the Trinity House of Deptford-Stroud, situated on Tower-Hill, which has jurisdiction over the Thames, Medway, and the coast from Harwich to the Isle of Wight; and the Trinity Houses of Kingston-upon-Hull and Newcastle-on-Tyne. There are also societies of pilots at the larger ports out of these districts, the government in such case being vested in certain officials lawfully appointed as 'pilotage authorities.' Their powers over the members, &c., are defined in the act above quoted, and in the Merchant Shipping Act of 1854, 17 and 18 Vict. c. 104, sections 330—388.

Pilots board vessels entering their districts in boats conspicuously painted, on the bows and sails of which must be the man's distinguishing number as shown by his license. The boat also bears a flag of comparatively large size, of red and white divided horizontally. A ship requiring a pilot hoists a square blue flag. In passing up or down the Thames, every ship above 50 tons or 6 feet draught must bear a pilot; but her master or first-mate may act by license in that capacity, if he have passed the necessary examination. A master is subject to a penalty for sailing without a pilot; and, on the other hand, so also is any person, without a license, or whose license has been forfeited, presuming to act or offering to act as a pilot.

In the navies of some countries the pilot is a permanent officer of the ship, and has charge of her course; but his functions in that case approach nearer to those of the British navigating officer. Large French vessels have often several sailing pilots called *pilotes hauturiers*, and a *pilote côtier* or *lamaneur*. The ancient laws of France contained provisions for the education and regulation of both these classes.

The general rule as to the responsibllity of the owners of the ship is, that no owner or master of a ship is answerable to any person whatever for any loss or damage, occasioned by the fault or incapacity of any qualified pilot acting in charge of such ship within any district where the employment of the pilot is compulsory.

PILOT-FISH (*Naucrates ductor*), a fish of the family *Scomberidæ*, and belonging to a section of that family in which the first dorsal fin is represented by mere spines, and there are no finlets behind the second dorsal and anal fins as in the mackerel, &c. The shape of the P. is very similar to that of the mackerel. It is usually about a foot long; the general color silvery grayish-blue, five dark-blue transverse bands passing round the whole body. Its flesh is very delicate, and resembles mackerel in flavor. It is common in the Mediterranean, and appears to be widely-diffused through the warmer parts of the ocean, often following ships for a long time and very far, in which way it has been known to come from Alexandria to Plymouth. It is, however, of rare occurrence even on the southern coasts of Britain. It is supposed to be the *Pompilius* of the ancients, which was believed to point out their desired course to sailors. It is often seen in the company of a shark, and is therefore very commonly supposed to direct the shark to its prey. Concerning this many wonderful stories are to be found in the writings both of voyagers and of naturalists. It has been contended, on the other hand, that the P. merely follows the ship along with the shark for the same object that gulls follow the steam-boats on our coasts, to feed on anything eatable that may fall or be thrown overboard; or that it attends the shark in order to seize small morsels of its large prey. The following statements of Dr. Bennett may be received with confidence: 'I have observed that if several sharks swim together, the pilot-fishes are generally absent; whereas, on a solitary shark being seen, it is equally rare to find it unaccompanied by one or more of these reputed guides. . . . The only method by which I could procure this fish was, that when capturing a shark I was aware these faithful little fishes would not forsake him until he was on board; therefore by keeping the shark, when hooked, in the water until he was exhausted, or, as the sailors term it, "drowned," the pilot-fish kept close to the surface of the water over the shark, and by the aid of a dipping-net fixed to the end of a long stick I was enabled to secure it with great facility' (*Gatherings of a Naturalist*).—A much larger species of *Naucrates* is found on the coasts of South America.

PILPAI. See BIDPAI.

PI'LSEN, a town of Bohemia, in a fertile and beautiful valley at the confluence of the Mies and the Beraun, 52 miles west-sout-west of Prague. The church of St. Bartholomew (built in 1292), the town-hall, and the house of the Teutonic Knights are interesting Gothic edifices. The town also contains a gymnasium and other educational institutions, an arsenal, theater, and a number of churches and convents. P. has leather and cloth-factories, a great alum-work, iron and coal mines, and an important brewery. Pop. (1880) 38,883.

PIME'NTO, PIMENTA, ALLSPICE, or JAMAICA PEPPER, a well-known spice, is the dried fruit of *Eugenia Pimento* (see EUGENIA), a small West Indian tree, which grows to the height of twenty to thirty feet, and has oblong or oval leaves about four inches long, of a deep shining green, and numerous axillary and terminal trichotomous panicles of white flowers, followed by small dark-purple berries. The P. tree is much cultivated in some of the West Indian Islands. It is a very beautiful tree, with straight trunk and much branching head; and about the month of July is covered with an exuberance of flowers, which diffuse a rich aromatic odor. The leaves and bark partake of the aromatic property for which the fruit is valued. The fruit, when ripe, is filled with a sweet pulp, and the aromatic property, which so strongly characterizes it in an unripe state,

has in a great measure disappeared. The gathering of the berries, therefore, takes place as soon as they have reached their full size, which is about that of pepper-corns. They are gathered by the hand, and dried in the sun on raised wooden floors, during which process great care is taken, by turning and winnowing, to prevent them from being injured by moisture. Their color changes in drying, from green to reddish-brown. When dry they are packed in bags for the market. Some planters kiln-dry them.—The name *Allspice* was given to P. from a supposed resemblance in flavor to a mixture of cinnamon, nutmeg, and cloves.



Pimento.

P. is much employed in cookery, and is also used in medicine as a carminative and stimulant, to prevent the griping of purgatives, and to disguise the taste of nauseous drugs. It depends for its properties chiefly on a volatile oil, *Oil of P.*, which is obtained from it by distillation with water, and is sometimes used to relieve toothache, and for making the *Spirit of P.* (or of *Allspice*) and *P. Water* (or *Allspice Water*) of the shops.

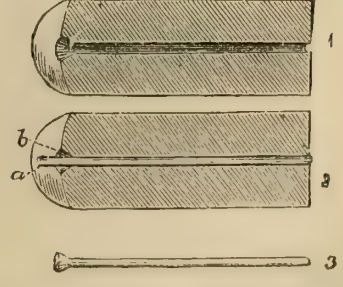
PI'MPERNEL (*Anagallis*), a genus of plants of the natural order *Primulaceæ*, having a wheel-shaped corolla, and the capsule opening by division round the middle. The species are elegant little annual and perennial plants, natives chiefly of temperate climates. The flowers are not large, but very beautiful.—The SCARLET P. (*A. arvensis*) is a common plant in Britain, occurring as a weed in fields and gardens; it is common also in most parts of Europe, and in many parts of Asia. The flowers are of a fine scarlet color, with a purple circle at the eye. There is a common belief in England, mentioned by Lord Bacon, that when this plant opens its flowers in the morning a fine day may be expected; and they certainly close very readily on the approach of rain. They usually open about eight in the morning, and close about noon.—The BLUE P. (*A. cærulea*), is far less common in Britain, but very abundant in some parts of Europe.—The BOG P. (*A. tenella*), frequent in bogs in England, but rare in Scotland, is an exquisitely beautiful plant.—Several species are cultivated in our flower-gardens.—Acrid properties prevail in this genus, and *A. arvensis* has been used medicinally in epilepsy, dropsy, and mania.—The name WATER P. is given to *Samolus Valerandi*, also called *Brookweed*, another British plant of the same order, with racemes of small white flowers, growing in watery gravelly places. It is supposed to be the *Samolus* which Pliny says the Druids gathered fasting, with the left hand, and without looking at it, ascribing to it magical virtues in the cure and prevention of diseases in cattle. Its geographic distribution extends over almost all the world.

PIN. As a requisite of the toilet, &c., pins were first used in Britain in the latter part of the 15th c.; they were at first made of iron wire, but in 1540 brass ones were imported from France by Catherine Howard, queen of Henry VIII. Several inventions, however, were previously in use for holding together parts of the dress, such as buckles, brooches, laces, clasps, hooks, &c. At first pins were made by filing a point to a proper length of wire, and then twisting a piece of fine wire around the other extremity, or fixing it after twisting, in order to form a knob or head; and ultimately these operations were so skilfully conducted, that a completely round head was made of very small size, and scarcely showing the nature of its construction. Some pins are still made in this way. It is suprising how many operations are needed to complete so small an article. They are as follows: 1. *Straightening and Cutting the Wire.*—The straightening is necessary, because the wire-drawers coil the wire as they make it upon a cylinder, and when it is unrolled, the coils remain. It is therefore drawn through an arrangement of upright iron rods which completely straighten it, after which it is cut into lengths of 30 feet, and these are again reduced to lengths of four pins. 2. *Pointing.*—This is done by two operations and different workmen, each standing at a separate grindstone; the first is the rough grinder, and the second the finisher. Each holds with the thumb on the palm of the hand a number of the wires amounting to 30 or 40, and by a movement of his thumb he manages to make the wires turn round so as to make a point to each as he holds them to the grind-stones, the second of which, being of a fine material, gives them a smooth finish; they are then reversed, and the other end pointed. 3. *Cutting.*—The length of a single pin is cut off of each end of these pieces; the intermediate portions are then handed back to the pointers, and each end receives a point, after which they are divided into two, and thus the four pin piece is reduced into single pin lengths, each having a point.

4. *Twisting the Heads.*—These are made of very thin wire, which is coiled twice, by means of a lathe, around the end of another piece of wire the same thickness as the pins. 5. *Cutting the Heads.*—The head being formed on the thin wire, it is handed to another workman who cuts it off; these two operations are performed with great rapidity, so great, indeed, that as many as 12,000 have been made in an hour. 6. *Annealing the Heads.*—This is softening them by putting some thousands into an iron ladle, and after making them red hot, plunging them into cold water. 7. *Stamping or Shaping the Heads.*—This is pressing the heads into a better shape by means of a small lever press, and at the same time fixing them on the pins; a good worker will do as many as 12,000 to 15,000 per day. 8. *Yellowing or Cleaning the Pins.*—This is done by a process which is often called *souring;* it consists in boiling them for about half an hour in the dregs of sour beer, or a solution of argol or cream of tartar, and then washing them in clean water. 9. *Whitening or Tinning.*—In this process a large copper pan is used, and in it is first placed a layer of about six pounds of the cleaned or yellowed pins, and over these a layer of grain-tin to the amount of about eight pounds. Several alternate layers of pins and tin are put in one vessel, and then by a pipe arranged inside the copper pan water is gently poured in, and goes through the pipe to the bottom, first rising up through the different layers so gently as not to disturb them. Fire is now applied to the bottom of the pan, and when it is nearly boiling its surface is sprinkled with a quarter of a pound of cream of tartar and the whole is slowly boiled for half an hour, then poured into a strainer and shaken, to separate the pins from the grain-tin and liquid; by this process a thin deposit of tin has been thrown on the pins, which now are white instead of yellow; without the souring this would not take place, it being essential that they should be quite free from any oxidation or soil. 10. *Washing.*—The pins are now thoroughly washed in pure water. 11. *Drying and Polishing.*—They are now put into a large leathern bag with a quantity of bran, and violently shaken backwards and forwards by two men.

12. *Winnowing.*—The bran is next separated by fanning. 13. *Pricking the Papers to receive the Pins.*—This is now done by an ingenious machine, through which the papers are passed, and which, at regular intervals, arranged according to the size of the pins, pinches up a fold of the paper, and at the same time pricks the holes to receive the pins, and then places the pins in their places. Formerly this required a separate operation. Thus fourteen persons were required to make and put up for sale a pin, and in some manufactories this is still the case; but in all the large establishments machines are now employed, and an immense reduction of hand labor is effected by them.

The first machine was invented by Lemuel Wellman Wright, of the United States, in 1824. This did very little more than make



solid heads to the pins, by a process in principle like that used for nail-making—viz., by driving a portion of the pin itself into a counter-sunk hole. The action, however, was automatic, and consisted in an arrangement by which the wire was seized in two small grooved cheeks, as in figs. 1 and 2, which represent them

separated. Fig. 1 has the groove empty, but in fig. 2 is seen the wire which projects at *a*. When both cheeks are placed face to face, and the wire is held tightly in the groove with the small portion (*a*) projecting, a small ram or hammer connected with the machine strikes on *a*, and compresses it into the small cup-shaped depression *b*, and thus the head is formed, as in fig. 3. The pointing and dressing of the pins was afterwards carried on as described in the processes for hand-made pins. Since Wright's invention many remarkable improvements have been effected in these machines, which have consequently become very complicated in their details, although the principles upon which they act are very simple.

No description would convey a satisfactory idea of these wonderful pieces of mechanism, which now, without the aid of hands, complete the pin in all respects except the coloring and polishing; but a slight account of the leading features will enable the reader to understand their mode of working. First, then, a reel of wire as it comes from the wire-drawer is placed in the rear of the machine, and the end of the wire is taken hold of by a pair of nippers, which pull it over a fixed *straightening board*, and pass it on completely straightened, until it is seized by two cheeks similar to those in figs. 1 and 2, when a cutter descends and cuts it off, leaving the projecting part for the head; on the withdrawal of the cutter, the hammer flies forward, and makes the head as before described; the cheeks open, and the pins drop on to a sloping metal plate finely grooved, down which they slip with the heads upwards, until the end which is to be pointed comes in contact

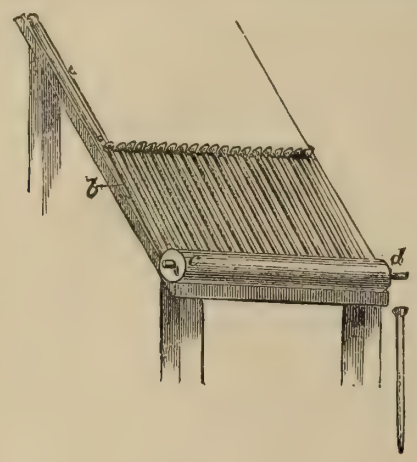


Fig. 4.

with a cylindrical roller with a grinding surface, which soon grinds points upon them, owing to two or three ingenious arrangements: the first is, that the grooved surface of the plate by which the pins descend terminates a little above the grinding roller, then a slight depression is given to the sloping plate and also to the roller, so that one end is an inch or two lower than the other; therefore, as the pin descends the groove (*a*, fig. 4), and is thus

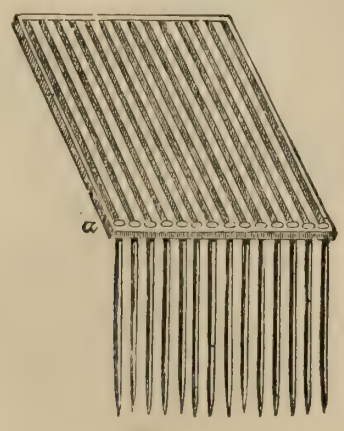


Fig. 5.

brought down the inclined plate until it lies on the smooth part (*b*, fig. 4), where it is highest, and with its end in contact with the grinding roller (*c*) which is revolving, the pin itself is compelled by the friction of the roller to turn round, and gradually descends from the upper to the lower part of the inclined plate (*d*), and then falls into a box placed to receive it. This is attempted to be shown in fig. 4. These operations are performed so rapidly that they can scarcely be followed by the eye, and the pins fall into the box beautifully pointed in a complete stream. They are then *yellowed*, *tinned*, and prepared for papering, which is a remarkable process.

The machine by which it is done is worked by two children; one feeds the machine with pins, the other with papers. The first part of the machine is a box, about 12 inches long by 6 inches broad and 4 inches deep; the bottom is made of small square steel bars, sufficiently wide apart to let the shank of the pin fall through but not the head, and they are just as thick as the space between papered pins; the bottom of the box, with the row of pins hanging through it, are seen in fig. 5. The lower part of the bottom of the box at *a* is made to detach itself as soon as the row of pins is complete, and row after row at regular intervals is received and passed down a corresponding set of grooves, until they reach the paper which, as before described, is pinched into regular folds and pierced to receive the pins, which, by the nicest imaginable adjustments, come exactly to their places, and are pressed into them. In this way many thousands of those neat-looking paper packages of pins, with which all are familiar, are put up in one day by two little girls, aided by these wonderful machines.

PI'NA CLOTH, a very beautiful fabric made of the fibres of the leaves of the pine-apple plant (*Ananassa sativa*), and other allied species. This cloth is only made in Manilla, and in its manufacture resembles horse-hair cloth, because the threads both of warp and weft are each single unspun fibres, consequently only small pieces can be made; the workers have, however, a plan of joining the fibres of the coarser kinds end to end, so as to make warp threads of considerable length. Pina cloth is very strong, and the better sorts far excel the finest lawns in texture It is chiefly employed in the manufacture of ladies' pocket-handkerchiefs, which often have their costliness much increased by beautiful embroidery.

PI'NCHBECK is an alloy of zinc and copper, in which the proportions slightly differ from those which constitute brass; 3 parts zinc to 16 of copper constitute this material, instead of one part of the former to two of the latter as in common brass. Pinchbeck, when new, has a color resembling red gold, and it was at the beginning of the present century much employed in making watch-cases and other small articles in imitation of gold.

PIND DADU'N KHAN, a town in the Punjab, stands on a narrow verdant plain on the right bank of the Jhelum, and at the southern base of the Salt Range or Kalabagh Mountains, 110 miles north-west of Lahore. The town consists of three groups of houses, four miles from the Jhelum. The houses are built of mud, but the framework is of cedar-wood. In the vicinity, salt is extensively raised in the Salt Range. See PUNJAB. Entire population (1872), 13,340.

PI'NDAR (Gr. *Pindaros*), the great lyric poet of Greece, was born about 522 B.C., of a noble family of Thebes, at Cynoscephalæ, a village in that territory. His genius for music was hereditary, and at an early age he was sent by his father, himself a flute-player, to receive instruction in the same art from Scopelinus. At this time his genius for poetry too—foreshadowed, according to later writers, by a swarm of bees miraculously resting on his lips when asleep—began to develop itself, and so he went to Athens to be placed under the tuition of Lasus of Hermione, the founder of the Athenian school of dithyrambic poetry. Before completing his 20th year he returned to Thebes, where he continued to pursue his studies under Myrtis and Corinna, of Tanagra, two poetesses then famous in Bœotia. With both of these instructresses he contested the prize for music at Thebes, but was five times defeated by Corinna. He was still a young man when he entered on his professional career as a poet, and his services soon came to be in great request on festive occasions throughout all the Hellenic states. He composed choral songs for Hiero, tyrant of Syracuse; Alexander, son of Amyntaz, king of Macedonia; Theron, tyrant of Agrigentum; Arcesilaus, king of Cyrene; and also for many free states and private individuals.

He won not only the admiration of his employers for his lyrical genius, but also their respect for his independent character, which, amid all the presents and rewards conferred upon him, never degenerated into that of the poet who merely performed for hire. He was especially the favorite of Alexander, king of Macedonia, and of Hiero, tyrant of Syracuse; and it is said that to the praises he lavished on the former of these monarchs his house owed its preservation at the hands of Alexander the Great, when he reduced the rest of Thebes to ruins. His life was for the most part spent abroad at the courts of kings, and at the scenes of the great public games; and at one period, 473 B.C., he resided at Syracuse at the court of Hiero for the space of four years. He died most probably in 442 B.C., in his 80th year. Of the immense number of his poems, consisting of hymns to the gods, pæans, dithyrambs, odes for processions (*prosodia*), maidens' songs (*partheneia*), mimic dancing songs (*hyporchemata*), con-

vivial songs (*scolia*), dirges (*threnoi*), and encomia on princes, we only possess fragments. His *Epinikia*, or Triumphal Odes, however, have come down to us entire; and it is from these—divided into four books, and celebrating the victories won in the Olympian, Pythian, Nemean, and Isthmian games respectively—that we must form an opinion of P. as a poet. A victory at these games conferred honor not upon the winner and his family only, but also on the city to which he belonged; and for its celebration —which began with a procession to the temple, where sacrifice was offered, and ended with a convivial banquet—a poem was specially composed, and was sung by a chorus either during the procession, or, more frequently, at the banquet (*comus*).

P.'s poetical style is peculiar. Full of bold conceptions and striking metaphors, his manner is so rapid and so subject to abrupt transitions, as to render him not only a difficult but an obscure composer. Typical examples of his strength, as well as of his weakness, will be found in the Second Olympian and First Pythian Odes, where the description of the Islands of the Blest in the former, and of an eruption of Mount Ætna in the latter, are brilliant offsets to the shadowy mythological allusion and the undeveloped metaphor which also characterize them. His metres, in spite of the able efforts of Böckh, still remain to be satisfactorily elucidated; and all that we can here say of them is, that he makes chief use of the Dorian rhythm, and not unfrequently of the Æolian and Lydian. He has been fortunate neither in his numerous imitators nor translators—Gray being, perhaps, the most successful among the former, and Carey, Abraham Moore, Morice, and Baring among the latter. He has been elaborately explained and criticised in Schmidt's *Pindar's Leben und Dichtung* (1852); while his relation to lyric poetry in general forms the subject of Villemain's brilliant *Essais sur le Génie de Pindare et sur la Poesie Lyrique* (1859). The best editions are those of Böckh; of Dissen, re-edited by Schneidewin; and of Hartung.

PINDAR, PETER. See WOLCOT.

PI'NDUS, anciently the name of a chain of mountains in Greece (q. v.).

PINE (*Pinus*), a genus of trees of the natural order *Coniferæ*. The Linnæan genus includes all kinds of Fir, Larch, and Cedar; but as now limited, the genus *Pinus* is distinguished by monœcious flowers, and woody cones with numerous two-seeded scales, the scales having an angular truncated apex. The leaves are linear and very narrow, of a very dark-green color, growing in clusters or in pairs, and surrounded by scarious scales at the base. To this genus belong many noble and useful trees. They mostly grow in mountainous or other exposed situations, and their narrow leaves are admirably adapted to evade the force of winds, which produce in the tops of pines a peculiar sound, much noticed by the ancient poets, more soft and continuous than in trees of richer foliage. Most of the pines are more or less social, one kind often covering a considerable tract; some of them clothing the sides and even the summits of mountains with magnificent but sombre forests; some growing in lower situations, on otherwise unproductive sandy grounds, as the *Pine Barrens* of North America. The pines growing in the most barren soils, or in the coldest climates and most exposed situations, are often very small; and although very unlike any other shrubs or bushes, are scarcely to be called trees. Pines are widely diffused over the northern hemisphere, being found on mountains within and near the tropics, and in the colder temperate and the arctic regions descending to the level of the sea.

The SCOTCH P. or SCOTCH FIR (*P. sylvestris*) is the only species indigenous to Britain. It has leaves in pairs, about an inch and a half long; the cones about the same length, obtuse, and with unarmed scales. On very poor soils and at great elevations it is reduced to a kind of shrub, but in favorable situations it becomes a lofty tree. A plank five feet and a half in diameter has been obtained from a Scottish forest. The Scotch P. is of quick growth, but has been known to attain the age of 400 years. Its head is somewhat conical or rounded, and the lower branches die off as the tree grows, leaving the older trees bare of branches for the greater part of their height; but it is more apt to send off large branches than most of the Coniferæ. There are still native forests of Scotch P. at Braemar and elsewhere in the Highlands of Scotland; and even in the south of Scotland noble trees are to be seen which, probably, were not planted by man. The Scotch P. is not indigenous to the south of England, but having been introduced, is spreading rapidly and spontaneously, along with the Pinaster, in some of the heaths and other unfertile tracts. Immense forests of it exist in some countries of Europe, in some of which it is mingled with the Spruce Fir. In the middle and north of Europe and of Asia, it is found even in plains near the level of the sea, especially where the soil is somewhat sandy; in the south of Europe it grows only on mountains. Its timber is highly valuable, being very resinous and durable, and is the *Red Deal* or *Red Pine* used in house and ship-carpentry. There is very great difference, however, in the timber of Scotch P. growing in different soils and situations, rich soils and sheltered situations being unfavorable to the quality of the timber, which becomes white, soft, and comparatively worthless; and there exist several varieties of Scotch P., some of which yield timber very superior to others.

Many plantations in Britain have, unfortunately, been made of inferior kinds. One of the best varieties is that which forms the northern Scottish forests, often designated *Braemar P.* by nurserymen. It is remarkable for its very horizontal branches, and is therefore sometimes called *P. horizontalis*.—The Scotch P. is not only valuable for its timber, which is available for some purpose at every stage of its growth, but on account of other products. Common Turpentine is in great part obtained from it, and much Tar, Pitch, Resin, and Lamp-black. See these heads. Oil of Turpentine is sometimes distilled from the cones, and even from the leaves; the leaves have also been used in Germany for the manufacture of a substance resembling tow, and called *Waldwolle* (Forest Wool), suitable for stuffing cushions, &c. The resinous



Braemar Pine.

roots are dug out of the ground in many parts of the Highlands of Scotland, and being divided into small splinters, are used to give light in cottages instead of candles. Fishermen, in some places, make ropes of the inner bark, which is applied to a very different use, when most soft and succulent in spring, by the Kamtchatdales and Laplanders, being dried, ground, steeped in water to remove the resinous taste, and used for making a coarse kind of bread. —The DWARF P. (*P. Pumilio*, or *P. Mughus*) is found on the Alps and Pyrenees, its trunk often lying on the ground, although sometimes it appears as a bush or low tree. The recumbent trunks are called *Krommholz* (Crooked-wood) and *Knieholz* (Knee-wood) by the Germans.—The leaves are in pairs, very like those of the Scotch P., but a little longer; the cones are also similar.

From the young shoots an oil resembling oil of turpentine is obtained by distillation, which is a kind of universal medicine among the peasantry of Hungary, as is also the resin spontaneously exuding from the tree, which is known as *Hungarian Balsam*.—The BLACK P., or BLACK FIR (*P. nigricans*, or *P. Austriaca*,) is another species closely allied to the Scotch P., but remarkable for its very long leaves. It is a native of Austria. It abounds in resin more than any other European tree.—To the same group of pines belongs the SEASIDE or TAURIAN P. (*P. Pallasiana maritima*, or *Taurica*), which also affords resin in great quantity, and of a very pleasant odor. It is found in many parts of the south of Europe. Its timber is of little value; but great part of the turpentine of the *Landes* and other maritime districts of France is obtained from it. It yields also part of the *Burgundy Pitch* of the apothecaries' shops.—The ALEPPO P. (*P. Halepensis*), a native of the south of Europe, Syria, &c., is a very graceful tree of moderate size, with leaves in pairs and slender. It yields a liquid resin or turpentine, which is extracted from it in Provence and elsewhere, and sold as *Venice Turpentine*. The wood is extensively used in the Levant for shipbuilding.—The LARICIO (*P. Laricio*) has leaves in pairs, lax, and 4—8 inches long, cones 2—4 inches long, with the scales slightly pointed. It is often called the CORSICAN PINE. It grows on the shores of the Mediterranean Sea, and is valuable both for its timber and for its resinous products. In the island of Corsica, it frequently attains the height of 140 feet. It grows well in sandy soils, and has been made particularly useful for preventing the drifting of the sand, and turning to account the otherwise useless tracts between the mouths of the

Garonne and the Adour in France, thus also preserving valuable lands which the sand threatened to overwhelm.—The PINASTER or CLUSTER PINE (*P. Pinaster*) is another of the most important European species. It has cones in whorls of 3, 4, or even 8 together, 4—6 inches long, leaves in pairs, and very long. It is found on the shores of the Mediterranean, and also in the Himalaya and in China.

It has been used in France to a great extent, in the same way as the Laricio, for covering waste sandy tracts. The timber is of inferior quality, but great quantities of resin are procured from it. It yields *Bordeaux Turpentine*.—The PYRENEAN P. (*P. Pyrenaica*) is a majestic tree, a native of the Pyrenees, and producing very fine timber.—The CALABRIAN P. (*P. Bruttia*) somewhat resembles the Pinaster.—The STONE P. (*P. pinea*) a tree with a broad umbrella-shaped head, a form often seen also in the Scotch fir, forms a characteristic feature of the scenery of the Mediterranean, and is very often introduced in paintings. It



Stone Pine (*P. Pinea*).

is the *Pinie* of the Germans, the *Pignon* of the French. The leaves are in pairs, 4—5 inches long; the cones very large, ovate, and obtuse. The seeds, which do not ripen till the fourth year, are large, abound in a fixed oil, and when fresh have a sweet taste resembling that of almonds. They are used in Italy and other countries in the same way as almonds and pistachio nuts for the dessert, in various dishes, also in emulsions, &c., under the names of *pinies*, *pinioles*, and *pignons*. The use of them, however, is almost entirely confined to the countries in which they are produced, as they very soon become rancid. They are sometimes imported into London in the cone, in which way they can be kept longer, but the cost of importation is much increased. The wood of this tree is very useful and beautiful. It yields resinous products only in small quantity.—The CEMBRA P., or SWISS STONE P., which grows in the central parts of Europe and the south of Siberia—a stately tree, with the lower branches more persistent than they are in most pines, and rigid leaves in groups of three to five—also produces eatable seeds (*Cembra Nuts*), which, although they are extracted with difficulty, are much used. The cuticle contains a resinous juice; but in Siberia, this fruit is so much prized, that noble trees are often cut down to obtain it. The Cembra P. yields a pellucid, whitish oil, resembling oil of turpentine, and known as *Carpathian Balsam*.

North America produces many species of P., some of them very beautiful and very valuable. Besides those long known, and which are found in the states and colonies near the Atlantic, a number of the noblest species of this genus have, since the commencement of the present century, been discovered in California and the north-western parts of America.—The RED CANADIAN P. (*P. resinosa*) is found from Canada to the Pacific, but does not reach far south in the United States. It is the YELLOW P. of Canada and Nova Scotia. It delights in dry and sandy soils, and attains a height of 70—80 feet, with a diameter of two feet at the base, the trunk continuing of uniform diameter for two-thirds of its length. The leaves are in pairs, and are congregated towards the extremities of the branches. The timber is highly esteemed for strength and durability, and furnishes excellent planks for ship-building. It is also used for masts.—Somewhat resembling this in botanical characters, is the SCRUB P., or GRAY P. (*P. Banksiana*), generally only 3—10 feet high, which begins to appear in the northern parts of the United States upon high mountains, and is interesting as an arctic species, extending further north than any other.—The YELLOW P. (*P. variablis*, or *P. mitis*) abounds in the Atlantic States from New Jersey to Virginia. It is a tree of 50—60 feet high, 15—18 inches in diameter at the base, with leaves 4—5 inches long, usually in pairs, but sometimes in threes upon the younger shoots. The timber is very extensively used for ship-building, and is largely exported to Great Britain. At Liverpool it is known as NEW YORK PINE.—The JERSEY P., or SCRUB P. (*P. niops*), abounds in the lower parts of New Jersey, and thence to the south-west. The leaves are in pairs 1—2 inches long, the cones armed with strong spines. The tree is rarely 30 or 40 feet high. Great quantities of tar are made from it in Kentucky.—The PITCH P. (*P. rigida*) is a native of the northern and middle parts of the United States, often growing in great miry swamps, and attaining a height of 70—80 feet, and a diameter of two feet at the base. The leaves are in threes, varying much in length, as the cones do in size. Immense quantities of it are used for fuel. Tar and lamp-black are sometimes made from it.

The LOBLOLLY or OLD FIELD P. (*P. Tæda*) grows in dry and sandy soils in the lower parts of the Southern States, often occupying lands exhausted by cultivation. Vast tracts never cultivated, in the Southern States, are *Pine Barrens*, in great part covered with this species of pine. It attains a height of 80 feet and upwards, and has a wide-spreading crown. The leaves are 6 inches long, in threes, sometimes in fours on young branches; the cones four inches high, with strong spines. The timber is not of much value —The LONGLEAVED P., or SOUTHERN P. (*P. palustris*, or *P. Australis*), is perhaps the most important of North American forest trees. It furnishes the greater part of the tar, resin, pitch, and turpentine used in the United States. The timber is also very valuable, and is much used for ship-building. In England and the West Indies, it is known as GEORGIA PITCH PINE. The tree attains a height of 60—70 feet, and a diameter of about 16—18 inches; the leaves are in threes, and about a foot long; the cones 7—8 inches long, and 4 inches in diameter, with small spines. The seeds are sometimes eaten.—The WEYMOUTH P., or WHITE P. (*P. Strobus*), attains a height of 150 feet, and a diameter of 5 feet and upwards. It has lax sub-triangular leaves in groups of five; and pendulous cones 4—5 inches long, with thin smooth scales. It is frequently planted in Britain and on the con-



Lambert's Pine (*P. Lambertiana*).

tinent of Europe for its beauty. In its native country, it abounds chiefly from lat. 47° to lat. 43°, and southward on the Alleghanies. The timber is not strong, but easily wrought and durable.—Of the species belonging to the north-western parts of America, one of the most magnificent is *P. Lambericana*, which is found on the Rocky Mountains, between lat. 40° and lat. 43°, chiefly in sandy soils. It attains a height of 150—200 feet, and a diameter of 7 feet and upwards, almost to 20 feet.

The trunk is remarkably straight, and destitute of branches for two thirds of its height; the leaves in fives, the cones upwards of a foot long. The timber is white, soft, and light; and the tree produces great quantities of a pure amber-colored resin, which, when the wood is partly burned, is changed into a somewhat saccharine substance, used by the natives as a substitute for sugar. The seeds are eaten either roasted or pounded into coarse cakes. —*P. flexilis* is found on the Rocky Mountains, near the headwaters of the Arkansas, and occurs almost to the limit of perpetual snow. It has a dense crown, formed of numerous and remarkably flexile branches. The leaves are in fives. The seeds are used as food by hunters and Indians.—*P. ponderosa*, another

native of the Rocky Mountains, is a magnificent tree, remarkable for the heaviness of its timber, which almost sinks in water. The leaves are in threes, and 9—14 inches long.—*P. Sabiniana*, *P. Coulteri*, and *P. insignis*, are also noble species from the west of North America. The Himalaya Mountains abound in pines, some of which rival in magnificence those of North-west America. The BHOTAN P. (*P. excelsa*), much resembling the Weymouth P. in its botanical characters, and attaining a height of 90—120 feet, abounds in Bhotan, although it is not found in the neighboring countries of Sikkim and Nepaul. The wood is highly valuable, being durable, close-grained, and so resinous as to be used for flambeaux and candles.—The CHEER P. (*P. longifolia*) of India is a tree of remarkable and most graceful appearance; with leaves in threes, very long, very slender and generally pendulous. It is abundant on the crests of hills in the lower Himalaya, growing at a lower elevation than the other pines. It is cultivated in some parts of India as an ornamental tree. It is much valued for its resin.

The wood is used in India as a substitute for European deal.—The KHASIA P. (*P. Khasiana*) is peculiar to the Khasia Mountains, and has very much the general appearance of the Scotch pine.—*P. Gerardiana*, a species with leaves in threes, is a large tree, a native of Nepaul. The seeds are eatable.—The Mountains of India and the north-western parts of America produce numerous other species; Mexico has a number of very fine ones peculiar to itself; the mountains of St. Domingo have one; the Canary Islands have one; China and Japan also have some. Most of those which have been named, and a number of others, are now readily to be procured in nurseries in Britain, although some of them only at prices which prevent any attempt at extensive plantation. Some wealthy noblemen and gentlemen devote a portion of their grounds to a collection of different kinds of P., called a *Pinetum*. A few foreign species have become pretty common in plantations. Most of the pines are quite hardy in Britain, but this is not the case with the Cheer P. and some of the Mexican species. The name P, is often popularly extended, and even in scientific works, to other *Coniferæ*.

PINE-TIMBER.—This term is in general use for the timber of the pine-tribe (see CONIFERÆ), and is not confined to that of the genus Pinus, but embraces the wood of species of Abies, Larix, Araucaria, Dammara, &c. From the Baltic ports we receive red and white pine, or deal timber. The former is yielded by the Scotch Fir (*Pinus sylvestris*), and the latter by the Spruce Fir (*Abies excelsa*). These two, with the Larch (*Larix Europæa*), yield the greatest part of the pine-timber of Europe. Next in importance to these is the pine-timber of the British North American colonies, which is chiefly yielded by the Weymouth or White Pine (*Pinus Strobus*), although, doubtless, the wood of other coniferous trees is often substituted for it. It makes excellent masts; but is not so serviceable for large timbers, as it is subject to dry-rot. Of white pine, the Dominion of Canada exported, in 1876, 289,441 tons, valued at £613,179; and 37,040 tons red pine, worth £62,532; besides large quantities of pine in the form of battens or staves and deal. The wood has a peculiar odor.

The celebrated pitch-pine of Savannah, in the Southern States, is the produce of *Pinus rigida*. It is much used for ship's masts and yards, and for all purposes requiring great strength and durability, in both of which qualities it excels most others of its kind. The kinds above mentioned are those which constitute the greater part of the pine-timber used in ship and house-building, carpentry, &c., in Great Britain. In France, the timber of the Corsican Pine (*Pinus Laricio*) and the Seaside Pine (*Pinus pinaster*) are greatly used. In Italy, the pine-timber is chiefly yielded by the Stone Pine (*P. pinea*) and the Calabrian Pine (*P. Bruttia*; that of Spain is from the Pyrenean Pine (*P. Pyrenaica*). In Germany, and especially in Austria, the Black Pine (*P. Austriaca*) furnishes the greater portion; but the fine-grained, soft white pine, or deal, so much used for sounding-boards of musical instruments, is the wood of the Silver Fir. See FIR. The trade in this timber is very great, for not only do the Germans use it almost exclusively in their vast toy-manufactories and for lucifer-matches, but considerable quantities are exported. The finest is cut in the forests of Bohemia, where large establishments are formed for dressing and preparing the wood for various purposes.

The timber of the Norfolk Island Pine (*Araucaria excelsa*) is sometimes imported for making ships' masts, as several other kinds of pine-timber are imported from time to time, but those mentioned form the great staples of the timber-trade. The chief value of this class of timber-woods is in the combination of lightness and strength with softness of texture and ease in working with ordinary tools; they constitute, in fact, the principal materials of our builders, and are more used than all other kinds of wood together. Much confusion prevails as to their common designations, for in this country alone, *fir*, *pine*, and *deal* are terms applied to all and each of them, according to the caprice of the individual. The two first names are used because the material is derived from one or other of those genera; but the last is a misnomer altogether, as the term deal belongs only to pieces of fir or pine timber cut to particular sizes: they are three inches in thickness, nine inches broad, and of variable length; if of less width they are called *battens*.

PI'NEAL BODY, is a small reddish-gray body, of a conical form, and deriving its name from its resemblance to the fruit of the pine. It rests upon the corpora quadrigemina of the brain, in front of the cerebellum. It is about four lines in length, and from two to three in width at its base. It is larger in the child than in the adult, and in the female than in the male. It consists chiefly of gray matter, and in its base is a small cavity, which contains a transparent viscid fluid, in which are granules composed chiefly of phosphate and carbonate of lime, and termed *acervulus cerebri*. This organ was regarded by the ancients as the seat of the soul.

PINE-APPLE, or ANANAS (*Ananassa sativa*) a plant of the natural order *Bromeliaceæ*, highly esteemed, and much cultivated for its fruit. The fruit is a *sorosis*, formed by the calyces and bracts of a close spike of flowers, becoming succulent and combined. This is the distinctive character of the genus *Ananassa*. The P. has a number of long, serrated, sharp-pointed, rigid leaves, springing from the root, in the midst of which a short flower-stem is thrown up, bearing a single spike of flowers, and therefore a single fruit. From the summit of the fruit springs a crown or tuft of small leaves, capable of becoming a new plant, and very generally used by gardeners for planting; the P., in cultivation, being propagated entirely by crowns and suckers, as, in a state of high cultivation, perfect seed is almost never produced. The P. is a native of tropical America; it is found wild in sandy maritime districts in the north-east of South America, but it has been very much changed by cultivation. It has also been gradually diffused over tropical and subtropical countries, and not only as a cultivated plant, for it is fully naturalized in many parts both of Asia and Africa. It delights in a moist climate, and consequently does not succeed well in the dry climate of the south of Italy, although the warmth is sufficient.

The first particular account of the P. was given by Oviedo in 1535. It was in Holland that it first began to be cultivated in hot-houses; but it was introduced into England in the end of the 17th c., and its cultivation rapidly became general in the gardens of the wealthy. It is only since the peace of 1815 that it has ceived similar attention in continental Europe.. Great care is requisite in the cultivation of the P., which, without it, is generally fibrous and coarse, with little sweetness or flavor; and with it, one of the most delicate and richly flavored of fruits. Its size also very much depends on cultivation. The size varies from 2¼ lbs. to 12 lbs. in weight. The pine-apples grown in British hot-houses are generally much superior to those of the West Indies, because the latter grow almost or altogether without cultivation; but the importation of pine-apples from the West Indies having now been carried on to a considerable extent, and promising to add to the sources of wealth for these colonies, has led to greater care in cultivation there, and consequent improvement of quality.

In the cultivation of the P. in Britain, a tropical heat must always be maintained. It is generally cultivated in hot-houses specially appropriated to it, called *Pineries* or *Pine-stoves;* sometimes also in flued pits; and sometimes even without fire-heat, in frames continually supplied with fresh tanners' bark and dung. The universal practice, till of late, was to grow the plants in pots, plunged to the requisite depth in tanners' bark or other fermenting matter, and these were transferred from one house or one compartment to another, according to their stage of advancement; three years' culture being deemed requisite from the planting of a crown or sucker to the production of the ripe fruit; but the P. is now often planted in beds, and fruit of the best quality is sometimes obtained in fifteen months. The best soil is a rich and rather sandy loam. It is often formed from the turf of old pastures, with dung, peat, sand, &c., thoroughly mixed. Ventilation must be freely allowed from time to time, but care must be taken to keep the atmosphere moist. A P. which has borne fruit is thrown away as useless.

There are many varieties of the P. in cultivation. Of these, some are referred by some botanists to distinct species. But the greater number of varieties are universally referred to *A. sativa*, and differ in the more or less spiny serratures of the leaves, the globular, cylindrical, or pyramidal fruit, its size, &c.

A spirituous liquor (*Pine-apple Rum*) is made from the P. in some warm countries.

The use of the fibre of the P. is noticed in the article BROMELIACEÆ.

PINE-CHAFER, or PINE-BEETLE (*Hylurgus piniperda*), a small coleopterous insect of the family *Xylophagi*. See BARK-BEETLE. It is often very destructive to Scotch firs in rich soils and low situations, attacking the young terminal shoot in summer, and soon eating its way into the heart, which it proceeds to excavate so as to convert the shoot into a tube. Pines growing

in open situations are little liable to the attacks of this insect; and trees of thirty feet in height, or upwards, are very rarely attacked. The insect is about the size of a seed of the Scotch fir, and of a black or dark-brown color.

PINE-FINCH, or PINE GROSBEAK (*Corythus*), a genus of birds of the family *Fringillidæ*, nearly allied to Bullfinches and Crossbills, the bill nearly resembling that of the former, but the tongue very similar to the tongue of the crossbills, with the same peculiar bone articulated to the hyoid bone. See CROSSBILL. One species, the COMMON P. (*C. enucleator*), is a very rare visitant of Britain, but is abundant in many of the northern parts of Europe, Asia, and America. It is larger than a bullfinch, but much resembles the bullfinch in form, wings, tail, &c. The general color of the male is red. This bird frequents pine-forests, and associates in flocks in winter. It is easily tamed. Its song is rich and full.—There are other species in the northern parts of the world.—The name P. is given in North America to a very different and much smaller bird (*Carduelis pinus*).

PINEL, PHILIPPE, a celebrated French physician, was born 20th April 1745, at Saint-André, in the department of Tarn, France; and after receiving a good classical education at the college of Lavaur, removed to Toulouse, where he studied medicine, and took his degree in 1773. He continued his medical studies at Montpellier, maintaining himself meantime by teaching mathematics; and in 1778 removed to Paris, where he acquired some reputation by a translation into French of Cullen's *Nosology* (1785), and the works of Baglivi (1788), and also by some Memoirs on subjects connected with zoology and comparative anatomy. Having applied himself with success to the study of mental alienation, he was charged, in 1791, to make a report on the insane inmates of the Bicêtre, became chief physician of this institution in 1793, and in 1795, was chosen to the same office at the Salpêtrière (a similar asylum, but for females). In the latter institution, P. commenced a class of clinical medicine, which he continued after his appointment to the chair of Medical Physics and Hygiene, and subsequently that of Pathology, at the School of Medicine in Paris. He was admitted as a member of the Institute in 1803, and died at Paris, 26th October 1826. His most valuable works were his *Traité Medico-philosophique de l'Alienation Mentale* (1791), and *La Nosographie Philosophique* (1798), with its commentary, *La Médecine Clinique* (1802). P. gained for himself undying fame by his reformation of the old barbarous methods of treating the insane. The physicians brought up under the old system were not ashamed to offer a vigorous opposition to P.'s philanthropic opinions; but he fortunately succeeded in thoroughly establishing their correctness, and his system in a few years prevailed all over the whole of Europe.

PINERO'LO, or PIGNEROL, a town in the north of Italy, on the Clusone, at the entrance of the valley of Perosa, in the province of Turin, and 23 miles by railway south-west of the city of that name. It was formerly strongly fortified, and was the residence of the rulers of Piedmont. It contains a new cathedral, a bishop's palace, seminaries, barracks, &c. The ruins of the *citadel*, for some time the prison of the *Man with the Iron Mask* (q.v.), are still to be seen on the hill of St. Brigide. Broad-cloth, paper, leather, iron, and silk, are manufactured. Pop. (1872) 11,832.

PINE-WOOL. Several attempts have been made of late years to utilize the leaves of pine and fir-trees, which are cut down in vast numbers for their timber only. The leaves contain a considerable quantity of fine vegetable fibre, which, when separated, has much the appearance of cotton. In Germany, several works have been established for preparing this fibre, and fitting it for various applications; and under the name of pine-wool it is now sold for stuffing cushions, making wadding, &c. The principal manufacture is near Breslau in Silesia, where it was long carried on by the inventor, Herr Pannewitz.

PINEY TREE. See CALOPHYLLUM.

PINEY-VARNISH. See DAMMAR.

PINGUI'CULA. See BUTTERWORT.

PINHOEN, OIL OF. See PHYSIC NUT.

PINK (*Dianthus*), a genus of plants of the natural order *Caryophyllaceæ*, of which there are many species, annuals and perennials, with beautiful and often fragrant flowers, chiefly natives of Europe and the temperate parts of Asia. The calyx is tubular, 5-toothed, with two or four scales at the base; there are five petals suddenly contracted at the throat of the corolla into a linear claw. There are ten stamens, and one germen with two styles. The capsule is cylindrical, and one-celled. The exquisite beauty of the flowers has attracted admiration in all ages; and some of the species have long been much cultivated in gardens, particularly the GARDEN P. and CARNATION (q. v.), which are often referred to one original, the CLOVE P. (*D. caryophyllus*), a native of the south of Europe, growing wild on rocks and old walls, and naturalized in some places in the south of England; whilst some botanists refer the garden pinks in part to the MAIDEN P. (*D. deltoides*), a pretty commo British species, and those called Pheasant-eye pinks to the FEATHER P. (*D. plumarius*), a native of some parts of continental Europe, differing from the Clove P. chiefly in having the leaves rough on the margin, and the petals bearded and much cut. Nearly allied to them is *D. superbus*, found in moist places in some parts of Europe, and not unfrequently to be seen in flower-borders. It has very fragrant flowers. All the varieties of Garden P., whatever their origin, have been much changed by cultivation, and careful cultivation is requisite to preserve them in perfection. Both single and double pinks are generally propagated by *pipings*, which are short cuttings of the younger shoots. They are also sometimes propagated by layers. A rich loamy soil is the best for pinks. The Clove P., in a wild state, has flesh-colored flowers. The leaves are linear-awl-shaped, grooved, and glaucous.

The Maiden P. is a small much branched plant, growing in grassy places, on gravelly and sandy soils; it has rose-colored flowers spotted with white, and a white eye encircled by a deep purple ring.—The Deptford P. (*D. Armeria*) and the CLUSTERED P., or CHILDING P. (*C. prolifer*), also natives of England, differ from these in being annuals, and in having clustered flowers.—The BEARDED P., or SWEET WILLIAM (*D. barbatus*), a native of the middle of Europe and the south of France, with lanceolate leaves, flowers crowded in dense clusters at the top of the stem, acuminated bracts, and bearded petals, has long been a favorite garden-flower, still retaining its place alike in palace and cottage gardens. Although perennial, it is sown annually by florists, to secure fine flowers, and there are many varieties, single and double, exhibiting much diversity of color. The INDIAN P. or CHINA P. (*D. Chinensis*) is now also common in flower-gardens.

The Clove P. was formerly regarded as possessing medicinal properties, and was used in nervous maladies.—*Sea P.* is a common name of Thrift (q. v.).

PINK COLORS, very light shades of rose-red color: they are usually produced by extreme dilution of cochineal or carmine, Brazil and Braziletto wood colors, with whiting. Some mineral pinks for oil colors are obtained from preparations of manganese, &c. See RED-COLORS. The term pink is also applied to several Yellow Colors (q. v.).

PINKERTON, JOHN, an industrious and learned *littérateur*, was born at Edinburgh, 17th February 1758, and educated at the grammar-school of Lanark, where he was noted for the unusual excellence of his classical attainments, and for his hypochondriacal tendency. He was afterwards apprenticed to a Writer to the Signet, his father refusing to let him proceed to the university; and while engaged in the irksome and distasteful practice of law, he published an *Ode to Craigmillar Castle* in 1776, which he dedicated to Dr. Beattie. In 1780, he went to London, where he settled as a man of letters. Next year, he gave to the public a volume of *Rimes* (as he called his pieces), and a collection of *Scottish Tragic Ballads*, followed in 1783 by a second collection of *Ballads of the Comic Kind*—both of which subsequently appeared under the title of *Select Scottish Ballads*. They professed to be ancient, but many of them were really compositions—*forgeries*, some might say, of P.'s own, and would hardly deceive a critical archæologist. In 1784, he published an *Essay on Medals*, which went through several editions, and long held a high place among books on numismatics; and in 1785, *Letters on Literature*, marked chiefly by a novel system of orthography (e. g., the use of *a* instead of *s* in forming plurals), intended to soften the harshness of the English language, and which was abused as heartily as it deserved. These *Letters* were, however, the means of introducing him to Walpole, through whom he became acquainted with Gibbon and other literary celebrities. P.'s next publication was a most valuable one, *Ancient Scottish Poems never before in Print, from the MS. Collections of Sir Richard Maitland of Lethington, Knight* (2 vols. Lond. 1786).

It was followed in 1787 by his once notable *Dissertation on the Origin and Progress of the Scythians or Goths*, in which, for the first time, appear that grotesquely virulent hatred of the Britanno-Celtic race—Scotch Highlanders, Welsh, and Irish—that reaches its climax in his *Inquiry into the History of Scotland preceding the Reign of Malcolm III.* (2 vols. Lond. 1790), where he affirms again and again, obviously with the extremest gusto, that the Highlanders are mere 'savages, but one degree above brutes;' that they are just as they were 'in the days of Julius Cæsar;' that 'like Indians and Negroes,' they 'will ever continue absolute savages,' and that 'all we can do is to plant colonies among them, and by this, and encouraging their emigration, try to get rid of them.' But in spite of this extravagant truculence of speech, the *Inquiry* contains a great deal of important matter—rare and curious historical documents, some of which are to be found nowhere else in print. P. left England in 1802, and fixed his residence at Paris, where he died 10th March 1826, after a life of hard literary work. His principal publications, besides

those already mentioned, are *The Medallic History of England to the Revolution* (1790); *Scottish Poems* (3 vols. 1792), reprinted from scarce editions; *Iconographia Scotica, or Portraits of Illustrious Persons of Scotland, with Biographical Notes* (2 vols. 1795—1797); *The History of Scotland from the Accession of the House of Stuart to that of Mary* (2 vols. 1797), valuable for its laborious investigation of original materials, but disfigured, in a literary point of view, by an imitation of the grandiose style of Gibbon; *Walpoliana*, a collection of his notes of his friend Horace Walpole's conversation, in 2 vols.; *The Scottish Gallery, or Portraits of Eminent Persons of Scotland, with their Characters* (1799); *Modern Geography* (3 vols. 1802—1807); *General Collection of Voyages and Travels* (16 vols. 1808—1813); *New Modern Atlas* (1809—1815); and *Petralogy, or a Treatise on Rocks* (2 vols. 1811).

PINK ROOT. See SPIGELIA.

PI'NNA, a genus of lamellibranchiate molluscs of the same family with the *Pearl Mussel* (*Aviculidæ*), and having a shell of two equal wedge-shaped valves, closely united by a ligament along one of their sides. The mantle is closed on the side of the ligament; the foot is small and conical. The byssus is remarkably long and silky; and by it the species affix themselves to submarine rocks and other bodies, sometimes even to sandy or muddy bottoms. The best known species is *P. nobilis*, a native of the Mediterranean, the byssus of which was used by the ancients for fabrics, but chiefly as an article of curiosity, to which a great value was attached. It is still so used in Sicily and elsewhere. It is very strong and lustrous. The only reason against its more general use is the difficulty of procuring it in sufficient quantity. The byssus of this species is sometimes two feet long, the shell is about the same length. Pinnæ are often found in large beds, with only the edges of their shells appearing above the mud or sand. The animal is eaten.

PI'NNACE (from the Ital. *pinaccia*, a diminutive of *pino*, a ship) was originally a small vessel, usually schooner-rigged, employed as tender to a large ship, for the purpose of communicating with the shore, &c. At present, however, the signification is limited to a large boat carried by great ships. It is smaller than the launch, but larger than the cutters; and is generally rowed 'double-banked,' by from ten to sixteen oars.

PI'NNACLE, an ornamental termination much used in Gothic architecture. It is of simple form in the earlier periods of the style, having a plain square or octagonal shaft and sloping roof or top, terminating with a finial; but in later examples, the pinnacle is greatly developed, and becomes one of the most varied and beautiful features of the style. It is ornamented with shafts bearing canopies, and niches filled with statues. Pinnacles are most frequently used on buttresses and parapets, and when placed over the former, serve as a deadweight to increase their power of resisting a thrust.

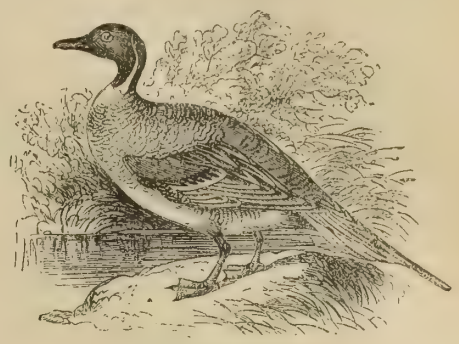
PI'NNULE, in Botany, a leaflet of a pinnate leaf, or of one which is bipinnate, tripinnate, &c. See LEAVES. The term is more frequently used, however, to designate the ultimate divisions of the fronds of ferns, when divided in the same manner.

PINSK, a town of West Russia, in the government of Minsk, surrounded by vast marshes called the Pinsk Marshes, stands on the banks of the Pina, a branch of the Pripet, 752 miles south-south-west of St. Petersburg, lat. 52° 7′ N., long. 26° 6′ E. It was founded in the 12th c., was conquered by the Prince of Lithuania in 1320, was annexed, together with Lithuania, to Poland in 1569, and came at last into the possession of Russia in 1795. The trade of P., chiefly transit, has increased, especially since the opening of the Oghinsky Canal, which connects the Dnieper, and the Black Sea with the Niemen and the Baltic Sea. A very considerable number of ships and barges enter and clear the port. They are laden principally with salt, corn, hemp-seed, iron, glass, tar, tallow, wool, tobacco, and timber. The manufacturing activity of the town is not great. The project for a branch line of railway (55 miles) connecting P. with the main line to Minsk, has already been sanctioned. Of the pop. (1880) 17,718, three-fourths are Jews, and have the trade almost entirely in their own hands.

PINT, a measure of capacity used both for liquids and dry goods, and equivalent to the eighth part of a Gallon (q. v.), or 34·65925 cubic inches. The Scotch pint, still in use, though superseded as a legal measure by the imperial pint, is equivalent to 3·00651 imperial pints.

PINTA'DO. See GUINEA FOWL.

PI'NTAIL, or PINTAIL DUCK (*Dafila*), a genus of ducks, of the section with the hind-toe destitute of membrane. The bill is without tubercle at the base, narrow, with laminæ not projecting beyond the margin. The tail of the male is long, and tapers to a point.—The COMMON P. (*D. acuta*) is a handsome bird, rather longer in shape than most of the ducks; the neck also longer and more slender. It is about equal in size to the mallard. The head is brown, with a white longitudinal line on each side extending down the neck; the back and sides marked with waving lines of black and grayish-white; the lower parts white; the elongated central tail-feathers black. It is a native of all the northern parts of the world, migrating southwards in winter, and a regular visitant of many parts of the British coasts. It also frequents



Pintail Duck (*Dafila acuta*).

fresh-water lakes and ponds, and is common in winter in the valley of the Mississippi. Its winter range extends southwards to the Mediterranean and the Gulf of Mexico, and even to Africa and the West Indian Islands. Its flight is very rapid and noiseless. It is very much esteemed for the table. It has been tamed, and has bred in confinement.

PIOMBI'NO, a principality now incorporated in the kingdom of Italy, lies along the Italian coast opposite the island of Elba, the greater part of which belonged to it. Its extent was about 132 English square miles; and its population, previous to its incorporation with the rest of Italy, about 25,000. P. was originally a fief of the empire, and, at the end of the 14th c., came into the possession of the family of Appiani, which, after ruling it for nearly 300 years, made way for a new dynasty, the family of Buoncompagni. This latter dynasty was mostly under the suzerainty of the neighboring states of Sardinia and Naples alternately.

In 1801, the Buoncompagni family were expelled by Napoleon, and the principality given to his sister Elisa, the wife of Felice, Prince Baciocchi; but the latter was ejected, and the old dynasty restored, by the Congress of Vienna; the principality being then put under the suzerainty of Tuscany, whose grand-duke indemnified the Buoncompagni for their loss of sovereignty. It is now part of the province of Pisa, in the kingdom of Italy. The strait between P. and Elba is called the 'Channel of Piombino.'

PIONEE'R, a military laborer employed to form roads, dig trenches, and make bridges as an army advances; and to preserve cleanliness in the camp when it halts. Formerly, the pioneers were ordinary laborers of the country in which the army was, impressed for military purposes; but now such persons are only brought in as auxiliaries, a few men being attached to every corps as a permanent body of pioneers. In the British army, one man is selected, for his intelligence, from every company. These pioneers march at the head of the regiment, and the senior among them commands as corporal. Instead of a musket, each man carries a saw-backed sword, which is at once tool and weapon. Each bears also an axe and two gun-spikes, other necessary tools being distributed among them. There is something rather conflicting between the functions of the pioneers and those of the engineer force.

PIOTRKO'W, since 1867, the capital of one of the 10 governments into which Poland was then divided, is near the Warsaw and Vienna Railway. It is one of the oldest Polish towns; here in the 15th and 16th centuries, diets were held, and kings elected. In 1702, P. was burnt by the Swedes; in 1709, the Russians gained a battle here. Pop. (1880) 18,000.

PIOZZI, Mrs. (*neé* HESTER LYNCH SALUSBURY), who cannot be forgotten while the great Dr. Samuel Johnson continues to be remembered, was the daughter of John Salusbury, Esq., of Bodvel, in Caernarvonshire, where she was born in the year 1739. Early introduced into the fashionable world of London, she charmed by her beauty and her lively manners; and, in 1763, was married to Mr. Henry Thrale, a rich brewer, with a recognized position in society, and, at the time, one of the members for the borough of Southwark. Her acquaintance with Dr. Johnson, which speedily became an intimacy of the closest and most affectionate kind, began shortly after. Of all Johnson's many friendships, this was perhaps, in certain essential respects, the most valuable to him. To Johnson, widowed and alone, and subject, as he had been throughout, to accesses of a frightful gloomy hypochondria, which made life at times to him an almost intolerable burden, the society of Mrs. Thrale, and of the circle which she gathered around her, was a source of incalculable

solace. Mrs. Thrale in particular, with her warm heart, and bright womanly intelligence was always a comforting presence; and her unfailing cheerfulness and vivacity enlivened for him many an otherwise cloudy hour. Her married life, though prosperous, was not an eminently happy one, Mr. Henry Thrale, though always a pleasant and kindly gentleman, being no miracle of conjugal virtue. If Johnson owed her much, it may be surmised that the benefit was in some sort reciprocal, and that, by her affectionate reverence and solicitude for her sage, she a little consoled herself for the gentlemanly indifference of her husband. On the death, in 1781, of her husband, Mrs. Thrale retired with her four daughters to Bath, where, in 1784, she married Mr. Gabriel Piozzi, an Italian teacher of music. This *mésalliance*—as it was held—was deeply censured by all her friends, and so unreasonably excited the ire of Dr. Johnson in particular, that a rupture of friendly relations was the result.

In the correspondence between them on the subject, it must be admitted that the lady has much the better of the philosopher, whose tone of unmannerly rudeness gives some countenance to the good-natured suspicion of his friends, that he had an eye to the widow himself. Though the feud was ostensibly healed, the friends never again met; Mrs. P. leaving England for Italy with her husband, and Dr. Johnson dying soon after. Some little time subsequent to his death, she published an octavo volume, entitled *Anecdotes of Dr. Samuel Johnson during the last Twenty Years of his Life*, in which it seemed to the indignant Boswell and others, that her main intention was to take her little feminine revenge on the deceased for his outrage in the matter of Piozzi. This work she supplemented in 1788 by a collection of *Letters to and from Dr. Samuel Johnson*, in 2 vols. 8vo. Of works more properly her own, may be mentioned, *Observations and Reflections made in the course of a Journey through France, Italy, and Germany* (2 vols. 8vo., 1789); *British Synonymy, or an Attempt at Regulating the Choice of Words in Familiar Conversation* (2 vols. 8vo, 1794); and *Retrospection, or a Review of the most striking and important Events, Characters, Situations, and their Consequences, which the last Eighteen Hundred Years have presented to the View of Mankind* (2 vols. 4to, 1801)—books long since utterly forgotten, if ever they were at all read and remembered. Having survived her second husband, her own celebrity, and almost in some sort that of the great Dr. Johnson, with whom her name remains indissolubly connected, Mrs. P. died at Clifton, near Bristol, on the 2d May 1821.

PIPA, a genus of batrachians, in general form resembling frogs and toads, and characterized by the very broad and triangular head, the sides of which are destitute of the glands (*parotoids*) so large in the true toads; the eyes small, and situated near the margin of the lower jaw; the ear concealed beneath the skin; the tongue merely rudimentary; the jaws destitute of teeth; the fore-feet not webbed, but divided into four fingers, each of which divides at the extremity into four small points, these, again, being minutely divided in a similar manner; the hind-feet five-toed and completely webbed; the larynx of the male extremely large—a triangular bony box, within which are two small movable bones for occasionally closing the entrance of the bronchi; the back of the female furnished with numerous cells or pouches, in which the eggs are hatched, and the young undergo all their transformations till they have attained a form similar to that of their parents. These characters are so remarkable as to make the creatures of this genus objects of peculiar interest; but particularly the mode of rearing the young. It was at first supposed that the young were produced in some unusual way in the cells from which they were seen finally to emerge; but this is not the case. The eggs are deposited by the female in the ordinary manner, and are carefully placed by the male in the cells of her back, which close over them. When the young are ready to use their limbs, they struggle out of the cells, to which they never afterwards return. The best-known species of P. is that commonly called the Surinam Toad (*P. Surinamensis*), a native of Guiana and other warm parts of continental America, where it inhabits swamps and ditches, and is occasionally found in damp and dirty corners of houses. It is sometimes seven inches long; its color is brownish-olive above, whitish below; the skin covered with small hard granules, mingled with occasional horny tubercles. The whole aspect of the creature is peculiarly hideous.

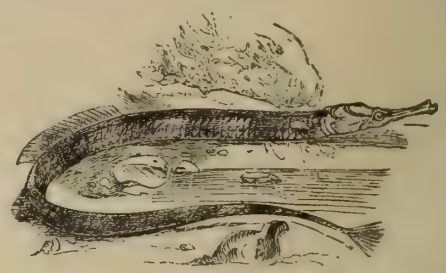
PIP, CHIP, or ROUP, a disease of poultry, often very fatal, particularly to chickens and turkey poults. It is very frequent also in young pheasants. Adult birds are, however, liable to it; and when it appears in a poulty-yard, it often attacks many in rapid succession, so that it is regarded as highly contagious. It most frequently occurs in wet or very cold weather, and is generally described as a kind of catarrh, although perhaps it might more accurately be called a kind of influenza. It begins with a slight hoarseness and catching in the breath, which is followed by an offensive discharge from the nostrils and eyes, rattling in the throat, and an accumulation of mucus in the mouth, forming a 'scale' on the tongue. The communication of the disease from one bird to another is supposed to take place through the contamination of the water in their common drinking-vessel; and therefore a bird affected with it should at once be removed from the rest. Castor-oil is freely administered by some poultry-keepers. Mrs. Blair, in *The Henwife*, recommends also a medicine composed of half a drachm of dried sulphate of iron, and one drachm of capsicum, made into 30 pills with extract of licquorice, one pill to be given three times a day. This after a certain time is to be followed by another compound of sulphate of iron, cayenne pepper, and butter. The eyes, nostrils, and mouth are to be washed with vinegar. In Wright's *Practical Poultry-Keeper*, it is specially recommended that the diseased birds should be kept warm; they are to be fed on oatmeal mixed with ale, and to get plenty of green food.

PIPE, a measure of quantity commonly employed by Portugal, Spain, France, and in some other countries which trade with these. It is used almost exclusively for wine and oil, and has a particular value for almost each locality. The pipe is called in England a butt, and is equal to two hogsheads, or half a tun. The pipe of Oporto is larger than those of Lisbon and of Spain in the proportion of 93 to 76. There are three different measures of this name in France; and there was formerly a pipe, a measure of capacity for dry goods, in use by the Bretons. But the pipe in England varies with the description of wine it contains; a pipe of port contains 114 imperial gallons; of sherry, 108 imperial gallons; and of madeira, 92 imperial gallons; while the common English pipe contains 126 wine gallons, or 105 imperial gallons nearly.

PIPECLAY is a fine Clay (q. v.), free from iron and other impurities, having a grayish white color, a greasy feel, and an earthy fracture. It adheres strongly to the tongue, and is very plastic, tenacious, and infusible. It is used for the manufacture of tobacco-pipes and white pottery. The localities where it is chiefly obtained are Devonshire, and the Trough of Poole in Dorsetshire. It is also found in various places in France, Belgium, and Germany.

PIPE-FISH (*Syngnathus*), a genus of osseous fishes of the order *Lophobranchii* (q. v.), and of the family *Syngnathidæ*. In this family the form is elongated, there is little flesh, and the body is almost covered with partially ossified plates; the head is long; the jaws are elongated so as to form a tubular snout—whence the names P. and *Syngnathus* (Gr. *syn*, together; and *gnathos*, a jaw); and the males have pouches, variously situated, in which they receive the eggs of their mate, and carry them till they are hatched.

The family *Syngnathidæ* is sometimes restricted to those in



Pipe-Fish (*Syngnathus acus*).

which the egg-pouch of the males is on the tail, and is open throughout its whole length, and the tail is not prehensile. Thus restricted, it contains a number of genera, of which one only, *Sgngnathus*, is British.—One of the most common British species is the GREAT P. (*Syngnathus acus*), which is sometimes found in deep water, and sometimes at low tide among the sea-weed in rock-pools. The specimens commonly seen are from 1 foot to 16 inches in length; but this fish is said to attain a length of 2 or 3 feet. Its food, and that of the other species, is believed to consist of small marine animals and the eggs of fishes; and it may be seen slowly moving about, with curious contortions, poking its long snout into every crevice in search of food, and sometimes assuming a vertical position with the head downwards, poking into or stirring the sand. This and the other pipe-fishes show great affection for their young, which are believed to return, on the appearance of danger, to the pouch of their male parent, after they have begun to leave it, and to swim about in the sea.

The name P. is sometimes also given to the fishes forming the family *Fistularidæ* (q. v.), or Flute-mouths, sometimes called *Pipe-mouths*.

PIPERA'CEÆ, a natural order of exogenous plants, natives almost exclusively of the hottest parts of the globe, particularly of Asia and America. None of them found in cold regions. About 600 species are known, to most of which the name PEPPER is sometimes given, although some are also known by other names.

particularly those of which the fruit is not used as a spice, but of which some part is employed for some other purpose, as Betel, Cubebs, Matico, and Ava. See these heads. But Pepper (q. v.) is the most important product of the order. Of the P., a few are almost trees; but they are generally shrubs or herbaceous plants, often climbing. They have jointed stems; opposite whorled or alternate leaves, with or without stipules, and insignificant greenish flowers in slender spikes, unisexual or hermaphrodite, the different kinds generally mingled in the same spike; the flowers without calyx or corolla, but each with a bract, the stamens 2—6, the ovary with one cell and one ovule, and crowned with one or three stigmas; the fruit somewhat succulent, containing one seed.

PI'PERINE ($C_{34}H_{19}NO_6$) is an alkaloid possessing very weak basic properties, which is found in the Pepper tribe. It may be obtained by heating powdered pepper with alcohol, which extracts the piperine and some resinous matter, which may be removed by digestion in a solution of potash. It occurs in colorless well-formed prisms, which are insoluble in cold water, but dissolve readily in alcohol and ether. According to Miller, piperine 'has an acrid taste, resembling that of pepper;' while Gorup-Besanez asserts that 'it is devoid of odor or taste, and that, consequently, the well-known properties of pepper are not dependent on it.' On heating piperine with soda-lime, a remarkable oily base, *Piperidine* ($C_{10}H_{11}N$), is obtained, with a pungent odor, resembling both that of ammonia and pepper.

PIPES, or TUBES, are made of various materials and for various purposes. Thus, we have draining-pipes for agricultural and sanitary purposes, made of earthenware, wood, and metal; pipes of various kinds of metals for a great variety of purposes, and Tobacco-pipes (q. v.) of various materials. Formerly, wooden pipes were extensively used for conveying water and for draining; but so great an improvement has been effected of late years in the manufacture of metal and earthenware pipes, that they have now become exceedingly rare, and will soon disappear. For agricultural purposes, *drain-tiles* are made of ordinary brick-clay; and owing to the use of machinery in their manufacture, they are produced very rapidly and cheaply. They are of various sizes, but the most general is 15 inches in length by 2½ inches diameter. The operation of the drain-tile machine is to squeeze a continuous length of soft plastic clay through a ring-shape orifice, the center of which is occupied by a core or mandrel of the size of the hollow part of the pipe. Another arrangement of the machine is to cut the pipe to the proper lengths as it passes through, and by means of a traveling-table, to carry them forward to be removed to the sheds, where they are dried, previous to being burned in the kilns.

Earthenware pipes are now made of almost every size, from an inch or two in diameter up to the enormous size of fifty-four inches. They are usually made of fire-clay, and are glazed like common pottery. See the article POTTERY. They are wider at one end, so as to form a socket, as in fig 1, to receive the end of another, and thus form a continuous tube. These are greatly used for the drainage of houses, and for sewering, for which they are admirably adapted: the inner surface being glazed, as well as the outer, offers no resistance to sedimentary matters, which are

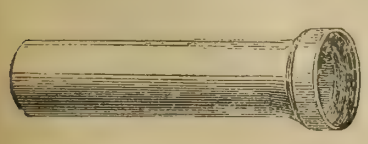


Fig. 1.

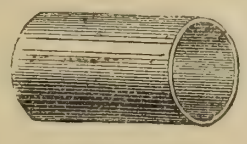
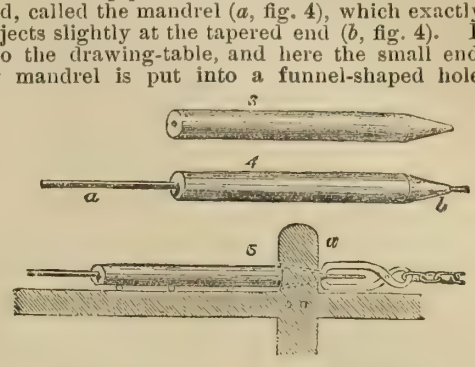


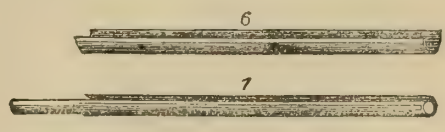
Fig. 2.

consequently carried away readily. These pipes are of such great strength, that many small towns in England are now sewered with them almost entirely. Another kind has been introduced for chimney flues. They are also made of fire-clay, but unglazed externally, and so thick, that there is little fear of breaking. They are placed one on another, and are built into the walls of houses, instead of the ordinary chimneys, and in this way save much labor in building, and in this way afford a much more effective, and easily cleaned flue (fig. 2). *Caoutchouc vulcanized* and *gutta percha* are also extensively used for making pipes for a variety of purposes, their flexibility rendering them very useful. *Leathern pipes* are used chiefly for the conveyance of water temporarily, as in the case of fire-engines: they are generally called *hose*. Metal pipes are made of iron, lead, tin, or an alloy of tin and lead, copper, brass, &c. Iron pipes are usually cast, and the manufacture of such pipes has become of enormous extent, in consequence of the vast works, by which almost all large towns in this kingdom and in many foreign states are now supplied with water and gas, the pipes for which are largely exported from Great Britain. A great proportion of the trade in cast-iron pipes is carried on in Scotland. The water-works which supply the great towns of Lancashire have nearly all been furnished with pipes from Scotland; and the magnitude of the supply can be best understood when it is known that for the Rivington Pike Works, which supply Liverpool, upwards of twenty miles of iron pipes, nearly four feet in diameter, are required. It would be impossible to make a correct estimate, but it has been stated, with great reason for belief, that in Great Britain the gas and water-pipes laid and in use exceed half a million of miles in length.

Pipes made from the ductile metals, such as brass, copper, and tin, are made by first casting an ingot of the metal into the shape shown in fig. 3, with a hole through its length of the same diameter the bore of the pipe is intended to have. Into this is placed an iron rod, called the mandrel (*a*, fig. 4), which exactly fits, and which projects slightly at the tapered end (*b*, fig. 4). It is then brought to the drawing-table, and here the small end with its projecting mandrel is put into a funnel-shaped hole, drilled



through a steel post (*a*, fig. 5), so as to allow the point to be griped on the other side by a pair of pincers, at the end of a strong chain; the machine-power is then applied to the other end of the chain, and the soft metal and its mandrel are drawn through, the former being extended equally over the surface of the latter, which is then removed, and the length of pipe is complete. Some metals require repeated drawing through holes, getting gradually smaller, and have to be softened or annealed at intervals, as the metal hardens under repeated drawing. In this way, brass, copper, tin, and pewter pipes are made; and a patent has also been taken out for making steel ones; but lead pipes are made of great lengths by squeezing the soft metal through a hole in a steel plate in which there is a fixed core or mandrel projecting, which forms and regulates the size of the bore of the pipe. Pipes are also made from copper, brass, and malleable iron by rolling out narrow strips of metal, and then passing them successively through rollers, which are deeply grooved, and which turn up the edges (fig. 6). A mandrel is then laid in it, as in fig. 7, and it is next passed through double-grooved rollers, which



turn the edges in, and thus form a complete tube round the mandrel. The edges, however, require soldering or welding, if of iron. All boiler tubes used to be made in this way; but the method of drawing has lately been so much improved, that copper and brass pipes, or tubes, as they are frequently called, are now drawn of considerable thickness and diameter.

PIPE-STICKS. It is usual to call the wooden tubes used for some tobacco-pipes by this name; and unimportant as it may at first sight appear what the tube is made of, there is great difference of taste in this respect; and great care is taken by some smokers to get what they consider the choicest material. Perhaps the most prized are the Agriot or Cherry pipe-sticks of Austria. These are the young stems of the Mahaleb Cherry (*Prunus Mahaleb*), which is extensively grown for the purpose in the environs of Vienna. An astonishing amount of care is bestowed on the cultivation of these shrubs, which are all raised from seed. When the seedlings are two years old, they are each planted in a small pot, and as they continue to grow, every attempt at branching is stopped by removing the bud. As they increase in size from year to year, they are shifted to larger pots or boxes, and great care is taken to turn them round almost daily, so that every part is equally exposed to the sun. When they have attained a sufficient height, they are allowed to form a small bushy head, and continue to receive the same attention in daily turning, &c., until they are thick enough in the stem. They are then taken up, and the roots and branches removed, and the stem put by to season. Afterwards, they are bored through, and are ready for use. These pipe-sticks have an agreeable odor, and are covered with a reddish-brown bark, which is retained. Sometimes they are five feet in length, and as smooth and straight as if turned. When of such a length, they command high prices. In Hungary, pipe-sticks made from the stems of the Mock Orange (*Philadelphus coronarius*)

are much used; and the jessamine sticks of Turkey are in great esteem in all countries. Orange and lemon-trees and ebony are also used. The chief recommendation of these materials seems to be in the power of the wood to absorb the oil produced in smoking tobacco, and consequently to render the smoke less acrid. See TOBACCO-PIPES.

PIPI, the name given to the ripe pods of *Cæsalpinia Papai* (see CÆSALPINIA), which are used in tanning, and are not unfrequently imported along with Dividivi (q. v.), and sometimes separately, but not to any considerable extent, being very inferior to dividivi. They are easily distinguished from the pods of dividivi, not being curved as they are, but straight.

PIPING CROW. See BARITAH.

PI'PIT, TITLING, or TITLARK (*Anthus*), a genus of birds included by Linnæus among Larks (*Alauda*); but now regarded as forming even a distinct family, *Anthidæ*, which is ranked among the *Dentirostres*, whilst the lark family (*Alaudidæ*) is ranked among the *Conirostres*. The bill is more slender than in larks; the tips of the mandibles slightly bent downwards and notched. The hind-claw is long, although not so long as in larks, and more or less curved. The plumage resembles that of larks; in habits and motion of the tail, there is a greater resemblance to wagtails. The bill is not strong enough for feeding on grain or hard seeds, and insects and worms are the principal food of pipits. The most common British species is the MEADOW P., COMMON TITLARK, or TITLING (*A. pratensis*), familiarly known in many parts of England and of Scotland as the *Moss-cheeper*. It is found in almost all parts of Europe, and the north of Asia, in Western India, in Japan, and in Iceland. It is a small bird, its color brown of various shades. It frequents heaths, mosses, and pastures; and usually makes its nest on a grassy bank, or beside a tuft of grass or heath. Its song is weak and plaintive, and it generally sings in the air. It is gregarious in winter. The cuckoo is said to deposit its egg more frequently in the nest of the Meadow P. than in that of any other British bird.—A rather larger British species is the TREE P., or FIELD TITLING, which has a shorter claw, and perches on trees, frequenting enclosed and wooded districts. It is a summer visitant of Britain, and most common in the south of England. It occurs in most parts of Europe, in Asia, and the north of Africa.—The Rock P., or SEA TITLING (*A. petrosus*), is to be found on the shores of all parts of Britain and Ireland. It is rather larger than the Tree P., and has a long curved hind-claw. It feeds chiefly on small marine animals, seeking its food close to the edge of the retiring tide.

PI'PPIN (so called probably because raised from the *pip*, or seed), a name given to many varieties of apple, among which are some of the finest in cultivation, as the *Golden P.*, *Ribston P.*, &c. The Ribston P. was long supposed to be an originally English variety, produced at Ribston Hall in Yorkshire, but it is proved to have been introduced from Normandy in the beginning of the 18th century.

PIQUÉ WORK, a very fine kind of inlaying with gold, silver, and other costly materials; it is, in fact, a kind of Buhl-work (q. v.), carried out on a very minute scale. It is only applied to articles of small size, such as snuff-boxes, card-cases, and similar articles.

PI'QUET is a small body of men posted at some point beyond the general line of the army or corps, for the purpose of observing the motions of an enemy, or giving timely notice in case of any attack. Piquets are either *outlying* or *inlying*.

PIQUET, a game of cards played between two persons with thirty-two cards—viz., the four honors, and the highest four plain cards of each suit. The cards are shuffled and cut as in whist, and then dealt, two by two, till each player has twelve; and the remaining eight, called the *talon*, or stock, are then laid on the table. The first player must then discard from one to five of his cards, replacing them with a similar number from the talon; and after him, the younger hand may discard if he pleases, similarly making up his proper number from the remaining cards of the talon. The player who first scores 100 wins the game, and the score is made up by reckoning in the following order—carte-blanche, the point, the sequence, the quatorze, the cards, and the capot. *Carte-blanche* is a hand of twelve plain cards, and counts ten for the player who possesses it. The *point* is the greatest number of cards in any suit, or, if the players are equal in this respect, that which is highest in value (the ace counting eleven, each court-card ten, and the plain cards according to the number of pips), and counts a number equal to the number of cards in the suit.

The *sequence* is a regular succession of three or more cards in one suit, and the highest sequence (i. e., the one containing the greatest number of cards, or if the players have sequences equal in this respect, the one of the two which begins with the highest card), if of three cards, counts three; of four cards, four; of five cards, fifteen; of six cards, sixteen, &c. The *quatorze* is a set of four equal cards (not lower than tens), as four aces, four queens, &c., and the highest quatorze counts fourteen for its holder; but should neither player have a quatorze, then the highest set of three is counted instead, but it reckons only three. The possessor of the highest sequence or the highest quatorze also counts all inferior sequences and quatorzes (including sets of three); while his opponent's sequences and quatorzes go for nothing. The first player reckons his points, and plays a card; the dealer then reckons his points, and follows his opponent's lead, and cards are laid and tricks are taken as in any ordinary card-game. Each player counts one for every card he leads, and the taker of the trick (if second player) counts one for it; the possessor of the greater number of tricks counting ten in addition (the 'cards'), or if he takes all the tricks, he counts forty in addition (the 'capot'). If one player counts thirty—i. e., 29 by his various points, and one for the card he leads, before his adversary has counted anything, he at once doubles his score, reckoning sixty instead of thirty (this is called the 'pique'); and should his score reach thirty before he plays a card, or his adversary begins to count, he mounts at once to ninety (the 're-pique').

PI'RACY is robbery on the high sea, and is an offence against the law of nations. It is a crime not against any particular state, but against all mankind, and may be punished in the competent tribunal of any country where the offender may be found, or into which he may be carried, although committed on board a foreign vessel on the high seas. It is of the essence of piracy that the pirate has no commission from a sovereign state, or from one belligerent state at war with another. Pirates being the common enemies of all mankind, and all nations having an equal interest in their apprehension and punishment, they may be lawfully captured on the high seas by the armed vessels of any particular state, and brought within its territorial jurisdiction for trial in its tribunals. The African slave-trade was not considered piracy by the law of nations; but the municipal laws of the United Kingdom and of the United States by statute declared it to be so; and since the treaty of 1841 with Great Britain, it is also declared to be so by Austria, Prussia, and Russia.

PIRÆ'US (Gr. *Peiræus*), the principal harbor both of ancient and modern Athens (q. v.). Only a few traces remain of the long walls which formerly united it and Munychia with the capital city. The modern P., which has sprung up since 1835, is a regularly laid-out town, with some good houses and shops, and a handsome stone exchange, built at the expense of the municipality. It was in 1869 connected with Athens by a railway, and it has several spinning factories of recent construction. The harbor, called also Porto Leone or Drakoni, is both safe and deep; but the entrance is narrow. In 1871, the number of vessels which entered the P. was 6206, with a tonnage of 294,338 tons. Pop. (1879) 21,055.

PIRA'NO, a seaport of Austria, in the markgrafdom of Istria, stands on a peninsula in the bay of Largone, 15 miles south-west of Trieste. It contains an old castle, has a port and several dock-yards, commodious roads, in which large vessels find safe anchorage, and is the seat of considerable trade and commerce. Among its more important edifices are an interesting Gothic church, a town-house, and a Minorite convent, with a number of good pictures. Wine and oil are made in considerable quantities, and there are salt-works in the neighborhood, which produce upwards of 330,000 cwts. of salt annually. Pop. (1880) 7387.

PIRAYA, or PIRAI, the name given in Guiana to *Serrasalmo piraya*, and other species of *Serrasalmo*, a genus of fishes of the family *Characinidæ*, regarded by many as a section of *Salmonidæ* (q. v.). The fishes of this genus, of which numerous species inhabit the rivers and other fresh waters of tropical South America, have a compressed and deep body, the belly keeled and serrated with a double row of hard serratures. They are extremely voracious fishes, and not only consume with great rapidity dead carcases thrown into the water, but attack living creatures very much larger than themselves, biting off the fins of large fishes, and then devouring them at leisure, often mutilating ducks and geese by depriving them of their feet, and venturing to attack even oxen and human beings. The latter, however, make reprisals on them, and find them very good food. *Serrasalmo piraya* seldom exceeds 10 or 12 inches in length, but some of the species attain a considerably larger size. Some of them are very brilliantly colored. The Indians use the teeth for sharpening the arrows, made of the very hard ribs of palm-leaves, which they use for their blow-pipes, and which they sharpen to a very fine point by drawing them across a piraya's jaw, an article with which the Indian of Guiana is always provided; nor does the edge of the teeth soon begin to be worn.

Pirayas are readily taken by a baited hook, and almost any kind of bait will do; but they at once cut through any line, and the line must therefore be cased above the hook in tin-plate. The Indians often shoot them with arrows.

PI'RMASENS, a town of the Bavarian Palatinate, and formerly the chief town of the county of Hanau-Lichtenberg, 22 miles west of Landau. In 1880, it had 12,039 inhabitants; chief manufactures, shoes and musical instruments.

PI'RNA, a small town of Saxony, stands on the left bank of the Elbe, 11 miles by railway south-east of Dresden. It is surmounted by a hill, crowned by a castle, now used as a lunatic asylum, contains a beautiful parish church, and a number of important benevolent institutions. The manufacture of stoneware employs many hands. Pop. (1880) 11,680.

PI'SA, one of the oldest and most beautiful cities of Italy, capital of the province of the same name, which formed part of the late grand duchy of Tuscany, is situated on the banks of the river Arno, which intersects the city and is spanned by three noble bridges. P. is situated in 43° 43′ N. lat., and 11° 24′ E. long. The population was, in 1881, 53,957. It has broad, straight well-paved streets, and several fine squares. Among its 80 churches, the most worthy of notice is the cathedral, or Duomo, begun in 1068, and completed in 1118, with its noble dome, supported by 74 pillars, and its fine paintings, variegated marbles, and painted windows. Near the cathedral stands the round marble belfry known as the Leaning Tower of Pisa, from the circumstance that it deviates about 14 feet from the perpendicular. This celebrated building, which is 180 feet in height, and consists of seven stories divided by rows of columns, and surmounted by a flat roof and an open gallery commanding a splendid view of the surrounding country, was erected in the 12th c. by the German architect Wilhelm of Innsbruck.

The Baptistery, or Church of St. John, opposite the cathedral, an almost equally remarkable structure, was completed in 1162 by Diotisalvi. The main building, which is circular, and raised on several steps, supports a leaden-roofed dome, having a second dome above it, surmounted by a statue of St. John. The beautifully proportioned interior, noted for its wonderful echo, contains a pulpit, which ranks as the greatest masterpiece of Nicola Pisano, various pieces of sculpture, and a large octagonal marble font. The Campo-Santo, or ancient national cemetery, dates from the year 1228, when the Pisans caused earth to be brought from Jerusalem for the graves of the most distinguished citizens of the republic. In 1283, the ground was surrounded by cloisters, the walls of which were adorned by fresco-paintings, now nearly obliterated, although some of these works of art, which are chiefly by Giotto, Veneziano, Orcagni, and Memmi, still retain traces of their original beauty. Among the other public buildings of P., special notice is due to the churches of La Madonna della Spina and San Stefano, both rich in paintings and sculptures, and the latter famous for its organ, the largest in Italy; the grand ducal and Lanfranchi palaces; the Torre della Fame, so called from its being supposed to have been the spot in which Ugolino Gherardesca and his children were starved to death in 1288; the university, founded in 1330, and restored by Cosmo I. de' Medici, which enjoyed a high reputation in the middle ages, and still possesses claims to consideration in its library, botanical garden, observatory, and affiliated schools and art collections, &c. The population of P., which, in the 13th c., amounted to 150,000, had fallen, in the present century, to less than one-sixth of that number; but of late years, trade and industrial arts have made a rapid advance, and the population has increased in proportion. In the neighborhood of P., at the foot of San Giuliano, lie the mineral baths, whose fame was known to Pliny, and which continued through the middle ages to attract sufferers from every part of Italy. The waters, which are rich in carbonic acid and chloride of sodium, are found efficacious in various arthritic and rheumatic affections.

History.—Ancient P., like other Etruscan cities subject to Rome, retained its municipal government, and enjoyed an almost unlimited freedom while nominally under Roman protection; but on the decline of the imperial power, it was compelled to submit in turn to the various transalpine nations, who successively overran Northern Italy. Early in the 11th c., P. had risen to the rank of a powerful republic, whose sway included the then fertile district known as the Maremma di Lerici, and which yielded little more than nominal homage to its suzerain lords, the emperors of Germany. Throughout the 11th c., P. was at the height of its prosperity, and to this period belong most of the splendid monuments of art that still adorn the city. Its troops took part in all the great events of the Holy Land; and its fleet in turn gave aid to the pope in Southern Italy, to the emperor in Northern France, chastised the Moors, and exacted its own terms from the Eastern emperors. In their wars with the Saracens of Sardinia, the Pisans had conquered Sardinia, Corsica, and the Balearic Islands, and for a time maintained their ground against their hereditary enemies, the Genoese; but having sided with the Ghibellines in the long wars which desolated the empire, P. suffered severely at the hands of the victorious Guelphic party. Indeed, the rivalry of the Guelphic cities of Florence, Lucca, and Siena, nearly brought P. to the brink of ruin at the close of the 13th c.; and after struggling for more than a hundred years against external foes and the internal dissensions between the democratic mob and the Ghibelline nobles, without losing their character for indomitable valor, the Pisans finally threw themselves under the protection of Galeazzo Visconti of Milan. The son of the latter sold the Pisan territory to their greatest enemies, the Florentines, from whose tyrannical rule it was for a time relieved by Charles VIII. of France, who, in 1494, accepted the protectorate of the city. When the French left Italy, the old struggle was renewed; and after a desperate resistance, the Pisans, in 1509, were compelled by hunger to surrender to the Florentine army. The most influential families, as formerly in 1406, emigrated. P., with the rest of Tuscany, became part of the kingdom of Italy in 1860. Since 1868, P. has given its name to an Italian province, containing a population of (1881) 283,269.

PISA, COUNCIL OF, one of the councils commonly reputed by Roman Catholics as œcumenical or general, although some, especially of the Ultramontane (q. v.) school, do not look upon it as such. It was assembled in the time of the great Western Schism, for the purpose of restoring the peace of the church, and the unity which had been interrupted by the rival claims of two competitors for the papacy. The history of this rival claim will be found under the head SCHISM, WESTERN. For our present purpose, it is enough to state that the adherents of both the claimants of the see of Rome—those of Gregory XII., as well as those of Benedict—agreed on the necessity of a general council, as the only means of putting an end to the schism; and the rival popes having themselves either evaded or declined the demand, the cardinals of both united in issuing letters of convocation, and in summoning both the claimants to the council so convened. Neither of them complied with the citation; but the council proceeded, nevertheless, to examine and deliberate upon the cause. It was opened at Pisa, March 25, 1409, there being present 22 cardinals, 4 patriarchs, 12 archbishops, 80 bishops, together with representatives of 12 archbishops and 102 bishops, and a vast body of abbots, doctors in theology, and other eminent ecclesiastics. Of the proceedings, it will be enough to say, that after a formal citation of the rival popes to appear within a stated period, the council, on the expiration of that period, proceeded to declare them contumacious, and to examine their respective claims as though they had appeared. The result, after a protracted inquiry, was a decree in the 13th session by which they were both declared schismatics, and their conduct heretical, and calculated to lead the people from the faith; wherefore, since they had violated the solemn engagements made at their respective elections, they were deposed from the papal dignity, and their followers released from obedience.

In the 17th session, the cardinals having first pledged themselves by oath, each, that, if elected, he would continue the sittings of the council, entered into conclave to the number of 24, and unanimously elected Peter Philargi, one of the cardinal priests, and a member of the Franciscan order. He took the name of Alexander V. The council proceeded after his election to pass a number of decrees, for the purpose of giving validity to the acts done on either side during the schism. A vain attempt was made to obtain the submission of the still recusant rivals, and it was resolved that a new council should be held within three years. The authority of this council, like that of the Council of Constance, is alleged, on the Gallican side, as establishing the superiority of a general council over the pope. But the Ultramontanes reply that both these councils, and also that of Basel, must be regarded as abnormal assemblies, called to meet the special emergency of a disputed succession and of a doubtful pope, and that these principles cannot by any means be applied to the ordinary circumstances of the church, or form a precedent by which to estimate the normal relations between a pope whose title is certain and undisputed, and a general council regularly assembled at a time of peace, and in the ordinary circumstances of the church. It cannot be doubted, nevertheless, that the spirit of the fathers of Pisa was the same which ran through the succeeding assemblies of Constance and Basel, and found its permanent representation in the Gallicanism (see GALLICAN CHURCH) of later centuries.

PISCA'TAQUA, a river of about 80 miles in length, which forms the southern part of the boundary between Maine and New Hampshire, U.S., and empties itself into the Atlantic, forming at its mouth the excellent harbor of Portsmouth.

PI'SCICULTURE, or FISH-CULTURE, the breeding and rearing of fishes, in order to the increase of the supply for food. Hitherto, it has been almost entirely limited to fresh-water fishes; nothing having been done as to sea-fishes but by legislation—chiefly in the case of the herring—to prevent the destruction of the very young fish, and that not, apparently, to much advantage. Ponds for sea-fishes have, indeed, been sometimes constructed, advantage being taken of natural circumstances favorable for the purpose; the ancient Romans had such ponds, and some have been made on different parts of the British coast; fishes

being caught in the open sea and placed in them to be fed and fattened for the table. Such ponds, however, are of little real utility. That the Romans succeeded in keeping sea-fishes in fresh-water ponds, as has been asserted, must be regarded as mere fable, or as an exaggeration, founded on the power which a few fishes have of adapting themselves both to fresh and salt water. But it may be doubted if in modern times sufficient advantage has been taken of this power.

Ponds for fresh-water fishes have been common from a very remote antiquity. It appears from Isaiah, xix. 10, that they were used in ancient Egypt. In the times of Roman luxury, almost every wealthy citizen had fish-ponds. The Chinese have long bestowed more attention on pisciculture than any other nation, and with them it is truly a branch of economy, tending to the increase of the supply of food and of the national wealth; not merely, as it seems to have been among the Romans, an appliance of the luxury of the great. In some countries of modern Europe, this branch of pisciculture is also prosecuted to a very considerable extent, particularly in Germany and Sweden, and of late years in France, in order to the supply of fish for the market.

In Britain it has never been systematically prosecuted, or for any important purpose; the country-seats of the nobility and gentry being, indeed, generally provided with fish-ponds, but in most cases rather as ornamental waters than for use. In the northern parts of Britain, trout, perch, and pike are almost the only fish kept in ponds; in England, they are often stocked with carp and tench, and are turned to much better account than in Scotland. In Germany, ponds carefully attended to are found very productive and remunerative. There can be no doubt that in Britain, also, many a piece of land at present very worthless, might easily be converted into a pond, and made to yield large quantities of excellent fish ; but such a thing seems almost never to be thought of.

In the construction of ponds, or *stews*, for fish, it is recommended to have, if possible, a succession of three ponds on the same rivulet, with sluices, by which they can be dried, so that the fish may be easily taken when required, the different ponds being in part intended for fish of different ages. But all this must be very much regulated by local circumstances. It is of more importance to note that the margin should be shallow, so that there may be abundance of reeds and other water-plants, and that only a small part of the pond should be too deep for the growth of pond-weeds (*Potamogeton*). Much depends on the soil of the neighborhood as to the supply of food, and consequently the growth of fish and productiveness of the pond. A stony bottom is very advantageous to perch and trout ponds; and in designing these, care should be taken to provide places of shelter for the fish, more especially if the pond be a shallow one, as trout and perch are easily killed by the glare of the sunshine. Ponds for pike must be larger than is necessary for any other fish known to British pisciculture : an extent of at least six acres is desirable.

A nursery for minnows may be established with great advantage in connection with a fish-pond, as they afford most acceptable food to perch, pike, and trout. But in a pond where carp and tench are expected to spawn, the presence of minnows is very undesirable. It is often impossible to provide a pond with a place suitable for the spawning of trout, for which a gravelly stream with a quick current is necessary; but for perch, pike, carp, or tench, the pond itself is sufficient, and the stock, once introduced, is kept up without replenishing. Indeed, it is recommended that a pond stocked with carp should also be stocked with pike, that the excessive multiplication of the carp may be checked, which would otherwise prevent the fish from growing rapidly or to a good size. Private ponds and stews in which country gentlemen breed fish for the use of their own tables, as well as similar places attached to monasteries and other religious edifices, in which fish were grown for fast-day uses, were at one time common enough throughout Great Britain and Ireland. It is probable that some of our rarest fishes were introduced into this country during the old monastic times, such as the Lochleven trout, the vendace, &c.

The greatest improvement in pisciculture, and a most important branch of it, to which the term is often restricted, is the breeding of fish in artificial breeding-places, from which not only ponds but rivers may be stocked; or the art of fecundating and hatching fish-eggs, and feeding and protecting the young animals till they are of an age to secure their own food, and protect themselves from their numerous enemies.

Modern pisciculture is the revival of an old art well known to the ancient Italians, but which had fallen into abeyance for a number of centuries. The art of breeding and fattening fish was practised by the luxurious Romans, and many stories are told about the fanciful flavors which were imparted to such pet fishes as were chosen for the sumptuous banquets of Lucullus, Sergius Orata, and others. The art bad doubtless been borrowed from the ingenious Chinese, who are understood to have practised the art of collecting fish-eggs and nursing young fish from a very early period. Fish forms to the Chinese a most important article of diet; and from the extent of the water-territory of China, and the quantities that can be cultivated, it is very cheap. The plan adopted for procuring fish-eggs in China is to skim off the impregnated ova from the surface of the great rivers at the spawning season, which are sold for the purpose of being hatched in canals, paddy-fields, &c.; and all that is necessary to insure a large growth of fish is simply to throw into the water a few yolks of eggs, by which means an incredible quantity of the young fry is saved from destruction, as a large percentage of the young of all fish die for want of food. Although all kinds of fish are enormously fecund, it is well known to naturalists that only a small percentage of the eggs ever come to life, and of the young fish, very few ever reach the table as food. So many of the eggs are destroyed by various influences, and so many likewise escape impregnation, that if we are to keep up our fish supplies, pisciculture, or protected breeding, becomes absolutely necessary.

Commercial pisciculture as at present carried on, owes its origin to the French, the art having been first put in practice by M. Remy, a poor fisherman who gained a living by catching fish in the streams of La Bresse in the Vosges. This re-discovery of the lost art of fish-breeding is understood to have been quite accidental on the part of Remy, although it is thought by some zealous Scotsmen that the Frenchman must have heard of the experiments of Mr. Shaw of Drumlanrig, who, for a few years previous to Remy's discovery, had been trying to solve some problems in the natural history of the salmon by means of the artificial system. The art had also been partially revived in Germany about the middle of last century by a gentleman of the name of Jacobi, who practised the artificial breeding of trout. Whether or not Remy had heard of either of these experimenters, it is certain that to him we owe the revival of the art in its larger or commercial sense; the others only used it as an adjunct to their study of the natural history of fishes.

It was the great waste of eggs incidental to the natural system of fish-breeding that led Remy, about 1842, in conjunction with Gehin, a coadjutor whom he assumed as a partner, to try what he could do in the way of repeopling the fish-streams of his native district. His plan being at once successful, attracted the favorable notice of many of the French savans, and led to rewards and preferment for Remy; the new art was besides taken under the protection of the government. At Huningue, in Alsace, on the Rhine, a gigantic fish-nursery and egg-dépôt for the supply of eggs, and the dissemination of the art, was erected some years ago. Since the cession of Alsace to Germany, the operations of the establishment at Huningue (now known as Hüningen) have been conducted on a still larger scale by a German association.

The course of business at Huningue is as follows : The eggs are chiefly brought from the streams of Switzerland and Germany, and embrace those of the common trout, as well as the Rhine and Danube salmon, and the tender charr or ombre chevalier. People are appointed to capture gravid fish of these various kinds, and, having done so, to communicate the fact to Huningue. An expert is at once sent to deprive these fishes of their spawn, and bring it to the breeding or resting boxes, where it is carefully tended till it is ready to be despatched to some district in want of it. It is, of course, much more convenient to send the eggs than the young fish, as the former, nicely packed among wet moss in little boxes, can be carried to a distance with greater facility. The mode of artificially spawning a salmon is as follows. It should, of course, be ascertained that the spawn is in a perfectly matured state, and that being the case, the salmon is held under water in a large tub, while the hand is gently passed along its abdomen, when, if the ova be ripe, the eggs will flow out like so many peas. The eggs are then carefully washed, and the water is poured off. The male salmon is then handled in a similar way, when the contact of the milt immediately changes the eggs into a brilliant pink color. After being again washed, they may be ladled out into the breeding-boxes, and left to come to life in due season. The period occupied in hatching is different in different climates. At Stormontfield, where the eggs have no shelter, the usual period is about 135 days; but salmon ova have been known to burst in about half that period, and to yield very healthy fish. Great care is of course necessary in handling the ova. The eggs manipulated at Huningue are all carefully examined on their arrival, when the bad ones are thrown out, and those that are good are counted and entered in a record. The ova are watched with great care, and from day to day all that become addled are removed.

The applications for eggs, both from individuals and associations, are always a great deal more numerous than can be supplied; and before second applications can be entertained, it is necessary for the parties to give a detailed account of how their former efforts succeeded. It may be interesting to note, as regards the cost of pisciculture at Huningue, that the most expensive fish is the ombre chevalier. Of some species, as many as sixty or seventy per cent. of the eggs are lost. The general calculation, however, is twelve living fish for a penny.

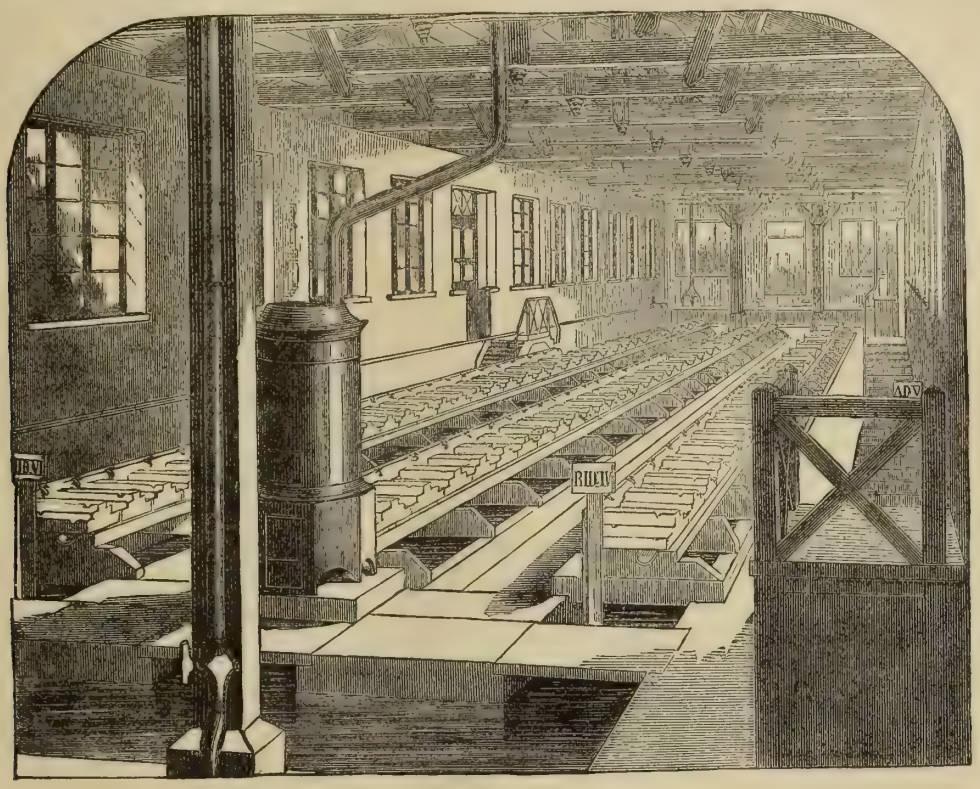
The most sustained effort in British pisciculture has been in

connection with the salmon-fisheries of the river Tay. At Stormontfield, near Perth, a series of ponds has been constructed, and a range of breeding boxes laid down capable of receiving 500,000 eggs. The operations at Stormontfield were begun in 1853, and are still continued. It is calculated that by means of these ponds half a million of young salmon are annually added to the stock of the river Tay, the rental derived from which is now over £20,000 per annum. At several other places in Scotland, the artificial system is being introduced as an adjunct to the natural breeding resources of different rivers. The art of pisciculture was also introduced into Ireland, at the fisheries of Loughs Mask and Carra, by the late Mr. Ashworth, who for a time obtained excellent practical results. These lochs contain an area of water equal to 35,000 acres; and a communication with the sea having been opened, they now teem with salmon. Several attempts have been made to introduce British fishes into the rivers of Australia, which in the case of trout, carp, tench, and perch, have been quite successful; but many thousands of salmon ova have been imported to Australia, New Zealand, and Tasmania, where a strong endeavor has been made to establish them in the rivers there. A salmon of 28 lbs. weight, caught in the Huon River, Tasmania, in the beginning of 1880, is proof that salmon are capable of acclimatization at the antipodes.

Pisciculture is largely practised in America, both by private persons and under the auspices of a commissioner, Mr. Spencer F. Baird, who acts on behalf of the government. Eggs are collected for distribution in the seas and rivers of the United States in enormous quantities, and are transported hither and thither to and from all parts of the country. As one example of what has been lately accomplished, it may be stated on the authority of a recent report to the House of Representatives, that the number of eggs of the Californian salmon collected during the season of 1875 at the United States Piscicultural Establishment on the Upper Sacramento, amounted to about 11,000,000, making a bulk of eighty bushels, and weighing with their packing gear nearly ten tons. In the years 1874 and 1875, a total of 26,137,855 eggs of shad and various kinds of salmon were distributed by the U. S. Fish Commission; and altogether 40,000,000 of fish eggs were handled in 1873-75. The Canadian government has established seven 'hatcheries,' in each of which about a million of ova are hatched.

Nearer home, namely in France, great efforts have been made to increase the supply of oysters by means of artificial cultivation. Oysters were cultivated in Italy during the classic ages, but the art of cultivating them seems to have been lost till it was accidentally re-discovered by an artisan of the Ile de Ré, who found out that the chief point in artificial oyster-culture is to insure a supply of spat. The seed of the oyster is too often carried away from the place of its birth by adverse winds acting on the waves, and thus it sometimes falls on an unpropitious growing-place. The spat of the oyster must have a 'coign of vantage' to which to cling; if it falls on a muddy bottom it is lost for ever. On the foreshores of the Ile de Ré, there are countless oyster-beds of the most simple description, in which the spat is reared and tended during its period of growth. All that is required for a good bottom to an oyster-bed is a rocky surface, which, if not found naturally, can be easily constructed by the laying down of stones and tiles.

Oyster-culture, in simple form, has been practised at Whitstable, on the coast of Kent, for a long period, and the famous



Reception-hall for Fish-eggs at Huningue.

'native' oysters are fed on ground at that place. Other experiments are in course of being made, and on some parts of the English coast, artificial *parcs* have been laid out on the French plan, in which plentiful supplies of oysters have been grown to maturity. The great difficulty in all experiments connected with oyster-culture is to find the requisite supply of spat from which to rear the mature animal.

Pisciculture is now being practised to some extent in several countries of Europe, and has been deemed of sufficient importance to demand the attention of governments. It is probable that the attention turned to the whole subject of pisciculture, and the example of the transportation of salmon to Australia, may lead to the introduction of valuable kinds of fishes into waters where they are now unknown. The grayling has thus already been introduced into the Clyde and Tweed. There is no apparent reason why every valuable fresh-water fish of Europe should not be plentiful in Britain.

PISCI'NA, the large basin (or *pond*) in the Roman thermæ, containing tepid water, in which the bather might swim.

PISCINA, a shallow stone basin with a drain (usually leading directly to the earth), in Roman Catholic churches, in which the priest washes his hands, and for rinsing the chalice at the celebration of the mass. In England, it is almost invariably placed on the south side of the choir, at a convenient height.



Piscina, Warmington.

PI'SÉ, a kind of work used instead of brick, &c., for the walls of cottages. It consists of loam or earth hard rammed into framing, which, when dry, forms a wall.

PI'SEK (Boh. *Piscek*, sand), a small town of Bohemia, on the right bank of the Wottawa, an affluent of the Moldau, stands on

a sandy plain (from which circumstance it probably received its name) 55 miles south-south-west of Prague. The town is old, and contains the remains of a royal castle. Among other institutions are a school of arts and a high school. The manufactures are woollen and cotton fabrics, iron wire, and musical instruments. Pop. (1880) 10,545.

PISHAMIN. See DATE PLUM.

PI'SOLITE (Gr. pea-stone), a concretionary limestone, differing from oolite in the particles being as large as pease.

PISTA'CIA, a genus of trees of the natural order *Anacardiaceæ*, having diœcious flowers without petals, and a dry drupe with a bony stone.—The PISTACIA or PISTACHIO TREE (*P. vera*) is a small tree of about 20 feet high, a native of Persia and Syria, but now cultivated in all parts of the south of Europe and North of Africa, and in many places naturalized. It has pinnate leaves, with about two pair of ovate leaflets and an odd one; flowers in racemes; fruit ovate, and about the size of an olive. The stone or nut splits into two valves when ripe; the kernel, which is of a bright green color, is very oleaginous, of a delicate flavor, and in its properties very much resembles the sweet almond. In the south of Europe and in the East, *Pistachio nuts* are much esteemed; but as they very readily become rancid, they are little exported to other countries. They are sometimes called *Green Almonds*. Oil is expressed from them for culinary and other uses. In cultivation, one male tree is allowed to five or six fertile ones. The tree produces flowers and even fruit readily enough in the south of England, but the summers are not warm enough to ripen the fruit, and the tree is apt to be destroyed by a severe frost.—The MASTIC TREE, or LENTISK (*P. lentiscus*), yields the gum-resin called Mastic (q. v.). It is a native of the countries around the Mediterranean.—The TURPENTINE TREE (*P. terebinthus*) yields the Turpentine (q. v.) known in commerce as *Cyprus Turpentine*, *Chian Turpentine*, or *Scio Turpentine*, which is of a consistency somewhat like that of honey, a greenish-yellow color, an agreeable odor, and a mild taste, and in its properties resembles the turpentine of the Coniferæ, but is free from acridity. It is obtained by making incisions in the trees, and placing stones for the turpentine to flow upon, from which it is scraped in the morning, before it is liquefied again by the heat of the sun. The tree is about 30 or 35 feet in height; and has pinnate leaves, of about three pair of leaflets and an odd one; the flowers in compound racemes, the fruit nearly globular. The kernel of the fruit is oleaginous and pleasant.

The BATOUM TREE (*P. Atlantica*), a round-headed tree of about 40 feet in height, a native of the north of Africa; produces a fruit much used by the Arabs; and a gum-resin of pleasant aromatic smell and agreeable taste, which exudes from its stem and branches, is chewed to clean the teeth and impart a pleasant smell to the breadth.—The fragrant oil of the kernels of *P. oleosa*, a native of Cochin China, is used by the people of that country to impart a perfume to ointments.

PI'STIL, in Botany, the female organ of fructification in phanerogamous plants; that part of the Flower (q. v.) which, after flowering is over, is developed into the fruit. There is sometimes one pistil in a flower, sometimes more; in some flowers, which have numerous pistils, they form a number of whorls, one within another, sometimes on an elevated receptacle or elongated axis, or, more rarely, they are spirally arranged. In every case, the center of the flower is occupied by the pistil or pistils, if present. See FLOWER. A pistil is either formed of a single Carpel (q. v.), as is the case when there are numerous pistils, or of several carpels combined; and the number of carpels of which the pistil is formed is often indicated by the number of the cells of the germen, or by its lobes or angles. The pistil usually consists of a Germen (q. v.) or ovary, in which the Ovules (q. v.) are contained, and which is surmounted by a *stigma*, either immediately or through the intervention of a *style;* but in Gymnogens (q. v.), there is neither germen, style, nor stigma, the female organs of fructification being mere naked ovules. The germen is always the lowest part of the pistil. The stigma exhibits an endless variety of forms, and is adapted to the reception and retention of the pollen grains requisite for fecundation, partly by the roughness of its surface—which is of a somewhat lax cellular tissue, covered with projecting cells, often in the form of minute warts, and often elongated into hairs—and partly by the secretion of a viscous fluid.

The stigma when not *sessile*—or seated immediately on the germen—is supported by the style, which rises from the germen, and on the top of which the stigma is generally placed. The style is sometimes very long and slender, sometimes very short; the germen sometimes passes imperceptibly into the style, and sometimes the style rises from it abruptly; and similar differences appear in the relations of the style and stigma; the stigma, however, may be regarded as always an expansion of the top of the style, although it is sometimes, but rarely, situated on one or both sides of the style, beneath its summit. In like manner, by peculiar modifications taking place in the growth of the germen, the style sometimes seems to arise from beneath its apex, or even from its base; but it always rises from what is, structurally considered, the real apex of the germen. When several carpels are united to form one germen, they are sometimes again separated in their



Pistils:

1, Section of flower of a species of Primrose, showing the pistil laid open; numerous ovules attached to a free central placenta. 2, Section of flower of Comfrey, with corolla removed, showing two of the four ovaries, and the style. 3, Pistil of the Barberry, consisting of several carpels combined; the style very short and thick, the stigma shield-like. 4, Section of the ovary of a Lily. 5, Section of flower of Cherry, showing pistil of two separate carpels, only one of which comes to perfection in fruit. 6, Pistil of Pea, opened; *a*, ovule; *b*, placenta; *f*, umbilical cord.—From Balfour's *Class-Book of Botany*.

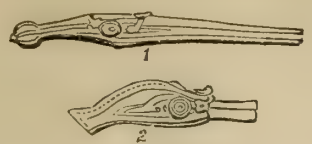
styles, and more frequently in their stigmas, so that one germen bears several styles, or the style divides at some point above the germen, or one style is crowned by a number of stigmas. The style is usually cylindrical; and when this is not the case, it is often owing to the combination of several styles into one, although sometimes the style is flat and even petal-like. It is traversed throughout its whole length by a canal, which, however, is in general partly filled up by cells projecting from its sides, and often also by very slender tubes extending in the direction of its length; the function of the canal, to which in some way or other the enclosed slender tubes are subservient, being to bring about the connection between the pollen and the ovules for Fecundation (q. v.).

The length of the style is adapted to the ready fecundation of the ovules, being such that the pollen may most easily reach the stigma; and in erect flowers, the styles are usually shorter than the stamens; in drooping flowers, they are longer than the stamens. After flowering is over, when fecundation has taken place, the *foramen* of the ovules closes, the germen enlarges and ripens into the fruit, whilst each ovule is developed into a seed. The style and stigma meanwhile either fall off, or remain and dry up, or they increase in size, and are changed into various kinds of appendages of the fruit, as feathery awns, beaks, &c.

PISTILLI'DIUM, in Botany, a term which, along with *Antheridium* (q. v.), must be regarded as provisional, and as expressive of an opinion, probable, but not yet ascertained to be true. The evidence in favor of it, however, seems continually to increase, and its great probability is more and more generally acknowledged. The pistillidium is an organ of cryptogamous plants, supposed to perform functions in fructification analogous to those of the pistil in phanerogamous plants. It consists of a germen-like body—the *sporangium*, *theca*, or *spore-case*—hollow, and containing Spores (q. v.), by which the species is propagated. These spore-cases are very various in their forms and in the situations which they occupy in different orders and genera; being sometimes immersed in the substance of the plant, sometimes distinct from it, sometimes sessile, sometimes stalked, &c. See the articles on the different cryptogamous orders.

PISTO'JA (anc. *Pistorium*), a manufacturing town of Italy, in the province of Florence, and 21 miles by railway north-west of the city of that name, stands on a gentle rising ground at the foot of the Apennines. It is well built; its streets are thoroughly Tuscan, and it is surrounded by lofty and well-preserved walls. The chief buildings are the cathedral, built at various times, and containing a number of good pictures; several old and interesting palaces, and a number of churches, some of which are of importance in the history of medieval architecture and sculpture. The principal manufactures are iron and steel wares, and paper. Pop. (1872) 12,966.

PISTOL is the smallest description of fire-arm, and is intended to be used with one hand only. Pistols vary in size from the delicate saloon-pistol, often not six inches long, to the horse-pistol,



Ancient Pistols:
1, Long Wheel-lock Pistol; 2, Pocket 'Wheel-lock Dag'—*temp.* Elizabeth.—From Fairholt's *Costume in England.*

which may measure 18 inches, and sometimes even two feet. They are carried in holsters at the saddle-bow, in the belt, or in the pocket. Every cavalry soldier should have pistols, for a fire-



Modern Pistol.

arm is often of great service for personal defence, and almost indispensable in giving an alarm or signal. Sailors, when boarding an enemy's ship, carry each two in their waistbelts.

As early as the reign of Henry VIII., the English cavalry carried clumsy pistols called 'dags.' The latest improvement on the pistol is the Revolver (q. v.)

PISTO'LE, the name formerly given to certain gold coins current in Spain, Italy, and several parts of Germany. The pistole was first used in Spain, and was originally equivalent to about 11 old French livres, but till 1728 it was merely an irregular piece of gold. From this time till 1772, its value was 17*s.* 1*d.* sterling; but it was after this date decreased till it reached the value of 80 reals, or 16*s.* 2*d.* sterling. The Italian pistoles were also gold coins, and varied considerably in value: that of Rome = 13*s.* 9*d.*; of Venice = 16*s.* 2½*d.*; of Florence and Parma = 16*s.* 10½*d.*; and the old coin of Piedmont = £1, 2*s.* 7½*d.*, or 24 old liras. Gold coins of this name used to be current in Hesse-Cassel, Switzerland, Brunswick, and Hamburg, but were in most cases merely convenient multiples of the ordinary thaler and gulden. Of late years, and especially since the introduction of new systems of coinage in Spain and Italy, and of a uniform system in the German Empire, the name P. is scarcely ever used.

PI'SUM. See PEA.

PIT, in Gardening, is an excavation in the ground, intended to be covered by a Frame (q. v.), and to afford protection to tender plants in winter, or for the forcing of vegetables, fruits, &c. Pits are often walled on all sides, although in many cottage gardens, excellent use is made of pits which are mere excavations. The walls are often raised above the ground, particularly the back wall, the more readily to give slope to the glazed frame. A pit in which no artificial heat is supplied, is called a *cold pit;* but when forcing is intended, flued pits are often used. Artificial heat is sometimes also given by means of fermenting matter. The ventilation of pits, as much as the weather will permit, is of the greatest importance.

PI'TA-HEMP, one of the names of the Agave or Aloe fibre. See AGAVE.

PIT'AKA (literally, 'basket') is, with the Buddhists, a term denoting a division of their sacred literature, and occurs especially in combination with *tri,* 'three;' *tripit'aka* meaning the three great divisions of their canonical works, the *Vinaya* (discipline), *Abhidharma* (metaphysics), and *Sútra* (aphorisms in prose), and collectively, therefore, the whole Buddhistic code. The term 'basket' was applied to these divisions, because the palm-leaves on which these works were written were kept in baskets, which thus became a part of the professional utensils of a Bhikshu, or religious mendicant.

PITCAI'RN ISLAND, a solitary island in the Pacific Ocean, lying at the south-eastern corner of the great Polynesian Archipelago, in lat. 25° 3′ 6″ S., and long. 130° 6′ W. Its length (2¼ miles) is about twice its breadth, and the total content is approximately 1¼ square miles; so that, except from its being the only station (with the exception of the Gambier Islands) between the South American coast and Otaheite at which fresh water can be procured, it would bo too insignificant to deserve notice, were it not for the manner in which it was colonized. The island is wholly surrounded by rocks; it has no harbor, and its soil is not very fertile. It was occupied in 1790 by the mutineers of the *Bounty* (see BLIGH, WILLIAM), who, after touching at Toobouai, sailed for Tahiti, where they remained for some time. Christian, the leader of the mutineers, however, fearing pursuit, hastened their departure; and after leaving a number of their comrades who preferred to stay on the island, they brought off with them 18 natives, and sailed eastward, reaching P. I., where they took up their residence, and burned the *Bounty.* They numbered then 9 British sailors—for 16 of the sailors had preferred to remain at Tahiti, and of these, 14 were subsequently captured, and (September 1792) three of them executed—and 6 Tahitian men, with 12 women. It was impossible for concord to subsist in a band of such desperate character; and, in the course of the next ten years, all the Tahitian men, all the sailors, with the exception of Alexander Smith (who subsequently changed his name to John Adams), and several of the women, had died by violence or disease. From the time of their leaving Tahiti, nothing had been heard of them, and their fate was only known when an American, Captain Folger, touched at P. I. in 1808, and on his return, reported his discovery to the British government; but no steps appear to have been taken by the latter.

On September 17, 1814, a British vessel, the *Britain,* called at the island, and found old Adams still alive, commanding the respect and admiration of the whole little colony, by his exemplary conduct and fatherly care of them. Solitude had wrought a powerful change in Adams; and his endeavors to instil into the young minds of his old companions' descendants a correct sense of religion, had been crowned with complete success, for a more virtuous, amiable, and religious community than these islanders, had never been seen. They were visited by British vessels in 1825 and 1830, and the reports transmitted concerning them were fully corroborative of the previous accounts; but, in 1831, their numbers (87) had become too great for the island, and at their own request, they were transported to Tahiti, in the *Lucy Ann,* by the British government. But, disgusted at the immorality of their Tahitian friends and relatives, they chartered a vessel, defraying the cost of it in great part with the copper bolts of the *Bounty,* and most of them returned to P. I. at the end of nine months. In 1839, being visited by Captain Elliot of H.M.S. *Fly,* they besought to be taken under the protection of Britain, on account of the annoyances to which they had been subjected by the lawless crews of some whale-ships which had called at the island; and, accordingly, Captain Elliot took possession of it in the name of Her Majesty, gave them a Union Jack, and recognized their self-elected magistrate as the responsible governor. He also drew up for them a code of laws, some of which are amusing from the subjects of which they treat, but the code was of great use to the simple islanders. From this time, they were frequently visited by European ships; and, in 1855, finding their numbers again too great for the island, they petitioned government to grant them the much more productive Norfolk Island, to which they were accordingly removed in 1856.

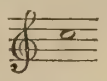
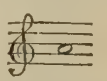
In 1859, however, two families, numbering in all 17, returned to P. I., reducing the number on Norfolk Island to 202, and others have since followed. From their frequent intercourse with Europeans, the Pitcairn Islanders have, while still retaining their virtuous simplicity of character and cheerful hospitable disposition, acquired the manners and polish of civilized life, with its education and taste. They are passionately fond of music and dancing, the latter evidently a legacy from their maternal ancestry. The men are engaged in whaling and herding cattle, or in cultivating their gardens and plantations; while the women (who seem to be the more industrious class) attend to their families, manage the dairies, and take an occasional part in field-labor.

P. I. was first discovered by Carteret in 1767, and was named by him after one of his officers; but it was never visited by Europeans till taken possession of by the mutineers. When Admiral de Horsey visited P. I. in 1877, there were in all 16 men, 19 women, 25 boys, and 30 girls on the island. The total population, in 1881, was 96.

PITCH. The common kind of pitch is the black residue which remains after distilling wood-tar. See TAR. It is made extensively in Russia, Norway, and North America. It is a most useful material for protecting wood from the action of water, hence it is used for calking the seams, and coating the outsides of ships and boats; it is also applied to the inside of water-casks, and many similar uses. A variety of pitch is now obtained from the distillation of coal-tar, and another from bone-tar; the latter is said to be nearly equal in value to that from wood, but coal-pitch wants the toughness which is one of the more valuable qualities of wood-pitch. It is, however, much used in making artificial asphalt for building and paving purposes; and for the black varnish used for coating iron-work to keep it from rusting. Pitch is solid at the ordinary temperature of our climate, but softens and melts with a small accession of heat.

PITCH, BURGUNDY. See BURGUNDY PITCH.

PITCH, the degree of acuteness of musical sounds. A musical sound is produced by a series of vibrations recurring on the ear at precisely equal intervals; the greater the number of vibrations in a given time, the more acute or higher is the pitch. In stringed instruments, the pitch is dependent on the length, the thickness, and the degree of tension of the strings; the shorter and thinner a string is, and the greater its tension, the higher is the pitch of the note. In wind instruments, where the notes are produced by the vibration of a column of air, as in the mouth-pipes of an organ, the pitch is dependent on the length of the column set in motion; the shorter the column of air, the higher the pitch becomes.

The pitch of musical instruments is adjusted by means of a tuning fork, consisting of two prongs springing out of a handle, so adjusted as to length that, when struck, a particular note is produced, that note being C  in Britain, and A  in Germany. It is obviously important to have a recognized standard of pitch, by which instruments and voices are to be regulated, but there is, unfortunately, not the uniformity that might be desired in the pitch in actual use. For a long time prior to 1859, concert pitch had been gradually rising, to the detriment of the voices of public singers. The C. tuning-fork, in use in 1699, made 489 vibrations per second, while in 1859, the number of vibrations had increased to 538. Mr. Hullah, in 1842, in the numerous classes instituted by him under the sanction of the Committee of Council on Education, found it necessary to secure a uniform standard of pitch, and adopted 512, which has an especial convenience as being a power of 2. The French Imperial government, in 1858, fixed on 522. In 1859, a Committee of the Society of arts was appointed to consider the subject of a uniform musical pitch. Their deliberations lasted twelve months. Sir John Hershel, in a letter to the Committee, strongly recommended the number 512. It was agreed on all hands that the then existing opera-pitch of 546 was too high and painful to the singers of soprano music. The instrumental performers stated that they could lower the pitch to 528, but if they had to lower it to 512, some of them would have to purchase new instruments; and, in consequence apparently of their representation, the Committee reported in favor of 528.

PI'TCHBLENDE, a mineral which is essentially oxide of Uranium (q. v.), with slight mixtures of other substances. Its color is grayish-black or brownish-black. It is infusible before the blowpipe, without the addition of borax, with which it fuses into a dull yellow glass.

PITCHER PLANT. See NEPENTHES.

PITCHSTONE, a name sometimes given to a variety of common Opal (q. v.), brown, black, gray, red, or of mixed colors; the lustre more resinous than in opal, and the fracture less perfectly conchoidal. It occurs in several localities in the British Islands, in Saxony, &c.—The same name is given to another mineral (Ger. *Pechstein*), a variety of Felspar (q. v.), occurring as a rock in dikes which traverse strata or in overlying masses, compact, slaty, or in concentric slaty, concretions. It exhibits great variety of color, and has a somewhat resinous appearance. It often contains numerous imbedded crystals of felspar, and is then called *P. porphyry*.

PITCHURIM BEANS, or SASSAFRAS NUTS, an occasional article of importation from South America, are the seed-lobes of *Nectandra Puchury*, a tree of the same genus with the Greenheart (q. v.), growing on the banks of the Rio Negro and elsewhere in the rich alluvial parts of the basin of the Amazon. They are about an inch and a half long, and half an inch broad. They are much in request among chocolate manufacturers for flavoring chocolate, as a substitute for vanilla. They are sometimes called Wild Nutmegs, because of a resemblance to nutmeg in flavor. The name Sassafras Nuts is also due to the flavor, which approaches that of Sassafras bark; and the tree belongs to the same natural order with the Sassafras tree.

PITH (*Medulla*), the light cellular substance which occupies the center of the stem and branches in Exogenous Plants (q. v.). In the earliest stage of a young stem or branch, it is entirely composed of pith and bark, by which alone, therefore, young buds are nourished; the vascular bundles or woody fibre appearing afterwards, and in trees and shrubs, generally increasing, so as to constitute the greater part of the substance of the stem and branches, whilst the pith is ultimately reduced to a very small column in the center. The pith, however, exists even in the most mature woody stem, and maintains its connection with the bark by means of *Medullary Rays*, analogous in their character to the pith itself, and which exists even in the most compact wood, although much compressed by the woody layers, and in a transverse section appearing as mere lines. The medullary rays convey to the central parts of the stem the secretions of the bark necessary for their nourishment. P. is in general entirely composed of cellular tissue; vessels occurring in it only in a few plants. Its cells diminish in size from the center towards the circumference. In a few plants, it exhibits cavities which have a regular arrangement; in many herbaceous plants of rank growth, large irregular cavities occur in it. The pith is immediately surrounded by a thin vascular layer called the *Medullary Sheath*, consisting chiefly of spiral vessels, which continue to exercise their functions during the life of the plant.

PITHE'CIA. See SAKI.

PITHE'CUS. See ORANG.

PI'TON BARK. See CARIBBEE BARK.

PI'TR'I (a Sanscrit word literally meaning father = Latin *pater*, in the plural *Pitaras*, but in English translations from the Sanscrit usually Anglicized to *Pitr'is*), a name which, in a general sense, means the deceased ancestors of a man, but in the special sense in which it occurs in Hindu mythology, denotes an order of divine beings inhabiting celestial regions of their own, and receiving into their society the spirits of those mortals for whom the funeral rites (see S'RADDHA) have been duly performed. They include, therefore, collectively the manes of the deceased ancestors; but the principal members of this order are beings of a different nature and origin. According to Manu, they were the sons of Marîchi, Atri, Angiras, and the other R'ishis or saints produced by Manu, the son of Brahmâ; and from them issued the gods, demons, and men. According to several Purânas (q. v.), however, the first Pitr'is were the sons of the gods; and to reconcile this discrepancy, a legend relates that the gods having offended Brahmâ by neglecting to worship him, were cursed by him to become fools; but upon their repentance, he directed them to apply to their sons for instruction. Being taught accordingly the rites of expiation and penance by their sons, they addressed the latter as fathers, whence the sons of the gods were the first Pitr'is (fathers). See Wilson's *Vishn'u-Purân'a*. Manu enumerates various classes of Pirt'is in defining those who were the ancestors of the gods, those who were the ancestors of the demons, and those from whom proceeded the four castes severally; but he adds, at the same time, that these are merely the principal classes, as their sons and grandsons indefinitely must likewise be considered as Pitr'is. The Purân'as divide them generally into seven classes, three of which are without form, or composed of intellectual, not elementary substance, and assuming what forms they please, while the four other classes are corporeal. In the enumeration, however, of these classes the Purân'as differ. The Pitr'is reside in a world of their own, called Pitr'i-loka, which is sometimes supposed to be the moon; according to the Purân'as, it is below the paradise of Indra, and is also the abode of the souls of devout Brahmans.

The time at which the Pitr'is are to be worshiped, the libations which they are to receive, the benefits which they derive from them, and the boons which they confer on the worshiper, are all minutely described in the Purân'as. See S'RADDHA. A song of the Pitr'is, as given by the *Vishn'u-Purân'a*, may convey an idea of the importance attributed to this worship, and of the manner in which the Brahmans turned it to their profit. It runs as follows: 'That enlightened individual who begrudges not his wealth, but presents us with cakes, shall be born in a distinguished family. Prosperous and affluent shall that man ever be who, in honor of us, gives to the Brahmans, if he is wealthy, jewels, clothes, lands, conveyances, wealth, or any valuable presents; or who, with faith and humility, entertains them with food, according to his means, at proper seasons. If he cannot afford to give them dressed food, he must, in proportion to his ability, present them with unboiled grain, or such gifts, however trifling as he can bestow. Should he be utterly unable even to do this, he must give to some eminent Brahman, bowing at the same time before him, sesamum seeds, adhering to the tips of his fingers, and sprinkle water to us, from the palms of his hands, upon the ground; or he must gather, as he may, fodder for a day, and give it to a cow; by which he will, if firm in faith, yield us satisfaction. If nothing of this kind is practicable, he must go to a forest, and lift up his arms to the sun and other regents of the spheres, and say aloud: "I have no money, nor property, nor grain, nor any thing whatever fit for an ancestral offering; bowing therefore to my ancestors, I hope the progenitors will be satisfied with these arms tossed up in the air in devotion."' See Wilson's *Vishn'u-Purân'a*.

PITT, WILLIAM, the second son of the Earl of Chatham and of Lady Hester Grenville, daughter of the Countess Temple, was born on the 28th May 1759. His genius and ambition displayed themselves with an almost unexampled precocity. 'The fineness of William's mind,' his mother writes of him when he was but twelve years old, 'makes him enjoy with the greatest pleasure what would be above the reach of any other creature of his small

age.' Owing to the excessive delicacy of his constitution, it was found impossible to educate him at a public school. His studies were, however, prosecuted at home with vigor and success. In 1773, he was sent to the university of Cambridge, where his knowledge of the classics seems to have astonished veteran critics. To modern literature he appears to have been utterly indifferent—he knew no continental language except French, and that very imperfectly. Among English poets, he liked Milton best; the debate in Pandemonium being his favorite passage. In 1780, P. was called to the bar. He took chambers in Lincoln's Inn, and joined the western circuit. A general election having taken place in the autumn of the same year, he stood for the university of Cambridge; but he was at the bottom of the poll. Through the influence, however, of the Duke of Rutland, he obtained a seat in parliament as member for Appleby. Lord North was now prime minister. The opposition consisted of two parties; one being led by Rockingham and Fox, the other by Lord Shelburne. The latter consisted chiefly of the old followers of Chatham; and to this party Pitt naturally became attached. On 26th February 1781, he made his first speech in parliament. It was in favor of Burke's plan of economical reform, and was a splendid success. 'It is not a chip of the old block,' said Burke; 'it is the old block himself.' Shortly before the meeting of parliament, in the autumn of 1781, the news arrived of the surrender of Cornwallis and his army.

In the debate on the address, P. spoke with even more energy and brilliancy than on any former occasion. No one was so loud in eulogy as Henry Dundas, Lord Advocate for Scotland; and from this night dates a connection between him and P., which was only broken by death. After several defeats, the ministry resigned, and Rockingham was called on to construct a cabinet. P. was offered the vice-treasurership of Ireland; but he declined to accept a position which did not confer a seat in the cabinet. On 7th May 1782, he made his first motion for a reform in the representation of the people; which motion was lost by only 20 votes in a house of more than 300 members. The reformers never again had so good a division till 1831. At the end of three months after his accession to office, Rockingham died; Lord Shelburne succeeded to the head of the treasury; and P., at the age of 23, became Chancellor of the Exchequer. In opposition to the government, there was then formed a coalition emphatically known as 'The Coalition.' On Lord Shelburne's resignation in 1783, the king himself, who hated the Coalition, tried to persuade P. to take the helm of affairs; but he resolutely declined. The Duke of Portland succeeded, with Fox and North as Secretaries of State. P., from the Opposition benches, brought for a second time the question of parliamentary reform before the House. His motion was lost by 293 votes to 149. On the prorogation, he visited the continent for the first and last time. In 1783, the ministry having been defeated on a motion for transferring the government of India to parliament, P. became First Lord of the Treasury and Chancellor of the Exchequer. But parliament was dead against him: between 17th December 1783 and 8th March 1784, he was beaten in sixteen divisions. The nation, however, was in his favor; both on account of his policy, and from admiration of his private character. Pecuniary disinterestedness is what all can comprehend; and even when known to be overwhelmed with debt, when millions were passing through his hands, when the greatest men in the land were soliciting him for honors, no one ever dared to accuse him of touching unlawful gain.

At the general election in 1784, 160 supporters of the Coalition lost their seats, P. himself heading the poll for the university of Cambridge. He was now, at 25 years old, the most powerful subject that England had seen for many generations. He ruled absolutely over the cabinet, and was at once the favorite of the sovereign, of the parliament, and of the nation; and from this date, the life of P. becomes the history of England and of the world. For seventeen eventful years, he held his great position without a break. In 1784, he established a new constitution for the East India Company. In 1786, he carried through a commercial treaty with France on liberal principles. In the same year, he established a new sinking fund; a scheme which experience has shown to be wrong in principle, though it was long viewed with favor by the nation. To exertions which were now begun for the abolition of the slave-trade, he gave the help of his eloquence and power. In 1788—1789, he maintained against Fox the right of parliament to supply the temporary defect of royal authority occasioned by the incapacity of the king. The year 1793 saw the beginning of the great war with France. Authorities differ as to the cause. It is, however, certain that P.'s military administration was eminently unsuccessful. But no disaster could daunt his spirit. When a new French victory, a rebellion in Ireland, a mutiny in the fleet, and a panic in the city had spread dismay through the nation, P. from his place in parliament poured forth the language of inextinguishable hope and inflexible resolution. Disaster abroad was regularly followed by triumph at home, until at last he had no longer an opposition to encounter. In 1799, he effected the union with Ireland. It was part of his scheme to relieve the Roman Catholic laity from civil disabilities, and to grant a public maintenance to their clergy; but the obstinacy of the king frustrated this design. Chagrined by this failure P. resigned office in 1801. He was succeeded by Mr. Addington, to whom for a while he gave his support.

In 1804, he returned again to the head of the treasury, which position he continued to hold till his death on 23d January 1806. This event was doubtless hastened by the stupendous success of Napoleon. The peculiar look which he wore during the last days of his life was pathetically termed by Wilberforce 'the Austerlitz look.' The impeachment also of his friend, Lord Melville, is supposed greatly to have hastened his end. It gave him, he said in parliament, a deep pang. His voice quivered as he uttered the word; and it seemed as if the man of iron were about to shed tears. 'He was,' says Macaulay, 'a minister of great talents, honest intentions, and liberal opinions, ... but unequal to surprising and terrible emergencies, and liable in such emergencies to err grievously, both on the side of weakness and on the side of violence.' But what man ever lived, we may ask, who, placed in such circumstances as P., would not often have greatly erred? His policy was liberal beyond his age, at least he wished it to be so, although he was often obliged to yield to the prejudices of his sovereign. He resigned office because he could not carry Catholic emancipation. He laid before the king unanswerable reasons for abolishing the Test Act. He was more deeply imbued with the doctrines of free-trade than either Fox or Grey. It cannot indeed be denied that he was addicted to port-wine, and that he died overwhelmed with debts; parliament voting £40,000 to his creditors. High as his character stands, it would have stood even higher had he united the virtue of frugality to that of disinterestedness. See *Life of Pitt* by Lord Stanhope (Lond. 1861); also Lord Macaulay's *Biographies* (Edin. 1860). In the former work, vol. ii., p. 185, will be found a valuable criticism on Macaulay's memoir.

PI'TTACUS, one of the 'Seven Wise Men' of ancient Greece, was born at Mitylene, in the island of Lesbos, about the middle of the 7th c. B.C. The incidents of his life do not perhaps rest on a very secure historical basis, but he is by no means to be regarded as a merely traditionary personage. We may feel quite certain that his career and character were substantially what later history represents them. About 612 B.C., in conjunction with the brothers of Alcæus the poet, he overthrew the 'tyrant' Melanchrus, and put him to death. He next figures in the contest between the Lesbians and the Athenians for the possession of Sigeum in the Troad, and displayed as much valor on the battle-field as Alcæus did cowardice. His townsmen, the Mitylenæans, were so pleased with his deeds of prowess, that they gave him a portion of the city-territory, which he dedicated to sacred uses, and which was known long after as the 'Pittacian land.' Meanwhile, the civic struggles did not cease; the democratic party, however, roughly represented by a series of popular 'tyrants,' were in the ascendant, and the oligarchic aristocrats, at the head of whom was Alcæus, were finally banished. P. was subsequently chosen dictator, 589 B.C., to prevent the turbulent exiles from returning to Mitylene, and ruled absolutely with great success for ten years, after which he voluntarily resigned his power, and withdrew into honored retirement. He died in 569 B.C. Many of the anecdotes preserved by tradition concerning P. are probably apocryphal; but they all attribute to him the same characteristics—great moral sagacity, a contempt of outward pomp, and a plain practical understanding. His favorite maxim, *Gnothi Kairòn* ('Know the fitting moment'), may be recommended to all statesman and politicians. To P. is also ascribed the saying which has so often been verified in actual history, *Chalepòn, esthlòn emmenai* ('It is a misfortune to be eminent'). Of his 600 didactic verses, only four are extant, and these prove that he was strongly impressed with the falsehood and insincerity of men. See Schneidewin's *Delectus Poesis Græcorum Elegiacæ*, &c. (Grott. 1839).

PITTOSPORA'CEÆ, a natural order of exogenous plants, allied to *Vitaceæ* (the Vine, &c.), and containing nearly 100 known species of trees and shrubs, chiefly Australian, although a few are natives of different parts of Asia, Africa, and the islands of the Pacific. To this order belongs the genus *Billardiera* (q. v.). The genus *Sollya* also deserves notice, as containing some of our most beautiful green-house climbers.

PI'TTSBURGH, a city of Pennsylvania, U.S. of America, at the confluence of the Alleghany and Monongahela rivers, at the head of the Ohio, lat. 40° 26′ 34″ N., long. 80° 2′ 38″ W. It is situated among some of the richest deposits of bituminous coal and iron in America, supplying, in 1874, coal to the amount of 135,215,250 bushels. The city possesses 60 iron-foundries, 42 iron and steel works, nearly 600 furnaces, extensive machine-shops, and manufactures of steam-boilers, engines, nails, &c. The annual value of the iron manufactures is about 30,000,000 dollars. There are also copper-smelting and rolling mills, 6 cotton-mills, oil-refining works, white-lead and glass works. The

numerous foundries and factories fill the atmosphere with smoke, and have given P. the name of the Birmingham of America. It is connected by steamboats with the whole Mississippi Valley, and by railways and canals with Philadelphia and Cleveland. Among its public buildings are a fine court-house, the largest Roman Catholic cathedral in the country, 141 churches, railway, aqueduct, and other bridges, United States arsenal, schools and colleges, western state penitentiary, &c. Nine railways center at this bustling city. It occupies the site of Fort Pitt, and the older French Fort Duquesne, in an expedition against which, the British general, Braddock, was defeated in 1755, by an allied force of French and Indians. It was taken, on a third attempt, by General Forbes in 1758. The city was chartered in 1816; in 1845, it was nearly destroyed by fire. Pop. (1840) 21,115; (1860) 49,220; (1870) 86,076. The annexation of adjacent boroughs and townships raised the pop. to 156,381 in 1880.

P'ITTSFIELD, a city in Massachusetts, U.S. of America, on the Boston and Albany Railway, 151 m. W. of Boston, and the terminus of the Housatonic and the Pittsfield and North Adams Railways. It has manufactures of cotton and woollen goods, &c.; a medical college, 9 churches, &c. Pop. (1880) 13,367.

PITUI'TARY BODY, a small reddish-gray mass of an oval form, weighing from six to ten grains, and situated on the sella turcica of the sphenoid bone, on the floor of the cavity of the skull. It is very vascular, and in its structure it resembles the ductless glands. In the fœtus, it is relatively larger than in the adult, and contains a cavity which subsequently disappears. It derives its name from its having been formerly supposed to secrete the fluid which (as we now know) is yielded by the Schneiderian or pituitary membrane of the nostrils. Its function is not known.

PITYRI'ASIS (from the Greek word *pityron,* bran) is the term given to one of the squamous or scaly diseases of the skin, in which there is a continual throwing off of bran-like scales of epidermis, which are renewed as fast as they are lost. It may occur upon any part of the body, giving rise to brown patches, in which there are sensations of itching, tingling, or pricking. It is more easily cured than the other scaly diseases, and its removal can generally be effected by the frequent use of the warm bath; or, if it fails, recourse may be had to alkaline or sulphur baths; due attention being at the same time paid to the general health. It sometimes occurs on the scalp, when it is known as *dandriff,* and must be treated with weak alkaline lotions, or, if these fail, with tar ointment, provided there is no inflammation. There is a variety known as *Pityriasis versicolor,* which is probably due to the presence of a parasitic fungus, the *Microsporon furfurans;* but whether the fungus is the positive cause of the disease, or only an attendant on it, finding a suitable *nidus* in the diseased epidermis is not certain. This variety may be detected by a microscopic examinatiou of the exfoliated scales, when the spores and filaments of the fungus will be detected. The treatment of this affection must be solely local. Dr. Watson mentions a case which yielded at once to a couple of sulphur baths. Probably the best remedy is the application of a saturated watery solution of sulphurous acid gas, or of one of the sulphites dissolved in diluted vinegar.

PIU (in Ital. more), as a musical term, when prefixed to another word, intensifies its meaning—e. g., *più mosso,* with more movement.

PI'US, the name of nine among the Roman pontiffs, of whom the following only appear to call for particular notice.—Pius II., originally known as Æneas Sylvius, was a member of the noble family of Piccolomini, and was born (1405) at Corsignano, in the duchy of Siena. His early life was not free from serious irregularities, but he made amends by his subsequent decorous conduct; and his eminent abilities as a canonist led to his being employed, when but 26 years of age, as secretary of the Cardinal of Fermo, in a post of the highest confidence at the council of Basel (q. v.). He was intrusted by that council—the views of which, in its conflict with the pope, he fully shared—in several commissions of great importance; and on the election of the antipope, Felix V., Æneas Sylvius was chosen as his secretary. But having been sent by him as ambassador to the Emperor Frederick III., he was induced to accept office in the imperial court, and served on several embassies and other missions of importance on behalf of the emperor. In the difficulties between Frederick and the Pope Eugenius IV., which arose after the council of Florence, Æneas conducted so skilfully a negotiation with which he was intrusted, that the pope was induced to retain him in his own court, in the capacity of secretary. His views of church matters having undergone a considerable change, he continued in equal favor under the successor of Eugenius, Nicholas V., 1447; and under Callistus III., he was elevated to the cardinalate. On the death of Callistus in 1458, he was elected pope, and took the name of Pius II. His pontificate was embarrassed by some contests on German affairs, but it is chiefly rendered memorable by the sustained efforts which P.—the first in this policy of a long line of pontiffs, to whom the public security of Europe owes a deep obligation—made to organize an armed confederation of Christian princes to resist the progress of the Turkish arms.

This organization, however, for a long time did not lead to any considerable results. P. died, August 14, 1464. The literary reputation of the scholar, Æneas Sylvius, has partially eclipsed the historical fame of the Pope Pius. He was one of the most eminent scholars of his age. His works were published at Basel (1 vol. fol., 1551), but many of his works are not included in that edition. They consist chiefly of histories, or historical dissertations and materials of history; but the most interesting portion of his collected works are his letters, which are very numerous, and full of details, characteristic as well of the writer as of the age. The same may be said of a biographical commentary, which is in truth an autobiography, being chiefly written from his own dictation, by his secretary, John Gobellinus, published at Frankfort in 1614. See Voight's *Life of Pius* (Berl. 1856).—Pius IV., Giovanni Angelo Medici, uncle of Saint Carlo Borromeo, deserves to be noticed from his connection with the celebrated creed known under his name. He was elected in 1560; and his pontificate is chiefly memorable as that in which the protracted deliberations of the council of Trent (q. v.) were brought to a close. P. had the duty, in December 1563, of issuing the bull confirmatory of its decrees. The well-known creed called the Creed of Pius IV., and sometimes the Tridentine Creed, was issued by P. IV. as an embodiment of all the doctrines defined in that council. P. died, December 8, 1565, in the arms of his nephew, Carlo Borromeo.—Pius V., a saint of the Roman Catholic Church, originally named Michele Ghisleri, was born of poor parents, in the village of Bosco, near Alessandria, in 1504, and at the age of fourteen, entered the Dominican order. His eminent merits were recognized by Paul IV., who named him Bishop of Satri, in 1556, and cardinal in the following year. Of austere and mortified habits, he carried into his administration the same rigor which distinguished his personal conduct; and when appointed inquisitor-general for Lombardy, he employed the most rigorous measures in repressing the progress of the Reformation, which had begun to effect an entrance. He was afterwards translated to the see of Mondovi; and immediately after the death of Pius IV., he was chosen unanimously as his successor, January 8, 1566.

P. carried into his pontifical life the same personal austerity and administrative rigor which he had evinced as a bishop. Applying to others the same rules which he enforced upon himself, he enacted a number of severe laws for the regulation of public morals, prohibiting bull-fights, suppressing prostitution, and proscribing a variety of popular but demoralizing exhibitions. The Roman Inquisition, too, under his government, exercised a severity of which no other pontificate has shown any example. He endeavored to enforce everywhere the disciplinary decrees of the Council of Trent; and the whole spirit of his pontificate is most strikingly exhibited in the decree by which he ordered the yearly publication of the celebrated bull, *In Cœna Domini* (q. v.). It was an application to the 16th c. of the principles and the legislation of the Hildebrandine epoch. But the most momentous event of the pontificate of P. was the expedition which he organized, with Spain and Venice, against the Turks, and which resulted in the great naval engagement of the Gulf of Lepanto, on 7th October 1571. P. died in the following May, 1572. He was canonized by Clement XI. in 1712.—Pius VI., originally named Angelo Braschi, was born at Cesena, December 27, 1717. He was selected by Benedict XIV. as his secretary; and under Clement XIII., he was named to several important appointments, which led finally, under Clement XIV., to his elevation to the cardinalate. On the death of Clement XIV., Cardinal Braschi was chosen to succeed him, February 15, 1775. The conflict with the civil power in the various states of Europe, in which, from the days of Innocent XI., the Roman see had been almost unceasingly involved to a greater or less degree, assumed under P. what may be called its complete and scientific development. His relations to the Emperor Joseph of Austria and the Grand Duke Leopold of Tuscany, who persisted in the reformation of the religious orders, &c., were far from amicable.

The internal administration of P., however, was enlightened and judicious. To him, Rome owes the drainage of the Pontine Marsh, the improvement of the port of Ancona, the completion of the church of St. Peter's, the foundation of the new Museum of the Vatican, and the general improvement and embellishment of the city. These and other similar projects were interrupted by the outbreak of the French Revolution. In 1793, a popular tumult at Rome, which was caused by the imprudence of a French political agent named De Basseville, and which resulted in his death, gave the French Directory an opportunity of hostile demonstrations against the pope. In 1796, Bonaparte took possession of the Legations, and afterwards of the March of Ancona, and by a threatened advance upon Rome, extorted from P., in the Treaty of Tolentino, the surrender of these provinces to the

Cisalpine Republic, together with a heavy war contribution. The year 1797 was marked by a continuance of the same vexatious measures; and at length the Directory ordered the invasion of Rome; Berthier entered the city, February 10, 1798, and took possession of the castle of St. Angelo. P. was called on to renounce his temporal sovereignty, and on his refusal, was seized, February 20, and carried away to Siena, and afterwards to the celebrated Certosa, or Carthusian monastery, of Florence. On the threatened advance of the Austro-Russian army in the following year, he was transferred to Grenoble, and finally to Valence on the Rhone, where, worn out by age and by the rigor of confinement, he died in August 1799, in the 82d year of his age and the 24th of his pontificate.—PIUS VII., originally Gregory Barnabas Chiaramonte, was born at Cesena in 1742. He entered the Benedictine order at an early age, and was employed in teaching philosophy and theology at Parma, and afterwards at Rome. He was appointed Bishop of Tivoli; and afterwards, being creteda cardinal, was translated to the see of Imola.

After the death of Pius VI., Cardinal Chiaramonte was chosen his successor (March 14, 1800). Rome, which, up to this time, had been in the occupation of the French, was now restored to the papal authority, and in the July of that year, P. VII. entered into his capital; and in the following year, the French troops were definitively withdrawn from the papal territory, with the exception of the Legations. From this time forward, P., ably seconded by his secretary of state, Cardinal Consalvi, was destined to occupy a prominent place in the political as well as the ecclesiastical affairs of Europe. Bonaparte had resolved to restore religion in France on the ancient basis of connection with Rome. With this view, he entered into negotiations with P. VII. for the establishment of a concordat suited to the new order of things which had arisen. These negotiations were conducted at Paris, and were attended with many difficulties and delays, until at length Cardinal Consalvi repaired in person to the conference, and, by his energy and decision, disentangled the complicated embarrassments in which it was involved. It was agreed to at Paris, July 15, 1801; ratified in Rome, August 14; and published in Notre-Dame on Easter Sunday 1802. But simultaneously with the concordat, and as if forming part of the same arrangement, was published a code of what were called 'Organic Laws,' seriously affecting the discipline of the church on marriage, on the clergy, and on public worship, which had never been submitted to P., and to which he not only had not consented, but to which he found himself compelled to offer every opposition. For the first year which succeeded the publication of the concordat, no occasion of difficulty arose; but conflict of principles was in the end inevitable. In 1804, Bonaparte having resolved on assuming the imperial crown, invited P. to come to Paris for the purpose of crowning him, and the pope, although with much hesitation, consented. He took advantage of his visit to demand the recall or modification of the articles, but without success; and although, during his visit to Paris, he was treated with great distinction and reverence, his relations with Napoleon from that date began to assume a less friendly character.

The French emperor now proceeded from one petty outrage to another, until finally, in February 1808, the French troops, under General Miollis, entered Rome, and took possession of the castle of St. Angelo; and on the 2d of April, a decree was issued annexing the provinces of Ancona, Fermo, Urbino, and Macerata to the kingdom of Italy. P., besides protesting against the usurpation, declared himself a prisoner in the French hands, and confined himself to his palace. The papers of the cardinal secretary were violently seized, and the pope was compelled to appoint a pro-secretary; and finally (May 17, 1809), the usurpation was consummated by a decree annexing Rome and all the remaining papal territory to the French empire. This was the signal for the pope abandoning his lengthened policy of forbearance. On June 10, P. issued a bull of excommunication, directed (without naming Napoleon) against the perpetrators and abettors of the invasion of the rights and the territory of the holy see. Soon afterwards, the French general ordered the removal of the pope from Rome; and P without offering any resistance beyond the declaration that he yielded to force, was removed, first to Florence, then to Grenoble, thence for a longer time to Savona, whence, in June 1812, he was finally transferred to Fontainebleau. During this prolonged captivity, P. firmly but quietly resisted every effort to compel or seduce him from his policy. At Fontainebleau, he was treated with much external respect; and on Napoleon's return from the Russian campaign, in December 1812, orders were given that the cardinals with certain exceptions, should be admitted to the presence of the pope. Under much pressure, both from the emperor himself—who is alleged by some to have acted with great rudeness, and even with personal violence—and from the ecclesiastics to whom the emperor confided his plans, P. was induced to sign a new concordat, an important provision of which was the recognition of the annexation of the Roman states to the empire.

Having obtained the concession, Napoleon at once permitted the absent cardinals to return, and of these many remonstrated so earnestly against the concordat, that, on March 24, P. wrote to revoke his consent. Napoleon took no notice of the revocation; nor was it till after the disasters of 1813 that he began to seek an accommodation. P. refused to treat until he should be restored to Rome; and on January 22, 1814, orders were sent for his immediate return to his capital. Unattended by his cardinals, he was escorted to Italy, and remained at Cesenat until the fatal campaign of the spring of 1814 placed Paris in the hands of the allies, when P. re-entered Rome amidst the gratulations of the people on May 24, 1814—a day since that time held sacred in the Roman calendar. During the Hundred Days, he was again compelled to leave Rome; but after the campaign of Waterloo, he finally resumed possession, which was undisturbed for the rest of his life, and which extended to the whole of the ancient territory, including the Legations.

The last years of his pontificate were devoted to measures of internal administration; and under the enlightened government of Cardinal Consalvi, were marked by much wisdom and moderation. But the administration chiefly by ecclesiastics and the secrecy of law procedure were resumed. P. repressed, too, with great vigor the disorder and brigandage which the long wars had introduced, and a whole village of notorious and incorrigible criminality, that of Somma, was razed to the ground in 1819. He was equally vigorous in repressing secret societies, especially that of the Carbonari (q. v.). The ecclesiastical measures of his later period were also of much importance. In 1814, he formally restored the suppressed order of the Jesuits (q. v.). In 1817 and the following years, he concluded concordats with Naples, with Prussia, Würtemburg, and other courts of Germany. In this and every other period of his life, P. was a model of gentleness, simplicity, benevolence, and Christian charity. In July 1823, having reached the patriarchal age of 81, he fell accidentally and broke his thigh. He sank gradually, and died August 20, 1823.

PIUS IX., GIOVANNI MARIA MASTAI FERRETTI, occupant of the papal chair during one of the most eventful periods in the history of the papacy, was born at Sinigaglia, May 13, 1792. He was originally destined for the military profession—the Noble Guard; but symptoms of an epileptic tendency led to his abandoning his intended profession. He received holy orders, and after exercising his ministry for a time in Rome, was sent as 'auditor' of the vicar-apostolic to Chili. Having been successively archbishop of Spoleto and of Imola, nuncio, and cardinal, he was, on the death of Gregory XVI. in 1846, elected 'by acclamation' to succeed him. He took the name of Pius IX., and entered at once on a course of reforms, by which he hoped to establish the papal government on a popular, but yet on a firm basis. He resolved to extirpate all abuses of administration, to withdraw the restrictions of personal liberty, to secularize the local administration, aud to extend the rights of self-government. His first step to this end was to grant an amnesty; and this measure, however humane and necessary, had the result of drawing together into the Roman states a body of men whom an unhappy experience of foreign exile had embittered against the existing order of things. For a time, the reforming policy of P. carried with it the affections of the people; but he soon fell short of the expectations which he had created. The outbreak of the French Revolution of February 1848 precipitated the crisis of popular discontent. In November of that year, Count Rossi, whom the pope had appointed his minister, was assassinated; and violent demonstrations were daily employed to compel the pope's assent to measures which he repudiated. Having at first confined himself to the Quirinal, he at length fled secretly from Rome to Gaeta, a Neapolitan seaport near the Roman frontier. A republic was proclaimed in Rome, the provisional heads of which proceeded to a complete and radical remodelling of the civil government of the state. P. from his exile addressed a remonstrance to the various sovereigns.

In April 1849, a French expedition was sent to Civita Vecchia, which eventually advanced upon Rome, and, after a siege of about thirty days, took possession of the city, and established a French army of occupation within the Roman state. The pope's government was re-established, but he himself did not return till 1850, when he again entered upon the administration. In consequence of the unsettled condition of Italy, and the failure of many of his early measures of improvement, he declared himself unable to proceed with the reformations which he had contemplated. After that time, his authority was maintained without interruption; but the discontent continued. After the war for the unification of Italy, the Legations, Ancona, and a considerable part of the papal territory southward in the direction of Rome, were annexed to the kingdom of Italy, but P. persistently refused to cede any portion or to enter into any compromise. His ecclesiastical administration continued very active, and proceeded upon the strongest assumption of the right of independent action on the part of the church. In this view, he re-established the hierarchy in England, he sanc-

tioned the establishment in Ireland of a Catholic university, and condemned the principles upon which the Queen's Colleges in that country were constituted. He concluded with Austria a concordat much more favorable to church authority than the existing ecclesiastical laws had permitted. See CONCORDAT. In 1854, he issued a decree propounding as a doctrine of the church, the faith of the Immaculate Conception of the Blessed Virgin Mary (q. v.) In the internal administration of his states, notwithstanding the embarrassed condition of finances produced by the curtailment of his territory, he introduced many ameliorations, and did much for the advancement and improvement of the city of Rome and of its institutions. In this he was aided by the voluntary contributions of the several churches, as well in special gifts as in the organization of the permanent tribute called Peter-pence (q. v.).

In 1864, on occasion of the centenary of the martyrdom of St. Peter, he brought together at Rome a large assemblage of bishops, and subsequently, on occasion of the canonization of the Jesuit martyrs of Japan. But the most important event of his pontificate was the convocation of the Vatican Council (see COUNCIL), at which bishops from all parts of the Catholic world assembled in Dec. 1869. For the discussions of this council, see POPE. It was adjourned in July 1870, after it had proclaimed the celebrated decree of the Infallibility of the Pope, when on a subject of faith or morals he issues a decree *ex cathedrâ* to the universal church. Soon after the adjournment, the Italian army occupied Rome, and declared it the capital of the kingdom of Italy. P. renewed with all solemnity his oft-repeated protest, and refusing an offered dotation, and all other proposals of accommodation, from that date declared himself a captive in the Vatican, to which he strictly confined himself. In June 1871, he completed the 25th year of his pontificate, thus exceeding the term of all previous pontificates except that assigned to St. Peter, and falsifying in his own person the traditional prediction that no pontiff would ever 'see the days of Peter.' His health was for some years precarious; but with the exception of occasional interruptions, he continued to attend personally to all the public affairs, civil as well as ecclesiastical, of his office. He died 7th February 1878.

PI'VOT, the point on which a body revolves, has a like signification in military affairs—the pivot-man being that soldier who marks the center while a line is wheeling.

PIYADASI, one of the names of the celebrated King As'oka. See BUDDHISM, INDIA. He is often designated by this name in inscriptions.

PIZARRO, FRANCISCO, the conqueror of Peru, was an illegitimate son of Gonzalo Pizarro, a colonel of infantry, and a soldier of some distinction. He was born at Truxillo, in Estremadura, Spain, about 1471. Of his youth, little is known, but it appears that he was wholly neglected by his parents, was taught neither to read nor write, and that in his youth his principal occupation was that of a swineherd. Abandoning this uncongenial employment, he sought the port of Seville, and there embarked, to seek fortune in the New World. He was in Hispaniola in 1510; later, he joined Balboa, and was with that cavalier when he crossed the Isthmus of Panama, and discovered the Pacific. In 1515, he was engaged in traffic with the natives on the shores of the newly-discovered ocean, but was afterwards chiefly employed in military service, in which he showed great bravery, resource, and power of endurance. About this time, when a fresh and powerful impulse was given to adventure by the splendid achievement of Cortes, rumors of a country far south, in which gold and silver were said to be as abundant as iron in Spain, reached Panama, and kindled P.'s ambition. He formed a sort of copartnery with Diego de Almagro, an adventurer and a foundling like himself, aud Hernando Luque, an ecclesiastic; and with the funds which the three friends amassed, they were enabled to fit out a small expedition, of which P. took command. In November 1524, he set sail southward, but went no further than Quemada Point. Making an agreement (dated March 10, 1526), that all lands, treasures, vassals, &c., that should be discovered were to be equally divided between them, the three friends, P., Almagro, and Luque, organized a second expedition, consisting of two ships, which set sail for the South Seas. Having reached the port of Santa, in lat. about 9° S., and having really discovered Peru, P. returned to Panama, carrying with him, however, many beautiful and valuable ornaments in gold and silver, which he had obtained from the friendly and generous natives, as well as specimens of woollen cloths of silky texture and brilliant hue, and some lamas and alpacas.

Unable to find in Panama a sufficient number of volunteers for the invasion of the newly-discovered country, the indomitable adventurer returned to Spain in 1528, narrated the story of his discoveries before Charles V. and his ministers, described the wealth of the territories, and showed, as proof, the gold ornaments and utensils, the manufactures, &c., which he had brought with him. The result of his representations was, that the right of the discovery and conquest of Peru was secured to him, and honorable titles—among others, those of Governor and Captain-general of Peru—were conferred on him. On his side, he agreed to raise a certain number of followers, and to send to the crown of Spain a fifth of all the treasures he should obtain. Returning to Panama, he set sail for Peru for the third and last time, with a well-equipped but small force, the number being not more than 180 men, of whom 27 were cavalry. The chief events of the conquest of Peru are detailed at sufficient length in the article PERU, and also the articles ALMAGRO and ATAHUALPA. Within ten years, the great *conquistador* made the empire of Peru his own; but he who had surmounted so many stupendous difficulties, who had broken through the lofty barrier of the Andes, and, with his group of followers, been a victor in so many fields, fell a victim to a conspiracy, June 26, 1541.

P. was a soldier of the most undoubted courage, inflexible constancy of purpose, and infinite resource; yet his success in Peru appears to have been more the result of chance than of calculation. His boldest stroke was the seizure of the Inca Atahualpa (q. v.), when surrounded by thousands of his followers; but in doing so, he deserved credit neither for originality nor policy, because the idea was borrowed from Cortes, and the step itself was so foolhardy and desperate, that its success can be regarded only as luck. Although on many occasions he appears to have been guided by noble and generous impulses, he was eminently selfish, perfidious, and relentless. His conquest of Peru is a drama in every act of which there is bloodshed; but the drama is at least consistent to the end. P. lived a life of violence, and died a violent and bloody death.

PIZARRO, GONZALO, threw in his fortunes with those of his brother Francisco, on the occasion when that leader returned to Spain in 1528. He was, like the great conqueror, illegitimate. He became a soldier at an early age, distinguished himself, before he joined his brother's expedition, by his skill in martial exercises, and when he reached Peru, was esteemed the best lance in the Spanish troop. The territory of Quito was assigned to him by Francisco, and he was enjoined to undertake an exploring expedition to the east, where a land, reputed to be extremely rich in spices, was said to lie. At the head of 350 Spaniards and a great concourse of Indians,, P. set out on his famous journey in the beginning of 1540. Marching east, they reached a country traversed by lofty branches of the Andes. Here the icy winds benumbed the limbs of the adventurers as they rose to the higher plateaux, and, rendered helpless by the cold, many of them sank and died. Descending the eastern slopes of the Andes, they reached the 'Land of Cinnamon;' but as they could not transport the trees across the mountains, their discovery was almost valueless. Hearing of a land abounding in gold at the distance of ten days' journey, the leader resolved to reach it. Pushing forward, the Spaniards entered great forests, where often they had to hew a passage with their axes. Their clothes were now torn to shreds, and their provisions had been long exhausted. They killed and ate the dogs they had brought with them, after which they lived on the herbs and dangerous roots of the forest. At length they struck the broad but desolate waters of the Napo, an important affluent of the Amazon. On the surface of this broad river, no vessel floated, and it ran amid gloomy woods, the silence of which was undisturbed save by the sound of the rushing waters. Here P. caused a rude bark to be constructed for the transport of the baggage and of the weaker travelers. Francisco de Orellana was intrusted with the command of the vessel.

P., hearing of a populous nation at the distance of a few days' journey, who dwelt near the confluence of the Napo with a larger river, sent forward Orellana to obtain and bring back supplies for the starving travelers, who had eaten the last of their horses, and were now reduced to the leather of their saddles and belts. Orellana reached the Amazon; but, unable either to obtain supplies, or to return against the current of the river, abandoned the expedition, and with his fifty followers resolved to sail down the Amazon, reach the Atlantic, and make for Spain. This wonderful design was successfully carried out. P., after waiting in vain for the return of the barque, resolved to return to Quito, which, after enduring terrible sufferings, and seeking fruitlessly for the rich regions of which he had heard so much, he reached in June 1542, after an absence of more than two years. The fatal character of this expedition may be inferred from the appearance the travelers presented on their return. Half of the 4000 Indians had perished, and of the Spaniards, only eighty remained; and these, clad in skins, blackened by the sun, and wasted by hunger and fatigue, with long matted locks, seemed like a troop of spectral savages. This expedition stands unmatched in the annals of American discovery for its dangers and sufferings, for the length of their duration, and for the heroic fortitude with which they were endured. For the fate of Gonzalo P., see article PERU.

PIZZICA'TO (Ital. twitched), abbreviated *pizz.*, a phraze used in Music for the violin or violoncello, to denote that the strings, instead of being played as usual by the bow, are to be twitched

with the fingers in the manner of a harp or guitar. The pizzicato is much used in accompaniments, as sounds thus produced do not cover the voice; it is also used in symphonic effects. The ordinary mode of playing is restored by the letters *c. a.* (*col arco*, with the bow).

PIZZO, a seaport of South Italy, 24 miles west-south-west of Catanzaro. At P., Murat (q. v.) was taken, tried, and shot. Pop. 6400.

PLACE'NTA, or AFTER-BIRTH, a temporary organ that is developed within the uterus during pregnancy, and is, as its popular name implies, expelled from the maternal organism shortly after the birth of the child or young animal. It is a spongy vascular mass, existing in some form or other in all mammals, excepting the *Marsupialia* and *Monotremata*, as an appendage to the fœtal membrane called the *chorion*. In the human subject (fig. 1), it is of considerable size at the period of delivery, being



Fig. 1.—Human Placenta (half of it being split in two) and Umbilical Cord.

of a rounded or oval form, with a diameter of 6 or 8 inches, and a thickness of somewhat more than an inch. Its outer surface, which, till the period of its detachment and expulsion, is attached to the walls of the uterus, is uniform and level (unless it has been morbidly adherent), being covered by a membrane, shortly to be noticed, called the *decidua serotina;* and on peeling off this membrane, the various lobes of which the placenta is composed are apparent. The internal or free surface is smooth and shining, and gives attachment to the umbilical cord or navel-string, which connects it with the fœtus. To render the mode of formation of the placenta clear, we must premise that the impregnated ovum, when it reaches the uterus, is invested with an outer membrane, the *chorion*, which forms a shut sac, externally covered with short villi. As the ovum advances in age, these villi diminish in number, until few remain, except at that part of the chorion which is in contact with the uterus; and here, about the second month (in the human subject), they divide into branches, as shown in fig. 2.

While these changes are going on in the membrane of the

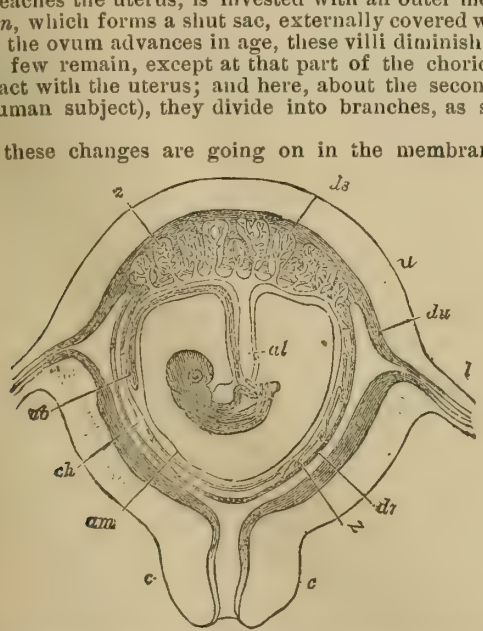


Fig. 2.—Diagrammatic Section of a Human Pregnant Uterus, with the contained Ovum:

u, uterus; *l*, oviduct (or Fallopian tube); *c*, cervix uteri (or neck of the womb); *du*, decidua uteri; *dr*, decidua reflexa; *ds*, decidua serotina; *ch*, chorion; *am*, amnion; *al*, allantois; *nb*, umbilical vesicle; *z*, villi, which form the fœtal part of the placenta; *z'*, villi over the rest of the chorion, which, in the human subject, take no part in the placental function.

ovum, the uterus is also undergoing modification; and it is on the nature and extent of these uterine changes that the character or type of the placenta depends. There are two such types, the first of which is best represented by the human placenta, and the latter by that of the pig.

In animals exhibiting the first type of placental structure, the mucous membrane lining the uterus undergoes a rapid growth and modification of texture, becoming connected with the *membrana decidua*, which is so called from its being thrown off at each parturition. For brevity, it is usually termed the *decidua*. This decidua is from an early period separable into three portions the *decidua vera*, or *decidua uteri*, which lines the general cavity of the uterus; the *decidua reflexa*, which immediately invests the ovum; and the *decidua serotina*, which is merely a special development of a part of the decidua vera at the part where the villi of the chorion are becoming converted into the fœtal portion of the placenta. The arrangement of these layers is distinctly seen in fig. 2. At first, the villi of the chorion lie loosely in the corresponding depressions of the decidua; but subsequently, the fœtal and maternal structures (the villi and the decidua vera) become closely united, so as to form one inseparable mass, by the following means: the deeper substance of the uterine mucous membrane in the region of the placenta is traversed by vessels which enlarge into what, in the case of the veins, are termed *sinuses*, dip down between the villi, 'and at last swell round and between them, so that finally the villi are completely bound up or covered by the membrane which constitutes the walls of the vessels, this membrane following the contour of all the villi, and even passing, to a certain extent, over the branches and stems of the tufts.' —Goodsir's *Anatomical and Pathological Observations*, p. 60.

The pure maternal blood is conveyed to the placenta by what are termed, from their tortuous course, 'the curling arteries' of the uterus, and is returned by the large veins termed sinuses. 'The fœtal vessels,' says Dr. Carpenter, 'being bathed in this blood, as the branchiæ of aquatic animals are in the water that surrounds them, not only enable the fœtal blood to exchange its venous character for the arterial, by parting with its carbonic acid to the maternal blood, and receiving oxygen from it, but they also serve as rootlets, by which certain nutritious elements of the maternal blood (probably those composing the liquor sanguinis) are taken into the system of the fœtus. It is probable, too, that the placenta is to be regarded as an excretory organ, serving for the removal, through the maternal blood, of excrementitious matter, whose continued circulation through the blood of the fœtus would be prejudicial to the latter.'—*Human Physiology*, 3d ed. pp. 1013, 1014. Moreover, the recent investigations of Bernard show that the placenta secretes, like the liver, the saccharine matter known as Glycogen (q. v.), which probably takes part in keeping up the animal heat. The vascular connection between the fœtus and the placenta is effected by the umbilical vein (containing arterial blood) and the two umbilical arteries (containing venous blood), all of which lie in the umbilical cord which connects the Fœtus (q. v.) with the placenta. The placenta may be formed at any point of the uterus, but is most commonly on the left side. Occasionally (in 11 cases out of 600, according to Naegele), it is situated partially or entirely over the mouth of the womb (*os uteri*), in which case dangerous flooding takes place previous to or at the period of labor. This condition is known as *placenta prævia*, and under ordinary management, 'one in three of the mothers are lost, and more than 65 per cent. of the children.'—Churchill, *Theory and Practice of Midwifery*, 3d ed. p. 473. By substituting the detachment and extraction of the placenta for the old method of turning the child *in utero* Professor Simpson finds that the mortality sinks to one in fourteen of the mothers, but slightly rises (to 69 per cent.) in the case of the children.

Another difficulty in midwifery practice, but far less serious than the preceding, is undue retention of the placenta. In ordinary cases, the average interval between the birth of the child and the expulsion of the after-birth is a quarter of an hour. When the expulsion does not take place within an hour or an hour and a half, the case is regarded as coming under the head of 'retained placenta.' It occurs in about 1 case in 400, and in these cases is fatal to about one mother in five; the cause of death being hæmorrhage. The principal causes of retention are either imperfect and insufficient, or irregular contraction of the womb, after the birth of the child. In the first of these cases, if the uterus cannot be excited to sufficient action, the placenta must be withdrawn by steady traction of the umbilical cord, and if it fail, extraction by the introduction of the hand (an operation always to be avoided if possible) must be resorted to; in the latter case, manual extraction is commonly necessary. Sometimes, in consequence of inflammatory or other affections of the placenta, there may be adhesion between its outer surface and the inner surface of the womb. This is the most dangerous form of retention, there being usually excessive flooding, and additionally the peril arising from the decomposition of any portion that cannot be removed without undue violence.

The placenta acquires its proper character, in the human sub-

ject, during the third month, and it subsequently goes on increasing to the full period of gestation. At about the fourth month, the blood, moving through the enlarged uterine vessels, produces a peculiar murmur, which is known as the *placental bruit*, resembling the sound made by blowing gently over the lip of a wide-mouthed phial, and increasing in intensity and strength as pregnancy (of which it is one of the characteristic signs) advances.

In animals exhibiting the second type of placental structure—as, for example, the pig—the placenta is comparatively simple in its structure. 'No *decidua* is developed; the elevations and depressions of the unimpregnated uterus simply acquire a greater size and vascularity during pregnancy, and cohere closely with the chorionic villi, which do not become restricted to one spot, but are developed from all parts of the chorion, except its poles, and remain persistent in the broad zone thus formed throughout fœtal life. The cohesion of the fœtal and maternal placentæ, however, is overcome by slight maceration or post-mortem change; and at parturition, the fœtal villi are simply drawn out like fingers from a glove, no vascular substance of the mother being thrown off.' Professor Huxley, from whose *Elements of Comparative Anatomy* (1864, p. 103) the preceding extract is borrowed, follows the opinion adopted by De Blainville, Von Baer, Eschricht, Milne-Edwards, Gervais, and Vogt in regarding 'the features of the placenta as affording the best characters which have yet been proposed for classifying the monodelphous [or placental] mammals.' He proposes to apply the term *deciduate* to those animals whose placenta presents the human type, and which throw off a *decidua;* and to term those animals *non-deciduate* in which the placenta is constructed on the same plan as that of the pig. 'Thus,' he observes, 'man; the apes, or so-called *Quadrumana;* the *Insectivora;* the *Cheiroptera;* the *Rodentia*, to which the lowest apes present so many remarkable approximations; and the *Carnivora*, are all as closely connected by their placental structure as they are by their general affinities. With the pig, on the other hand, the ungulate quadrupeds, and the *Cetacea* which have been studied, agree in developing no decidua, or, in other words, in the fact, that no vascular maternal parts are thrown off during parturition. But considerable differences are observed in the details of the disposition of the fœtal villi, and of the parts of the uterus which receive them.

Thus, in the horse, camel, and *Cetacea*, the villi are scattered as in the pig, and the placenta is said to be *diffuse;* while in almost all true *Ruminants*, the fœtal villi are gathered into bundles or cotyledons (fig. 3), which in the sheep are convex, and are received into cups of the mucous membrane of the uterus; while in the cow, on the contrary, they are concave, and fit upon corresponding convexities of the uterus.'



Fig. 3.—Uterus of a Cow in the middle of Pregnancy, laid open: *v*, vagina; *u*, uterus; *ch*, chorion; c^1, uterine cotyledons; c^2, fœtal cotyledons.

The remarks which have been made on the functions of the human placenta, are equally applicable to all placental mammals generally.

The *diseases* of the human placenta had not been studied with any accuracy, until the subject was taken up by Professor Simpson. This distinguished physician and subsequent observers have ascertained that the placenta is liable to (1) congestion, ending in the effusion of blood into the substance of the organ upon its surfaces, or between the membranes; (2) Inflammation, giving rise to adhesions, or terminating in suppuration, which may occasion very serious constitutional disturbances; (3) Partial or entire hypertrophy or atrophy; and (4), Fatty degeneration, affecting its small vessels. Whatever be the form of disease by which the placenta is attacked, the result is usually fatal to the fœtus.

PLACENTA, in Botany, a membrane of the interior of the Germen (q. v.) or ovary, to which the ovules are attached either immediately or by Umbilical Cords (q. v.). The placenta sometimes appears as a mere thickening of the walls of the germen. In many cases, it is a more decided projection from the walls of the germen. When thus connected with the walls of the germen, the placentæ are described as *parietal* (Lat. *paries*, a wall). But in some plants, the placentæ of the different cells of the germen are united together in a column in its axis, and they are then described as *axile*. This distinction is of great importance as characterizing different natural orders. Parietal placentæ are formed where the edges of carpellary leaves unite; but great difficulty has been experienced by vegetable physiologists in explaining the formation of axile placentæ; some regarding them as also originally formed in this manner, and others as formed in a quite different manner from the axis itself; nor is it impossible that both theories may be correct as to different orders of plants. It is certain that in many cases in which the placentæ appear as axile, they are formed from the edges of the carpellary leaves which fold in to meet in the axis, and form *Dissepiments* (q. v.) between the cells of the germen. The number of placentæ corresponds with the number of carpels in the germen, or appears to be the double of it, each carpel producing two rows of ovules instead of one. See figures in article PISTIL.

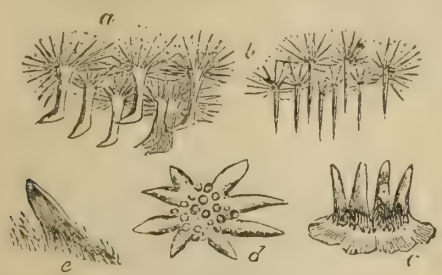
PLACE'NZA. See PIACENZA.

PLACETUM REGIUM, called also PLACET EXEQUATUR, LETTRES PATENTES, is an act or instrument executed in virtue of the privilege claimed by the government in certain kingdoms to exercise a supervision over the communications of the Roman pontiff with the clergy and people of those kingdoms, and to suspend or prevent the publication of any brief, bull, or other papal instrument which may appear to contravene the laws of the kingdom, or to compromise the public interest. The early Christian emperors, it is well known, freely stretched their legislation into the affairs of the church; and one constant cause of conflict between church and state, in the medieval period was the attempt on the part of the sovereigns to control the free intercourse of the pope with the several churches. In the Pragmatic Sanction in France, and in the similar legislation of Spain, Portugal, Sicily, and the Low Countries during the 15th c., the claims of the state on the same head are more than once asserted; and among the so-called 'liberties' of the later Gallican Church was a certain, though not a complete subjection to the state in this particular; but it was in the German states that this claim was most distinctly asserted, and most formally embodied in the constitutional law. The principle upon which the Peace of Westphalia so far as regards its religious provision is based, is that the will of the sovereign of the state is supreme and final in all the concerns of religion. *Cujus regio illius et religio* ('Whose the territory, his also the religion'), became the maxim of church government; and, of course, within certain limits, the Catholic sovereigns acted as freely upon it as the Protestant.

This intermixture of the spiritual and the temporal prevailed especially in the mixed governments of the ecclesiastical sovereigns of Germany, the prince-bishops of the Rhine; but without the same foundation, the system was carried to its height in Austria under Joseph II. (see FEBRONIANISM, PIUS VI.), the excessive minuteness of whose ecclesiastical ordinances procured for him the sobriquet of 'The Sacristan.' Under him, all pontifical bulls, briefs, and constitutions, and all the ordinances of the local bishops, were made subject to the imperial censorship, and it was forbidden to publish any of them without its receiving the *placet* of the emperor. The only exception, in the case of pontifical decrees, regarded those emanating from the Roman Penitentiary (q. v.), which, as being of their nature secret, were not held subject to revision. In Prussia, the same law was enforced, as also in Baden and Saxony, no less than in the Protestant governments of Würtemberg, Saxe-Gotha, Saxe-Weimar, &c. These claims of the state had always been the subject of protest on the part of the Roman see, but the church, nevertheless, had been compelled to acquiesce silently in the enforcement. In many cases, however, they have led to serious disputes, of which the mixed-marriage question in Prussia furnished a few years ago a very remarkable example. And since the ascendency obtained by Prussia in the German Empire at the close of the Franco-German war, the system of church legislation has undergone a complete change, the details of church government being largely taken into the control of the state, and obedience to the new code of church laws being exacted from the clergy under penalty of forfeiture of income, of deprivation of office, and in some cases of exile.

PLA'COID FISHES, an order of fishes, in the classification proposed by Agassiz, characterized by having *placoid* (Gr. *plax*, a broad plate) scales, irregular plates of hard bone, not imbricated,

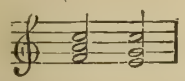
but placed near together in the skin. These scales or plates are of considerable size in some fishes, but in others they are very small tubercles, as in the dogfish, of which the skin forms fine-grained shagreen. Agassiz includes among the P. F. those cartilaginous fishes which have no scales. The order is exclusively composed of *Cartilaginous fishes* (q. v.). The existing P. F. are



Placoid Scales:
a and *b*, placoid scales of *Abeuteres trossulas*, one of the Bali tidæ, from Australia; *c*, *d*, *e*, scales from different parts of the body of *Aleuteres variabilis*.

few in comparison with the fossil genera and species. Placoid scales are often elevated in the middle, the center sometimes rising into a strongly projecting point or spine. They exhibit great variety of forms, sometimes even in different parts of the same fish.

PLA'GAL, a musical term, principally applicable to *Canto Fermo* and signifying collateral. Gregory the Great, in revising the labors of Ambrose, and remodelling the Plainsong (q. v.) of the church, added to the scales of Ambrose, which he distinguished as authentic, certain other collateral scales, which he called plagal, possessing the peculiarity of having the octave so divided that the fourth was above the fifth. Melodies are now known as plagal which have their principal notes contained between the fifth of the key and its octave or twelfth. The cadence, consisting of the subdominant harmony followed by the tonic, is called the plagal

cadence— 

PLAGIO'STOMI (Gr. transverse-mouthed), an order of fishes, in the system of Müller, containing the cartilaginous fishes with Placoid (q. v.) scales, and divided into two sub-orders, one containing sharks, and the other rays. The P. have five or more gill-openings. They have no air-bladder. Impregnation takes place before the eggs are deposited, and the males are furnished with *claspers*.

PLAGUE, a very malignant kind of contagious fever prevailing at certain times and places epidemically, characterized by buboes or swellings of the lymphatic glands, by carbuncles and petechiæ, and not apparently furnishing any security against its recurrence in the same individual. For a history of the origin of the plague in the far East (China), and its gradual spread, under the name of the *Black Death* (q. v.), through Asia and Europe, in the 14th c., the reader is referred to Hecker's *Epidemics of the Middle Ages* (1844), published by the Sydenham Society). Its true and permanent home seems to be in the regions bordering upon the eastern extremity of the Mediterranean. At different periods of the 15th, 16th, and 17th centuries, it visited Western Europe. It last attacked London and almost all England in the years 1663—1665; while so late as 1720, it destroyed nearly half the population of Marseille; and seventy years afterwards, prevailed in Russia and Poland, since which time it has been almost unknown in Western Europe. It is now limited chiefly to Egypt, Syria, Anatolia, Greece, and Turkey, occasionally extending northward towards Russia, and westward as far as Malta.

The disease usually commences with a sensation of intense weariness and fatigue, slight shivering, nausea and sickness, confusion of ideas, giddiness, and pain in the loins. These symptoms are rapidly followed by increased mental disturbance, with occasional stupor and delirium, by alternate pallor and flushing of the face, by suffusion of the eyes, and a feeling of intense constriction in the region of the heart. Darting pains are felt in the groins, armpits, and other parts of the body, which are soon followed by enlargements of the lymphatic glands, or *buboes* (which sometimes appear on the first and second day, sometimes not till near the close of the disease, and sometimes are altogether absent), and by the formation of *carbuncles* on various parts of the body.

As the disease advances, the tongue becomes dry and brown, while the gums, teeth, and lips are covered with a dark fur; the bowels, at first constipated, become relaxed, the stools being dark, offensive, and sometimes bloody. The power of the will on the muscles is much impaired; and altogether the patient resembles a person under the influence of intoxication. Throughout the disease, there is more or less tendency to faintness; and usually about the second or third day, petechial spots, livid patches like bruises, and dark stripes (called *vibices*), appear upon the skin, especially in severe cases. These discolorations are owing to the extravasation of blood, and are often accompanied with hæmorrhagic discharges from the mucous membranes. In fatal cases, the pulse gradually sinks, the surface becomes cold and clammy, blood oozes from the mucous surfaces, there is coma, or low delirium; and death occurs usually in five or six days, either without a struggle, or preceded by convulsions.

Great difference of opinion exists as to the cause of plague. Some maintain that it is propagated exclusively by a peculiar contagion; others, while admitting its contagious nature, maintain that it may also be spontaneously engendered by endemic or epidemic influences; while others, again, reject the contagion view altogether, and assert that it originates exclusively in local causes or epidemic influences. Of these three views, the great mass of evidence goes to show that the second is the correct one. Whatever may be the cause of the disease, temperature appears to exert a considerable influence over it. In tropical climates, the disease is unknown, and the cold weather of northern climates has been observed to check its ravages. In Europe, it has always been most fatal in the summer and autumn, especially in September. Thus, in the great plague of London in 1665, the deaths from the plague were, in June, 590; in July, 4129; in August, 20,046; in September, 26,230; in October, 14,373; in November, 3449; while in December, they were less than 1000.

The exact nature of the disease is unknown. A poison whose characters evade all chemical and microscopical examination, is absorbed, and alters at once, or after a short stage of incubation the composition of the blood and the condition of the tissues.

With respect to treatment, little can be done to arrest the progress of the disease in any individual case. The patient should if possible, be removed at once from the source of the disease; he should be exposed freely to fresh air; his secretions should be duly regulated, and his strength supported as far as possible. Friction with olive oil has been strongly recommended, but subsequent experience has not confirmed the first reports in its favor. But although treatment is comparatively valueless, much may be done towards guarding against the attacks of the disease. There can be little doubt that it is in consequence of the free external use of cold water, perfect cleanliness, moderate habits of life, and superior ventilation, that European (especially English) residents in the infected cities of the Levant are comparatively exempt from this disease. It is very possible that inunction of the body with olive oil may be (as has been asserted) a useful prophylactic agent, although it fails to cure the disease. It is almost needless to add, that all unnecessary communication with the sick, or contact with clothes or others matter that may have been infected with the poison, should be as much as possible avoided.

PLAICE (*Platsesa vulgaris*), a species of Flounder (q. v.), much resembling the common flounder, but rather broader in proportion to its length; the upper surface of the body and the fins olive-brown, marked with large bright orange spots; a row of similar spots on the dorsal fin and on the anal fin; no tubercular asperities on any part of the body, but a curved row of bony tubercles on the eye-side of the head. The P. inhabits sandy and muddy banks, not in very deep water, and is very abundant on most parts of the British coasts, as well as on those of continental Europe. Like the common flounder, it often ascends slow rivers to some distance from the sea, and it has even been found to thrive well when transferred to fresh-water ponds. It feeds on worms, molluscs, small crustaceans, and young fishes. It has been known to attain the weight of fifteen pounds, but a P. of seven or eight pounds is accounted large. It is taken both by lines and trawl-nets. It is in considerable esteem for the table, although so plentiful in the British markets, that it is in general very cheap.

PLAID, a woollen garment, in the form of a large scarf, to wrap round the body, and used chiefly among the rural population of Scotland. See TARTAN.

PLAIN, in Geography, is an extensive tract of country which, on the whole, preserves a nearly uniform elevation. When referred to the level of the sea, plains may be distinguished into low plains or lowlands, and elevated plains called plateaux or *Table-lands* (q. v.). Plains differ much in appearance, according to the nature of their soil and climate, from the frightful sandy wastes of Africa, to the luxuriant fertility of the South American silvas. They are occasionally crossed by hills of moderate altitude, which, however, are generally detached, and exhibit no connection with any neighboring mountain system. These hills often, as in the North American plains, degenerate into mere undulations, perfectly uniform in structure.

The term 'plains' is, in a limited sense, confined to the plains of Western Europe; those of other parts of the world receiving

special designations, and differing from each other in many important points; thus we have the *Steppes* (q. v.) of Eastern Europe and Asia; the *Deserts* (q. v.) of Arabia and Africa; the *Savannahs* (q. v.) and *Prairies* (q. v.) of North America; and the *Llanos* (q. v.), *Pampas* (q. v.), and *Silvas* (q. v.) of South America. The chief plains of Europe are, the country stretching from the foot of the Carpathians in Galicia to the Ural Mountains (including Poland and Russia), the drainage-area of the Danube in Hungary, and the portion of Europe which is bounded by the Elbe, the Harz Mountains, France, and the sea. Plains of comparatively small extent, but presenting the necessary characteristics in perfection, are found in almost all countries.

PLAI'NSONG, or CANTO FERMO (Ital.), a name given by the Church of Rome to the ecclesiastical chant. It is an extremely simple melody, admitting only notes of equal value, rarely extending beyond the compass of an octave, and never exceeding nine notes, the staff on which the notes are placed consisting of only four lines. The clefs are C and F. St. Ambrose is considered to have been the inventor or systematizer of the Plainsong. His labors consisted in selecting from the extremely complicated system of the Greeks a set of scales sufficiently few and simple for a very rude people. During the two centuries succeeding the death of Ambrose, his institutions fell into utter confusion. Gregory the Great revived and perfected them, recasting them into an *Antiphony*, or authorized body of ecclesiastical music, and brought Plainsong into the state in which it is yet used in the Roman church. See AMBROSIAN CHANT and GREGORIAN CHANT.

PLAI'NTIFF, in English and Irish Law, is the name given to the person who institutes and maintains a civil action or suit against another, who is called the Defendant. In Scotland, a plaintiff is called a Pursuer. But in both countries, many proceedings and applications of a civil nature are commenced by petition; and hence the party taking the initiative is called the Petitioner.

PLAN, a word frequently applied to all kinds of architectural drawings, but which ought to be limited to those which represent the horizontal sections of the various floors of buildings. Plans show the disposition of the apartments and walls, with the situation of the fireplaces, cupboards, doors, &c.; they, in fact, represent the different stories as they actually appear as seen from above, when the walls are built two or three feet above the level of each floor.

PLANA'RIA, a genus of worms placed by Cuvier among *Entozoa*, although not parasites, but inhabitants of stagnant waters, because of their great resemblance to some of the entozoic parasites, and particularly to flukes. The species are numerous. Some inhabit fresh, and others salt water; they feed on small annelids, molluscs, &c. They are generally found creeping among confervæ, or on the stems of plants. Many of the larger marine species are able to swim freely by flappings of the broad margins of their bodies. The body of a planataria seems to be entirely gelatinous; but M. de Quatrefages has detected under the skin an arrangement of muscular fibres. Two red specks in the fore-part of the body of many species have been supposed to be eyes; but there is no proof of it. Planariæ are hermaphrodite, but copulate for mutual impregnation. Their power of multiplication by division is very great; if an individual be cut in pieces, each piece continues to live and feel, and 'even if it be the end of the tail, as soon as the first moment of pain and irritation has passed, begins to move in the same direction as that in which the entire animal was advancing, as if the body was actuated throughout by the same impulse; and, moreover, every division, even if it is not more than the eighth or tenth part of the creature, will become complete and perfect in all its organs.'—*Rymer Jones.*

PLANCHETTE (a little board) is, as the name implies, a French invention, but its popularity in America has induced the belief of its being of American origin. It consists of a heart-shaped board seven or eight inches at its greatest breadth and length, mounted on two pentagraph wheels, about two inches high, at its widest part, while a pencil fastened at the apex forms its third support. Placed upon a table with a sheet of paper under it, and one or two persons with the necessary qualifications having their hands upon its tablet, setting it in motion, it is found to return answers to questions sometimes of a puzzling character. These answers are asserted by believers in spiritualism to be communications from the spirit-world.

PLANE, in Geometry, is a surface without curvature, and the test of it is, that any two points whatever being taken in the surface, the straight line which joins them lies wholly in the surface. When two planes cross or intersect one another, their common section is a straight line; and the inclination of the planes to each other is measured by taking any point in their common section, and drawing from it two straight lines, one in each plane, perpendicular to the common section; the angle contained by these lines is the angle of inclination of the planes. When the angle is a right angle, the planes are perpendicular to each other.

PLANE (*Platanus*), the sole genus of trees of the natural order *Placanaceæ*, regarded by many as a sub-order of *Amentaceæ* (q. v.). The flowers are in globose, small, pendulous, long stalked catkins, which give the tree a peculiar appearance in winter; the ovary is one-celled, and contains one or two pendulous ovules. The species of P. are few; natives of temperate climates in the northern hemisphere; tall trees, with deciduous large palmate leaves, and smooth whitish bark, which annually scales off in large pieces.—The ORIENTAL P. (*P. orientalis*), a native of Greece and the East, was planted by the Greeks and the Romans as an ornamental tree;



Plane Tree (*Platanus orientalis*).

no other tree, indeed, commanding equal admiration; and, for centuries, the youth of Greece assembled under its shade in the groves of Academus, to receive lessons in philosophy. The P. is still planted for shade and ornament in the south of Europe. Many fine trees exist in England, but they were at one time much more numerous, great part having died in the end of last century. The spring frosts, and the insufficient duration of the summer for the proper ripening of the wood, render Scotland less suitable for its cultivation; yet there is a tree at Gordon Castle 66 feet high. No tree better endures the atmosphere of a large city, and there are no finer trees within the precincts of London than its P. trees. In the East the P. attains an immense size. One tree, in the meadow of Buyukdere on the banks of the Bosporus, is 141 feet in circumference at the base, extends its branches 45 feet from the trunk, and is believed to be more than 2000 years old. The wood of the P., when young, is yellowish-white; when old, it is brownish, fine grained, takes a high polish, and is esteemed for cabinet-making. A rich alluvial soil and the vicinity of water are most suitable to this tree.

The NORTH AMERICAN P., or BUTTONWOOD (*P. occidentalis*), is a very similar tree. It is the largest deciduous tree of the United States, and abounds on the banks of the great rivers of the middle states. Its timber is not very valuable, and is very liable to decay. A tree of this species on the bank of the Thames, in Chelsea Hospital gardens, is 115 feet high, with a trunk five feet in diameter. The name P.-tree is commonly given in Scotland to the Sycamore (*Acer psuedo-platanus*), which resembles the true planes in its foliage.

PLANE, a tool used for rendering the surface of wood smooth and level. It consists of an oblong block of wood or metal (the latter has only recently come into use), with an opening through the center; this opening is square on the upper side, and is always large enough to admit the cutting instrument; it diminishes down

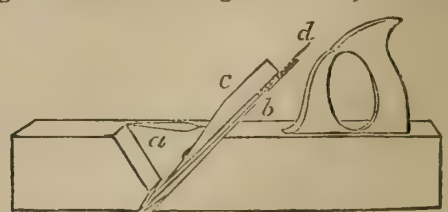
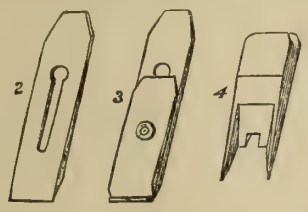


Fig. 1.

to a mere slit on the under side, just wide enough to allow the cutting edge of the plane-iron and the shaving of wood which it cuts off to pass through. The form of this opening will be seen at *a*, fig. 1, which represents the section of a common jack-plane. The essential part of the tool is the plane-iron, a piece of steel with a

chisel-shaped edge, and a slot in its center for a large-headed screw to work and to attach to it a strengthening plate. Fig. 2 shows the plane-iron, and fig. 3 the same with the strengthening plate attached; these are shown in their proper position at *bd* in the section fig. 1, and they are held in place by the hard-wood wedge (fig. 4), seen also in the section at *c*. By driving in the wedge, the irons are held very firmly in their place, and they are so adjusted that only the fine sharp chisel-edge of the cutting-tool projects through the slit in the bottom of the body of the plane, so



that when the tool is pushed forward by the force of the hand, the cutting edge pares off all irregularities, until the wood is as smooth as the under surface of the plane. There are many modifications in this tool, which can have its cutting edge and under surface made to almost any contour, so that mouldings of all kinds may be made. The two commonest are the jack-plane for rough work, and the smoothing-plane for finishing off plane surfaces.

PLANING-MACHINES have lately been much in use, by which both wood and metal are planed. In the case of those intended for wood, the cutting instruments are moved forward over the wood by machinery in the same manner as in the hand-plane. The precision and rapidity with which these machines work have given great facilities for building, as one machine will do as much work as sixty men. The planing-machines used for metal are different in principle. A well-tempered, chisel-edged steel cutter is held in a fixed position, pressing downwards upon the metal plate, which is moved forward by powerful machinery. The action of this movement is, that a groove is ploughed into the metal of the size of the steel cutter; when the metal has traveled its full length, and has made the groove complete, the downward pressure of the tool is removed, and by the action of the double screw which has carried it forward, it is returned, and readjusted for another groove to be formed by the side of the first; and this is repeated until the whole surface of the plate is reduced to the required level. However tedious this process may appear, it offers such facilities for metal working as were previously unknown.

PLANE'TA, the Greek name of the vestment called by the Latins Casula, and in English 'Chasuble,' which is worn by priests in the celebration of mass. The form of this vestment in the modern Roman church, differs both from the ancient form and from that in use in the Greek church. The change appears to date from the 9th c., but has been gradual. A certain modification of the Roman planeta was recently introduced in England under the inspiration of the late Mr. Pugin, the great reviver of Gothic architecture and ecclesiastical costume and decoration. But its use has been only partial even in England.

PLANETA'RIUM, a machine much employed by astronomers in the 17th and 18th centuries, and first constructed by Huyghens and Römer, for the purpose of exhibiting clearly the motion of the heavenly bodies in conformity with the Copernican doctrine. The P. exhibited only the orbital motions of the planets about the sun, either in circles or ellipses, and with constant or varying motions, according to the perfection of the machine. It was subsequently supplemented by the *combined tellurian and lunarian*, which exhibited at one and the same time the motion of the moon about the earth and that of the latter round the sun, with the principal phenomena (such as the succession of day and night, the varying length of each, eclipses, and the motion of the moon's apogee and nodes). The old P. was superseded by the Orrery (q. v.). But the most perfect apparatus of this kind is the P. exhibited by Perini in London in 1880. It occupies a pillared chamber with a hemispherical dome, and displays the solar system with the proper movements of the various members, at proportionate velocities.

PLA'NETOIDS, or A'STEROIDS, the name given to that numerous group of very small planets which are situated in the solar system between Mars and Jupiter. Till the present century they remained undiscovered; but for some years before, their existence had been suspected, mainly owing to the remarkable hiatus in the series of the planetary distances when compared with the law of Bode (q. v.). On the first day of the present century the first of them was detected by Piazzi of Palermo, and his success roused his brother astronomers to search for more planets. Their search was successful, for Olbers (q. v.) discovered two in 1802 and 1807, and Harding one in 1804; but as all researches for some time subsequent to 1807 were unavailing, astronomers gradually allowed themselves to settle down into the belief that no more planetoids remained to be discovered, when the detection of a fifth by Hencke in 1845, revived the hope of fresh discoveries, and from this period no year (excepting 1846) has passed without adding to the list. The number now known is more than 170. This remarkable success of the astronomers of our time is due to the systematic manner in which the zodiacal belt has been explored, and the place and apparent size of every star of this region distinctly determined; so that the presence of a wandering body can at once be detected.

The magnitudes of these celestial bodies have not been accurately ascertained, but it is certain that they are exceedingly small as compared even with Mercury, the least of the other planets; the diameter of the largest among them being generally believed not to exceed 450 miles, while most of the others are very much smaller than this. They also differ, generally speaking, from the rest of the planets in other respects; their orbits are of greater excentricity, are inclined to the ecliptic at a greater angle, and are interlaced in a most intricate manner, crossing each other so frequently as to form, when viewed perpendicularly, a kind of network. The consequence of this is, that a planetoid which is nearest the sun at one part of its orbit, is, when at another part of its orbit, further from it than are several of the others and a mutual eclipsing of the sun at different periods by two planetoids must be of very frequent occurrence. Of the planetoids, of which the elements had in 1876 been satisfactorily calculated, Flora has the shortest period of revolution, 1193 days, and Sylvia the longest, 2374 days. The corresponding mean distances from the sun, expressed in parts of the earth's mean distance, are respectively 2·201 and 3·482. [But it is now known that Hilda has a period of 2868 days and a mean distance of 3·947.] The nearest approach to the sun is made by Phocea (perihelion distance 1·787). Freia recedes furthest from him (aphelion distance 4·002). Polyhymnia's orbit has the greatest excentricity, amounting to 0·33998; Lomia's, the least, 0·2176. Massalia's orbit makes a smaller angle—only 41′ 7″—with the ecliptic than that of any other planet in the solar system, while the inclination of the orbit of Pallas is no less than 34° 42′ 41″. After the first two or three of these bodies had been discovered, the opinion was propounded by Olbers that they were but the fragments of some large planet; and this hypothesis received corroboration from the intimate connection which was shown to subsist among them; but of late years it has fallen out of favor with astronomers. Some infer that the P. are best accounted for by the nebular hypothesis.

It has been calculated that the combined mass of all the P. cannot exceed one-fourth of the earth's mass.—The number of P. discovered now amounts to 230; the following is a table of those known in February 1877:

Name.	Date of Discovery.	Discoverer.
1 Ceres	1801, Jan. 1	Piazzi, Palermo.
2 Pallas	1802, Mar. 28	Olbers, Bremen.
3 Juno	1804, Sept. 1	Harding, Bremen,
4 Vesta	1807, Mar. 29	Olbers.
5 Astræa	1845, Dec. 8	Hencke, Driesen (Prussia)
6 Hebe	1847, July 1	Hencke.
7 Iris	" Aug. 13	Hind, London.
8 Flora	" Oct. 18	Hind.
9 Metis	1848, Apr. 25	Graham, Sligo.
10 Hygieia	1849, Apr. 12	De Gasparis, Naples.
11 Parthenope	1850, May 11	De Gasparis.
12 Victoria	" Sept. 13	Hind.
13 Egeria	" Nov. 2	De Gasparis.
14 Irene	1851, May 19	Hind.
15 Eunomia	" July 29	De Gasparis.
16 Psyche	1852, Mar. 17	De Gasparis.
17 Thetis	" Apr. 17	Luther, Bilk (Düsseldorf).
18 Melpomene	" June 24	Hind.
19 Fortuna	" Aug. 22	Hind.
20 Massalia	" Sept. 19	De Gasparis.
21 Lutetia	" Nov. 15	Goldschmidt, Paris.
22 Calliope	" Nov. 16	Hind.
23 Thalia	" Dec. 15	Hind.
24 Themis	1853, Apr. 5	De Gasparis.
25 Phocea	" Apr. 7	Chacornac, Marseille.
26 Proserpine	" May 5	Luther.
27 Euterpe	" Nov. 8	Hind.
25 Bellona	1854, Mar. 1	Luther.
29 Amphitrite	" Mar. 1	Marth, London.
30 Urania	" July 22	Hind.
31 Euphrosyne	" Sept. 1	Ferguson, Washington.
32 Pomona	" Oct. 26	Goldschmidt.
33 Polyhymnia	" Oct. 28	Chacornac, Paris.

Name.	Date of Discovery.	Discoverer.
34 Circe	1855. Apr. 6	Chacornac.
35 Leucothea	" Apr. 19	Luther.
36 Atlanta	" Oct. 5	Goldschmidt.
37 Fides	" Oct. 5	Luther.
38 Leda	1856, Jan. 12	Chacornac.
39 Lætitia	" Feb. 8	Chacornac.
40 Harmonia	" Mar. 31	Goldschmidt.
41 Daphne	" May 22	Goldschmidt.
42 Isis	" May 23	Pogson, Oxford.
43 Ariadne	1857, Apr. 15	Pogson.
44 Nysa	" May 27	Goldschmidt.
45 Eugenia	" June 27	Goldschmidt.
46 Hestia	" Aug. 16	Pogson.
47 Melete	" Sept. 9	Goldschmidt.
48 Aglaia	" Sept. 15	Luther.
49 Doris	" Sept. 19	Goldschmidt.
50 Poles	" Sept. 19	Goldschmidt.
51 Virginia	" Oct. 4	Ferguson.
52 Nemausa	1858, Jan. 22	Laurent, Nimes (France).
53 Europa	" Feb. 6	Goldschmidt.
54 Calypso	" Apr. 4	Luther.
55 Alexandra	" Sept. 10	Goldschmidt.
56 Pandora	" Sept. 10	Searle, Albany, New York.
57 Mnemosyne	1859, Sept. 22	Luther.
58 Concordia	1860, Mar. 24	Luther.
59 Olympia	" Sept. 12	Chacornac.
60 Echo	" Sept. 15	Ferguson.
61 Danäe	" Sept. 19	Goldschmidt.
62 Erato	" Sept. 14	Förster, Berlin.
63 Ausonia	1861, Feb. 10	De Gasparis.
64 Angelina	" Mar. 4	Tempel, Marseille.
65 Maximiliana	" Mar. 8	Tempel.
66 Maia	" Apr. 9	Tuttle, Cambridge.
67 Asia	" Apr. 17	Pogson, Madras.
68 Hesperia	" Apr. 29	Schiaparelli, Milan.
69 Leto	" Apr. 29	Luther.
70 Panopea	" May 5	Goldschmidt.
71 Niobe	" Aug. 13	Luther.
72 Feronia	1862, Feb. 12	Peters, Clinton, New York.
73 Clytie	" Apr. 7	Tuttle, U.S.
74 Galatea	" Aug. 29	Tempel.
75 Eurydice	" Sept. 22	Peters.
76 Freya	" Oct. 21	D'Arrest, Copenhagen.
77 Frigga	" Nov. 12	Peters.
78 Diana	1863, Mar. 15	Luther.
79 Eurynome	" Sept. 19	Watson, Ann Arbor, U. S.
80 Sappho	1864, May 3	Pogson, Madras.
81 Terpischore	" Sept, 30	Tempel.
82 Alemene	" Nov. 27	Luther.
83 Beatrix	1865, Apr. 26	De Gasparis.
84 Clio	" Aug. 25	Luther.
85 Io	" Sept. 19	Peters.
86 Semele	1866, Jan. 6	Tietjen, Berlin.
87 Sylvia	1866, May 16	Pogson, Madras.
88 Thisbe	" June 15	Peters
89 Julia	" Aug. 6	Stéphan, Marseille.
90 Antiope	" Oct. 1	Luther.
91 Ægina	" Nov. 4	Stéphan.
92 Undina	1867, July 7	Peters.
93 Minerva	" Aug. 24	Watson.
94 Aurora	" Sept. 26	Watson.
95 Arethusa	" Nov. 23	Luther.
96 Ægle	1868, Feb. 17	Coggia, Marseille.
97 Clotho	" Feb. 17	Tempel.
98 Ianthe	" Apr. 18	Peters.
99 Dike	" May 29	Borelly, Marseille.
100 Hecate	" July 11	Watson.
101 Helena	" Aug. 16	Watson.
102 Miriam	" Aug. 22	Peters.
103 Hera	" Sept. 7	Watson.
104 Clymene	" Sept. 13	Watson.
105 Artemis	" Sept. 16	Watson.
106 Dione	" Oct. 10	Watson.
107 Camilla	" Nov. 17	Pogson, Madras.
108 Hecuba	1869, Apr. 2	Luther.
109 Felicitas	" Oct. 9	Peters.
110 Lydia	1870, Apr. 19	Borelly.
111 Ate	" Aug. 14	Peters.
112 Iphigenia	" Sept. 19	Peters.
113 Amalthea	1871, Mar. 12	Luther.
114 Cassandra	" July 24	Peters.
115 Thyra	" Aug. 6	Watson.
116 Sirona	" Sept. 8	Peters.
117 Lomia	" Sept. 12	Borelly.
118 Peitho	1872, Mar. 15	Luther.
119 Althea	" Apr. 3	Watson.
120 Lachesis	" Apr. 10	Borelly.
121 Hermione	" May 12	Watson.
122 Gerda	" July 31	Peters.
123 Brunhilda	" July 31	Peters.
124 Alcestis	" Aug. 23	Peters.
125 Liberatrix	" Sept. 11	Prosper Henry, Paris.
126 Velleda	" Nov. 5	Paul Henry, Paris.
127 Johanna	" Nov. 5	Prosper Henry.
128 Nemesis	" Nov. 25	Watson.
129 Antigone	1873, Feb. 5	Peters.
130 Electra	" Feb. 17	Peters.
131 Vala	" May 26	Peters.
132 Æthra	" June 13	Watson.
133 Cyrene	" Aug. 16	Watson.
134 Sophrosyne	" Sept. 27	Luther.
135 Hertha	1874. Feb. 18	Peters.
136 Austria	" Mar. 18	Palisa, Pola.
137 Melibœa	" Apr. 21	Palisa.
138 Tolosa	" May 19	Perrotin, Toulouse.
139 Juewa	" Oct. 10	Watson, Peking.
140 Siwa	" Oct. 13	Palisa.
141 Lumen	1875, Jan. 13	Paul Henry.
142 Polana	" Jan. 28	Palisa.
143 Adria	" Feb. 23	Palisa.
144 Vibilia	" June 3	Peters.
145 Adeona	" June 3	Peters.
146 Lucina	" June 8	Borelly.
147 Protogeneia	" July 11	Schulhof, Vienna.
148 Gallia	" Aug. 7	Prosper Henry.
149 Medusa	" Sept. 21	Perrotin.
150 Nuwa	" Oct. 18	Watson.
151 Abundantia	" Nov. 1	Palisa.
152 Atala	" Nov. 2	Paul Henry.
153 Hilda	" Nov. 2	Palisa.
154 Bertha	" Nov. 4	Prosper Henry.
155 Scylla	" Nov. 8	Palisa.
156 Xanthippe	" Nov. 22	Palisa.
157 Dejanira	" Dec. 1	Borelly.
158 Coronis	1876. Jan. 4	Knorre, Berlin.
159 Æmilia	" Jan. 26	Paul Henry.
160 Una	" Feb. 21	Peters.
161 Athor	" Apr. 18	Watson.
162 Laurentia	" Apr. 21	Prosper Henry.
163 Erigone	" Apr. 26	Perrotin.
164 Eva	" July 12	Paul Henry.
165 Loreley	" Aug. 19	Peters.
166 Rhodope	" Aug. 17	Peters.
167 Urda	" Aug. 29	Peters.
168 Sibylla	" Sept. 28	Watson
169 Zelia	" Sept. 28	Prosper Henry.
170 Maria	1877, Jan. 10	Perrotin.
171 Ophelia	" Jan. 13	Borelly.
172 Baucis	" Feb. 5	Borelly.

PLA'NETS (Gr. *planetes*, 'a wanderer') are those heavenly bodies (including the Earth) which belong to our solar system, and revolve in elliptic orbits round the sun. They are often denominated *primary planets*, to distinguish them from their moons or satellites, which are called *secondary planets*. The name planet is of considerable antiquity and was applied to these dependants of the sun to distinguish them from the myriads of luminous bodies which stud the sky, and which present to the naked eye no indication of change of place (see STARS). The planets at present known are, in the order of their distance from the sun, Mercury, Venus, the Earth, Mars, the Planetoids (q. v.), Jupiter, Saturn, Uranus, and Neptune. Six of these, Mercury, Venus, the Earth (which was not, however, then reckoned a planet), Mars, Jupiter, and Saturn were known to the ancients; Uranus was discovered by Sir William Herschel (q. v.) in 1781; and Neptune, after having its position and elements determined theoretically by Leverrier and Adams, was discovered by M. Challis, and afterwards by Dr. Galle, in 1846. The Planetoids, of which more than 180 are now known, have all been discovered during the present century. Five of the planets, the Earth, Jupiter, Saturn, Uranus, and Neptune, are attended by one or more satellites; Uranus (generally), Neptune, almost the whole of the Planetoids, and all the satellites except the Moon, are invisible to the naked eye. The visible planets can be at once distinguished

from the fixed stars by their clear steady light, while the latter have a sparkling or twinkling appearance. The comparative proximity of the planets may be proved by examining them through a telescope of moderate power, when they appear as round luminous disks, while the fixed stars exhibit no increase of magnitude.

The planets, as observed from the Earth, move sometimes from west to east, sometimes from east to west, and for some time remain stationary at the point where progression ends and retrogression commences. This irregularity in their movements was very puzzling to the ancient astronomers, who invented various hypotheses to account for it. See PTOLEMAIC SYSTEM and EPICYCLE. The system of Copernicus, by assuming the sun, and not the earth, as the center of the system, explained with admirable simplicity what seemed before a maze of confusion.

The planetary orbits differ considerably in their degrees of excentricity, the Planetoids, Mars, and Mercury being most, and the larger planets least excentric. No two planets move exactly in the same plane, though as a general rule, the planes of the larger planets most nearly coincide with that of the ecliptic. The latter are consequently always to be found within a small strip of the heavens extending on both sides of the ecliptic; while the others have a far wider range, Pallas, one of them, having the angular elevation of its orbit no less than 34° 42″ above the ecliptic. According to Kepler's Laws (q. v.), the nearer a planet is to the sun the shorter is the time of its revolution. The arrangement of the planets in the solar system bears no known relation to their relative size or weight, for though Mercury, Venus, and the Earth follow the same order in size and distance from the sun, yet Mars, which is further from the sun, is much less than either the Earth or Venus, and the Planetoids, which are still further off, are the least of all. Jupiter, which is next in order, is by far the largest, being about 1½ times as large as all the others together; and as we proceed further outwards, the planets become smaller and smaller, Saturn being less than Jupiter, Uranus than Saturn, and Neptune than Uranus.

With reference to their distance from the sun, as compared with that of the Earth, the planets are divided into *superior* and *inferior;* Mercury and Venus are consequently the only 'inferior' planets, all the others being 'superior.' The inferior planets must always be on the same side of the Earth as the sun is, and can never be above the horizon of any place (not in a very high latitude) at midnight; they are always invisible at their superior and inferior conjunctions, except when, at the latter, a *transit* (see SUN) takes place. The superior planets are likewise invisible at conjunction, but when in opposition they are seen with the greatest distinctness, being then due south at midnight. The time which elapses from one conjunction to its corresponding conjunction is called the *synodic period* of a planet, and in the case of the inferior planets must always be greater than the true period of revolution.

Mercury, the planet which is nearest the sun, is also, with the exception of the Planetoids, the smallest (being only 3 times the size of the moon), and performs its revolution round the sun in the shortest time. Its greatest elongation is never more than 28° 45′, and consequently it is never above the horizon more than two hours after sunset, or the same time before sunrise; on this account, and from its small apparent size (5″ to 12″), it is seldom distinctly observable by the naked eye. It shines with a peculiarly vivid white or rose-colored light, and exhibits no spots.

Venus, the next in order of distance and period, is to us the most brilliant of all the planets. Its orbit is more nearly a circle than any of the others, and when at its inferior conjunction, it approaches nearer the Earth than any other planet. Its apparent angular dimensions thence vary from 10″ at the superior, to 70″ at the inferior conjunction. Its greatest elongation varies from 45° to 47° 12′, and therefore it can never be above the horizon for much more than three hours after sunset, or the same time before sunrise. While moving from the inferior to the superior conjunction, Venus is a *morning star;* and during the other half of its synodic period, an *evening star.* When this planet is at an elongation of 40°, its brilliancy is greatest, far surpassing that of the other planets, and rendering a minute examination through the telescope impossible. At this period it sometimes becomes visible in the daytime, and after sunset is so bright as to throw a distinct shadow. Astronomers have repeatedly attempted to ascertain the nature and characteristics of its surface, but its brightness so dazzles the eyes as to render the correctness of their observations at best doubtful. From the changes in the position of dusky patches on its surface, which have been frequently noticed, it is concluded that it revolves on its axis, and that its equator is inclined to the plane of its orbit at an angle of 75°; but many astronomers doubt these conclusions. Both Venus and Mercury necessarily exhibit phases like the moon. For *transits* of Venus, see SUN.

The *Earth,* the next planet in order, will be found under its own name; it has a single satellite, the *Moon* (q. v.).

Mars, the first of the superior planets, is much inferior in size to the two previous, its volume being about ⅛th of the Earth's, and, after Mercury, its orbit is much more excentric than those of the other planets. When it is nearest to the Earth (i. e., in opposition), its apparent angular diameter is 30′; when furthest from it (i. e., in conjunction), not more than 4″. Mars revolves on its axis (which is inclined at an angle of 28° 27′) in 24 hours 37 minutes, and its year is 687 days long. In 1877, Hall of Washington discovered that it had two satellites. It shines with a fiery red light, and is a brilliant object in the heavens at midnight when near opposition; when seen through the telescope its surface appears to be covered with irregular blotches, some of them of a reddish, others of a greenish color, while at each pole is a spot of dazzling white. The red spots are surmised to be land; the green, water; while the white spots at the poles are with some reason supposed to be snow, since they decrease when most exposed to the sun, and increase under the contrary circumstances. The Phases (q. v.) of Mars range between full, half, full (in conjunction, if visible), and half.

The Planetoids.—After Mars in order come the *Planetoids* (q. v.), formerly but improperly called Asteroids.

Jupiter, the next in order, is the largest of all the planets, its bulk being more than 1400 times that of the Earth, though, from its small density, its mass is only 338 times more. After Venus it is the brightest of the planets and the largest in apparent size, its angular diameter varying from 30″ to 45″. When looked at through a telescope, it is seen to be considerably flattened at the poles, owing to its rapid revolution on its own axis; and its surface is crossed in a direction parallel to its equator by three or four distinct and strongly-marked belts, and a few others of a varying nature. Spots also appear and remain for some time on its surface, by means of which its revolution on its axis has been ascertained. This planet is attended by four satellites, which are easily observable through an ordinary telescope, and which have rendered immense service in the determination of longitudes at sea, and of the motion and velocity of light. The satellites, which were discovered by Galileo, were proved by Sir William Herschel to revolve on their own axes in the same time that they revolve round their primary. The smallest is about the same size as our Moon, the others are considerably larger.

Saturn, next in position, is about 735 times larger in volume, though only about 100 times greater in mass than the earth. Its apparent diameter when in opposition is 18″, and there is a considerable flattening towards the poles. Its surface is traversed by dusky belts much less distinctly marked than those of Jupiter, owing doubtless in great part to its inferior brightness; its general color is a dull white or yellowish, but the shaded portions, when seen distinctly, are of a glaucous color. The most remarkable peculiarity of Saturn is its ring, or series of concentric rings, each one parallel and in the same plane with the others and with the planet's equator; the rings are at present supposed to be three in number, the two outermost are bright like the planet itself, while the innermost is of a purplish color, and is only discernible through a powerful telescope. The rings are not always visible when Saturn is in the 'opposite' half of its orbit, for when the plane of the rings is intermediate between that of the Earth's orbit and of the ecliptic, their dark surface is turned towards us, and when the sun is in their plane only the narrow edge is illumined; in both of these cases the ring is invisible from the Earth. Its plane being inclined at an angle of 28° to the ecliptic, we see the two surfaces of the ring alternately for periods of 15 years at a time; and at the middle of each period, the rings attain their maximum obliquity to the ecliptic, and are then best seen from the Earth. It is hardly necessary to remark that at the end of each period they become invisible. Saturn has also no less than eight satellites, seven of which revolve round it in orbits little removed from the plane of the ring, while the eighth, which is the second in size, is considerably inclined to it. Two of the satellites were discovered by Herschel in 1787 and 1789, four by Cassini in 1672 and 1684, one by Huyghens in 1655, one by Mr. Lassell in England and Professor Bond in America in 1848. The satellites are all situated outside of the ring, and the largest of them is nearly equal to the planet Mars in size.

Uranus, the next planet in position, was discovered accidentally by the elder Herschel on 13th March 1781, and was named 'the Georgium Sidus' and 'Herschel,' but these names soon fell into disuse. It is about 96 (some astronomers say 82) times greater than the Earth in volume, and 20 (according to others, 15) times in mass; but though so large, its distance is so much greater in proportion that astronomers have been unable to gain much information concerning it. No spots or belts have hitherto been discovered on its surface, and consequently its time of rotation and the position of its axis are unknown. It is attended by a number of satellites, but so minute do these bodies appear, that astronomers hitherto have been unable to agree as to their exact number; Sir William Herschel reckoned six, while other astronomers believe in the existence of four, five, and eight respectively. That there are at least four is without doubt.

Neptune is the next and outermost member of the solar system, and, at a distance of nearly 3000 millions of miles from the center of the system, slowly performs its revolution round the sun, accomplishing the complete circuit in about 165 solar years. It is about 84 times larger than the Earth, but from its extreme remoteness is of almost inappreciable magnitude when seen through an ordinary telescope. It was the disturbance in the motion of Uranus caused by the attractive force of this planet which led Leverrier and Adams to a calculation of its size and position, on the supposition of its existence; and the directions which were given by the former to Dr. Galle of Berlin, specifying its exact position in the heavens, led that astronomer to its discovery on 23d September 1846. Mr. Lassell of Liverpool has discovered that Neptune is attended by one satellite. The satellites of Uranus and Neptune differ from the other planets, primary and secondary, in the direction of their motion, which is from east to west, and in the case of the former, in planes nearly perpendicular to the ecliptic. Both Uranus and Neptune were observed long before the times of Herschel and Leverrier, but they were always supposed to be stars. Uranus is known to have been observed by Flamsteed between 1690 and 1715, and Neptune by Lalande in 1795.

In astronomical tables, almanacs, &c., the planets are for convenience denoted by symbols instead of their names, as follows: Mercury, ☿; Venus, ♀; Earth, ⊕; Mars, ♂; the Planetoids, in the order of their discovery, ①, ②, ③, &c.; Jupiter, ♃; Saturn, ♄; Uranus, ♅; Neptune, ♆; the Sun, ☉; the Moon, ☾.

For a TABLE of the periods, distances, size, density, &c., of the planets, see SOLAR SYSTEM.

PLANT, a living organic being, destitute of any indication of mind or feeling, and sometimes defined as essentially differing from an animal in the want of voluntary motion. Plants are the organisms which form the *vegetable kingdom;* the science which treats of them is Botany (q. v.). Plants of higher organization can never be mistaken for animals, nor animals of higher organization for plants. But there is no regular ascending and descending scale of organisms, from the highest animal to the lowest plant; instead we find a widely-extended base from which the ascent seems to begin at once in both the organic kingdoms, with many ramifications in each; and in the case of the lowest groups of either kingdom, it is sometimes difficult to discern the difference between plants and animals. The difficulty may be owing to our ignorance and incapacity of proper observation.

Something which resembles the voluntary motion of animals is to be seen in some plants, in various phenomena of Irritability (q. v.); and there is even locomotion in the vegetable kingdom wonderfully simulating voluntary locomotion, a provision of nature for the diffusion of some of the lower vegetable organisms; the *Gonidia* (q. v.) of Algæ and the *Spermatozoidia* (q. v.) of some other cryptogamous orders moving in a surrounding fluid by means of cilia, so that they have often been mistaken for animalcules. But no motion which can really be deemed voluntary takes place in the vegetable kingdom; and no animal, certainly to be pronounced such, fails to exhibit it—even when there is no power whatever of locomotion—in the prehension of food, or for some of the purposes of life.

The general laws which govern life prevail in plants as in animals. There are organs of nutrition and organs of reproduction; the whole being made up of organs, and every organ destined to maintain the existence either of the individual or of the race. But there is nothing in plants corresponding to the mouth, stomach, and alimentary canal of animals. Nutrition takes place in a different manner; assimilation being effected by a process very unlike that of digestion in animals. There are, however, animals destitute of a mouth, stomach, and alimentary canal; so that the distinction between plants and animals cannot be stated so absolutely in this respect as in respect to voluntary motion; and as there are many plants which have no roots, nutrition by means of roots, although peculiar to the vegetable kingdom, is not its distinguishing characteristic. The nutriment of plants is derived either by their roots from the soil (see ROOT), or through the integuments of their other parts from the air or water in which they live; and all their nutriment is either liquid or gaseous, being taken up in the former case by Endosmose (q. v.), and in the latter case through *Stomata* (q. v.). Many plants, and among them the greater number of phanerogamous plants, owe their nourishment both to the soil and to the atmosphere, their roots deriving it from the former, and the Leaves (q. v.) of plants that have leaves being the principal organs by which they derive it from the latter. When leaves are wanting, the integument of the parts exposed to the air performs the functions ordinarily assigned to them. Solid matter cannot be appropriated by plants until it has been dissolved in water, or decomposed. See MANURE and SOIL.

The nutriment appropriated by the plant is not assimilated until it has undergone chemical changes, which sometimes take place entirely within the very cell through the integument of which it has entered, some of the lowest kinds of plants consisting altogether only of a single cell; but which in other plants of higher and more complex organization, depend upon a Circulation of the Sap (q. v.), and a very various action of many different organs, each formed of a multitude of cells. These processes are still very imperfectly understood. By them, not only is the plant nourished, but vegetable products of every kind are elaborated, in which, throughout the wide domains of the vegetable kingdom, there is such wonderful variety, and often great diversity in different parts of the same plant.

Whatever the source from which plants derive their nutriment, no organic substance is appropriated by them; but in order to their use, it must first undergo decomposition. Their food consists wholly of inorganic matter, and the value of organic substances as manures depends not only on the abundance which they contain of the proper elements, but of the readiness with which they undergo decomposition so as to present these elements in the most suitable form; which is not, however, as elements uncombined, but in various combinations with each other. Thus carbon and oxygen enter plants together in the form of carbonic acid, oxygen and hydrogen together in the form of water, hydrogen and nitrogen in the form of ammonia. Carbonic acid absorbed by the leaves from the air is decomposed within the plant, under the influence of light, and particularly of the direct rays of the sun, and its carbon enters into new combinations to form vegetable substances, whilst its oxygen is exhaled again into the atmosphere, which is thus maintained in a state fit for the support both of vegetable and animal life by the opposite and balanced action of animals and plants.

Of the elements which enter into the composition of vegetable substances, Carbon is the most abundant; and, along with it, Oxygen, Hydrogen, and Nitrogen constitute the chief part of every plant. Other elements, both metallic and non-metallic, are found in comparatively small quantity, although some of them are very generally present in plants, as Calcium, Potassium, Sodium, Sulphur, Phosphorus, Silicon, Iron, Aluminium, Magnesium, Chlorine, and Iodine. Among the elements found in plants are also to be enumerated Bromine, Manganese, and Copper, which occur only in minute quantities, and Copper very rarely.

There is no circulation in plants like that of the blood in animals, nor any organ at all analogous to a heart; although there is a constant motion or circulation of their juices, both throughout the whole organism and within individual cells. And although the term *respiration* has been often employed with reference to plants, and particularly to leaves, yet there is not only no action analagous to that of lungs, but no oxygenation of the juices by their being brought into contact with the air; carbonic acid and ammonia—not oxygen—being imbibed from it for nutrition. And there is nothing in the vegetable kingdom having the slightest resemblance to a brain or a nervous system. In the possession of sexual organs, however, there is a wonderful agreement, where it might least have been expected, between plants—or at least all phanerogamous plants—and animals. As to this and other important points concerning the life of plants, see VEGETABLE PHYSIOLOGY. See also the article FLOWER, and those on the different organs of which the flower is made up; the articles FRUIT, SEED, SPORE; CELLS, CELLULAR TISSUE, VASCULAR TISSUE; METAMORPHOSIS OF ORGANS; LEAVES; STEM, &c. The great divisions of the vegetable kingdom are noticed in the article BOTANY, in connection with the subject of classification, and in separate articles. The GEOGRAPHICAL DISTRIBUTION OF PLANTS, and the DISEASES OF PLANTS, are noticed under these heads.

Besides the relations of the animal and vegetable kingdoms already noticed in this article, in their joint and balanced action, keeping the constitution of the atmosphere such as is fit both for animal and vegetable life, reference may be here made, in conclusion, to similar relations subsisting in plants and animals as to temperature and as to their mutually providing food for one another. 'It would almost seem as if plants possessed a power of producing cold analagous to that exhibited by animals in producing heat, and of this beneficent arrangement man enjoys the benefit in the luxurious coolness of the fruit which nature lavishes on the tropics' (Sir J. E. Tennent). Flowers indeed produce heat; but the juices of plants are colder than the soil or surrounding atmosphere during the time of active vegetation; and the coolness of groves is owing not only to shade but to the transpiration of moisture by the innumerable leaves.—Inorganic substances are appropriated by plants, as food, and converted by a 'high and mysterious' chemistry into organic substances of many kinds, many of them suitable food for animals, which feed on organic substances alone. But the excrements of animals again furnish food for plants; and when animals die, their bodies undergo a series of changes by decomposition, which terminate in the production of the substances most suitable for the nourishment of plants. There is, moreover, not only this conversion of the same matter into animal and vegetable substances alternately; but

there is also a continual transformation of matter which has remained inorganic throughout long geologic periods into organic substances, and in this some of the lowest kinds of plants are particularly employed, as lichens, which decompose and feed upon the very rocks on which they grow; whilst, on the other hand, the fossil remains of remote periods, are all the products of decomposition, exhibit matter which once formed part of living organisms returned to an inorganic state.

PLANTA'GENET, the surname of the French family of Anjou, which, in 1154, succeeded to the throne of England on the extinction of the Norman dynasty in the male line, and reigned till 1485, when it was supplanted by the family of TUDOR (q. v.). The name P. belonged originally to the House of Anjou, and is said by antiquarians to have been derived from the circumstance of the first count of this house having caused himself to be scourged with branches of broom (*planta-genista*), as a penance for some crime he had committed. On the extinction of the male line of the Norman dynasty in the person of Henry I., the crown of England was claimed by Stephen, count of Blois, the son of Henry's sister Adela, or Adeliza, and by Henry's own daughter Matilda ('the Empress Maud'), then the wife of Geoffrey P., Count of Anjou, for her son Henry Plantagenet. Stephen, by favor of the nobles, was the successful competitor, on the condition that Henry should succeed him; and accordingly on Stephen's death, in 1154, the son of Geoffrey P. ascended the throne of England as Henry II. His sons Richard I. and John succeeded him, and the descendants of the latter in the direct male line—viz., Henry III., Edward I., Edward II., Edward III., and (Edward III.'s eldest son, the Black Prince, having died before his father, leaving an only son, who as) Richard II.—succeeded without interruption. The eldest male line now became extinct, and it was necessary to choose the rightful heir to the throne from among the descendants of Edward III.'s other sons. His second son had died without heirs, but Lionel, Duke of Clarence; John of Gaunt, Duke of Lancaster; and Edmund Langley, Duke of York, his third, fourth, and fifth sons respectively, were still represented by legitimate issue. Of these, Edmund Mortimer, Earl of March, and Anne Mortimer, the wife of Richard, Earl of Cambridge (who was the eldest son and heir of Edmund Langley, Duke of York), the lineal descendants of Lionel of Clarence, possessed the prior claim to the throne; but Edmund was put in prison by Henry IV., the eldest son of John of Gaunt, Duke of Lancaster, who usurped the crown in 1399, and transmitted it to his lineal descendants Henry V. and Henry VI.

By this time Edmund Mortimer had died without heirs, and the descendants of the marriage of his sister Anne (the heiress of Clarence) with Richard, Earl of Cambridge (the heir of York), uniting the claims of the *third* and *fifth* sons, had, through their maternal ancestress, a superior claim to the throne over Henry VI. the Lancastrian monarch, who only represented the *fourth* son of Edward III. Richard Duke of York, the son of Richard of Cambridge and Anne Mortimer, attempted to obtain the crown, but he was taken and executed, leaving to his sons the task of avenging his death, and asserting the claims of the combined house of York and Clarence to the throne, in which they were ably assisted by Richard Neville, Earl of Warwick ('the King-maker'). The result was a long and desolating civil war (1455—1485) between the partisans of York and Lancaster, which is known in history as the 'Wars of the Roses' (the Lancastrians having chosen for their emblem a *red* and the Yorkists a *white* rose), in which more than 100,000 persons perished, and many noble families were either extirpated on the field and the scaffold, or completely ruined. During this dreadful contest in which the Yorkists generally had the advantage, Edward IV. (the eldest son of the Duke of York who had been executed), his son Edward V., and his brother Richard III. (q. v.) successively swayed the sceptre. But Richard's cruel and tyrannical government added new vigor to the reviving Lancastrians, and Henry Tudor (see HENRY VII.), the representative of their claims, defeated the Yorkist tyrant on the field of Bosworth; and then, by his marriage with Elizabeth, the eldest daughter of Edward IV., and the representative of the Yorkist claims, reunited in his family the conflicting pretensions to the throne, which he transmitted in peace to his descendants. See TUDOR; and for the events of this contest, see ROSES, WARS OF THE.

PLANTAGI'NEÆ, or PLANTAGINA'CEÆ, a natural order of exogenous plants, mostly herbaceous and without stems; the leaves forming rosettes, flat and ribbed, or taper and fleshy; the flowers generally in spikes, and generally hermaphrodite; the calyx 4-parted, persistent; the corolla hypogynous, membranous, persistent, its limb 4-parted; the stamens four, inserted into the corolla, with long filaments; the ovary free, of a single carpel, 1—4 celled; the cells containing one, two, or many ovules; the fruit, a membranous capsule with a lid. The *testa* of the seeds abounds in mucilage, which is easily extracted by boiling water. The order is allied to *Plumbagineæ* and *Primulaceæ*. There are about 120 known species, diffused over all parts of the globe, but most abundant in temperate and cold countries. The most important genus is *Plantago*, the species of which often receive the English name PLANTAIN. Five of this genus are found in the United Kingdom, the chief of which are the following: the GREATER PLANTAIN, or WAYBREAD (*P. major*), one of the most common of British plants; a perennial, with broad ovate stalked leaves and long cylindrical spikes, growing in pastures, waysides, &c. It is very widely diffused over the world. Its seeds



Greater Plantain (*Plantago major*).

are a favorite food of birds, and the gathering of the spikes to feed cage-birds is familiar to every one. The leaves are applied to wounds by the peasantry in many districts. They are said also to be a useful application to ulcers and indolent scrofulous tumors.—The RIBWORT PLANTAIN, or RIBGRASS (*P. lanceolata*), is another very common British plant, forming no small part of the herbage of many meadows and pastures, and sometimes sown by farmers, because its foliage is produced early in the season, and is then acceptable to oxen, sheep, and horses; but deemed most suitable for poor soils, as its spreading leaves occupy too much of the ground, and choke better grasses in rich land. Its leaves are lanceolate, and taper at both ends; its spikes are short, ovate or cylindrical, and placed on long angular stalks. Its seed is acceptable to cage-birds.

This is the plant commonly known as 'bullies,' or 'sodgers,' the striking off the heads (or spikes) of which is such a favorite amusement of children.—The mucilage of the seeds of *Plantago ispaghula* and of *P. psyllium* is much used in India in catarrhs and other complaints; and *P. psyllium*—called FLEAWORT, and its seeds FLEASEED—is cultivated in France for the sake of this mucilage, which is used by paper-stainers in preference to that obtained from linseed, and is also extensively used by muslin manufacturers for stiffening their goods. The plant has a branched spreading stem, and recurved leaves.

PLA'NTAIN (*Musa Paradisaica*), a most important food-plant of tropical countries, and one of the largest of herbaceous plants, belongs to the natural order *Musaceæ* (q. v.), and is a native of the East Indies, where numberless varieties of it have been cultivated for thousands of years. It is now diffused over all the tropical and subtropical regions of the globe. It must have been carried to America soon after or during the days of Columbus, for its fruit was a principal article of food there in the first half of the 16th c.; but there is nothing to support the conjecture of Humboldt that there may be different species cultivated under the name of P., and some of them natives of America. The P. is now, however, cultivated to the furthest depths of the primeval American forests, accompanies the Indians in their frequent changes of residence, forms the wealth of many occupiers of land in the vicinity of great towns, where large plantations of it are made, and is a true staff of life to the population of all colors and classes in tropical countries. In many regions it is the principal article of food.

In the genus *Musa* there arise from the midst of the leaves—or apparently from the top of the stem, the sheathing bases of the leaves forming a tree-like false stem—stalks which bear great spikes of flowers, each enclosed in a large bract or spathe; the flowers, and afterwards the fruit, are arranged in clusters or almost in whorls on the stalk; the flowers have a perianth of six

segments, five of which cohere as a tube slit at the back, and the sixth is small and concave; there are six stamens, one or more of them imperfect; the germen is inferior, 3-celled, with two rows of ovules in each cell; the fruit is fleshy, and has many seeds imbedded in its pulp. The name *Musa* is from the Arabic *moz*, a plantain; the P. seems to be described by Pliny under the name *pala*, a name probably derived from an eastern root, from which also comes the name *plantain*. The specific name *Paradisaica* alludes either to a fancy that the P. was the forbidden fruit of Eden, or to a legend that the aprons which our first parents made for themselves were of P. leaves.

The stem of the P. is usually 15 or 20 feet high, although there are varieties having a stem of only six feet. The leaves are very large, the blade being sometimes ten feet long and three feet broad, undivided, of a beautiful shining green; the midrib strong and fleshy. The fruit is oblong, varying from its usual long shape to an almost spherical one, obscurely angular, eight inches to a foot long in the varieties commonly known by the name P., of which the fruit is usually cooked or prepared in some way in order to be eaten, and very often forms a substitute for bread; whilst the smaller-fruited varieties, of which the fruit is eaten raw, are generally known by the name Banana (q. v.); these names, however, being somewhat variously used.

The P. is generally propagated by suckers; and a sucker attains maturity in about eight months or a year after being planted. The stem is cut down after fruiting, but the plantation does not require renewal for 15 or 20 years. Plantains ought to be at least ten feet apart in plantations of them, or six feet in single rows around fields or gardens. The P. has been sometimes cultivated with success in hothouses.

With the exception of two or three palms, it would not be easy to name, in the whole vegetable kingdom, any plant which is applied to a greater number of uses than the plantain. The fruit is sometimes eaten raw, although more generally—except that of the banana—boiled or roasted, and variously prepared. It is both farinaceous and saccharine. In most of the varieties it has a sweetish taste; in some it is mealy; and in some it is sub-acid or austere. It is as much used before being perfectly ripe as when it is so. In the West Indies the P. boiled and beaten in a mortar is a common food of the negroes. Plantains baked in their skins, or fried in slices with butter and powdered over with sugar, are favorite dishes in some tropical countries. They are preserved by drying in the sun or in ovens, and pressed into masses, in which state they keep for years, and furnish a wholesome article of food. The unripe fruit, peeled, sliced, dried, and powdered, is called *P. meal*, and in Guiana *Conquin-tay;* it is whitish with dark-red specks, a fragrance like orris-root, and a taste like wheat-flour; and is made into excellent and nourishing dishes. A good and wholesome starch is obtained from the P., by rasping and washing.—A decoction of the fruit is a common beverage; and a kind of wine is obtained from it by fermentation.—The top of the stalk is a good boiled vegetable.—The leaves are much used for packing, and many other purposes; the fibre of their stalks is used for textile purposes and for cordage; and it is probable that it might be used for paper-making; but hitherto the leaves and stems of plantains have been generally burned or left to rot.

So great is the food produce of the P., that, according to Humboldt's calculation, it is to that of the potato as 44 to 1, and to that of wheat as 133 to 1. The P. requires little attention.

The name P. is frequently extended to the whole genus *Musa*. Wild species, with austere fruit, are found in many parts of the East. One ascends the Himalayas to an elevation of 6500 feet. A species found in the South Sea Islands (*M. troglodytarum*) is remarkable for bearing its clusters of fruit erect, not pendent like the other species. Its fruit is eatable, as is that of *M. Cavendishii* and of *M. Chinensis*, species or varieties smaller than the common plantain.—The *Musa* which is extensively cultivated in the Philippine Islands for its fibre, *Abaca* or *Manilla Hemp*, is very similar to the common P., but has a green, hard, and austere fruit. It is generally cut when about a year and a half old, before flowering. The outer layers of the stem yield the coarsest fibre; that of the inner is so fine that a garment made of it may be enclosed in the hollow of the hand.—The young stems of *M. Ensete*, the ENSETE of Abyssinia, are used in that country as a boiled esculent.

PLANTAIN-EATER (*Musophaga*), a genus of birds of the family *Musophagidæ*, to the whole of which the same English name is often extended. The *Musophagidæ* are tropical birds, African and South American, of the order *Insessores* and tribe *Conirostres*, allied to finches, but many of them large, and more like gallinaceous birds than finches. They are birds of beautiful plumage. They have strong thick bills, more or less curved on the top, the cutting edges jagged or finely serrated, so as to render them very efficient instruments for cutting soft vegetable substances, on which they feed, as the plantain and other fruits, and for dividing the succulent stems of plants, which they cut off close to the ground. They live much among the boughs of trees, and are active and wary birds. The true plantain-eaters (*Musophaga*) have the base of the bill extending upon the forehead; the TOURACOS (*Corythaix*) have a smaller bill, and the head crested.

PLANTA'TION, a term sometimes applied to places where timber trees have been planted. In that sense, as a general rule, whoever is the owner of the soil, is entitled to the trees which are planted in such soil. When land is let by lease to a tenant, the tenant does not become the owner of the trees, and cannot cut them down. But he is in England and Ireland entitled to reasonable estovers; that is, to cut sufficient wood to repair or build the houses, or make implements of husbandry. The common law of England was very defective in protecting plantations, for it was held that, as the trees were part of the realty, or soil, and nobody could steal the soil, hence nobody could be punished for larceny of trees. But this defect was cured by statute. Whoever cuts, breaks, roots up, or otherwise destroys or damages, with intent to steal, the whole or any part of a tree, sapling, or shrub, if the damage is of the amount of one shilling, may be convicted summarily, before justices of the peace, and fined £5; for a second offence, he may be committed to the house of correction for twelve months or less; and for a third offence, he is guilty of felony, and may be punished as for larceny. So, whoever steals or damages a live fence, may be fined by justices a sum of £5; and for a second offence, may be committed to the house of correction for twelve months. Moreover, if any person is found in possession of a piece of a tree or live fence, and do not give a proper account of his coming into lawful possession of the same, he may be fined £2.—In Scotland, various acts of the Scotch parliament were directed against offences of damaging trees, which are punishable as malicious mischief; the penalty being £10 Scots for each tree less than ten years old, and £20 Scots for each older tree. Tenants may also be fined for such offences. In case of injuries to fences, old Scotch statutes also provide a punishment.

PLANTATION AND PLANTING OF TREES. See ARBORICULTURE.

PLANTIGRA'DA, in Cuvier's zoological system, a tribe of *Carnivora* (q. v.) characterized by placing the whole sole of the foot on the ground in walking. The sole is generally destitute of hair. Both fore and hind feet are five-toed in all the plantigrada. The P. are generally more or less nocturnal in their mode of life, and their movements are slower and their gait more clumsy than those of the *Digitigrada*. They are also, in general, less carnivorous; many of them feed in part or occasionally on vegetable food. The conformation of their limbs and feet gives them a power of standing erect on their hind feet, which none of the *Digitigrada* naturally possess, and of which advantage is taken in tame bears for the amusement of spectators.



Plantigrade Foot.

PLANTIN, CHRISTOPHE, an eminent printer, was born at St. Avertin, near Tours, in 1514, and set up a printing establishment at Antwerp in 1550, which soon became the greatest and most celebrated of the time. He had often twenty presses or more in active operation. Guicciardini mentions his printing-establishment as the finest ornament of the city of Antwerp, and as one of the wonders of Europe, and the learned agreed in regarding him as the first printer of his time, although he was the contemporary of Aldus and Estienne (Stephens); but this is true only as regards the number of works which issued from his establishment, and the beauty of their typography; for the services which the others have rendered to classic literature are far beyond those of Plantin.

P. was nevertheless himself a man of varied, though probably not very profound learning. He superintended the publication of works in several languages, and was extremely careful of their accuracy, employing able and learned correctors of the press, whom he remunerated liberally, and publicly offering rewards for the discovery of errors. The most noted of all his publications is the *Biblia Polyglotta* (8 vols. 1569—1572), which was printed under the personal superintendence of Arias Montanus, the court chaplain of Philip II. of Spain, and towards which, Philip gave 6000 ducats for the purchase of paper. But the oldest book known to have proceeded from the press of P. is the *Institution d'une Fille de Noble Maison, traduite de Langue Toscane en François*, by Jean Beller (Ant. 1555). P. died at Antwerp in 1589. He had set up printing-establishments in Leyden and Paris, and these, with that in Antwerp, were carried on by the husbands of his three daughters.

PLANTS, in point of law, when put in a garden or other ground let to a tenant, belong to the landlord, and not to the tenant, for they become part of the soil. Hence, a tenant cannot

dig them up and remove them, at the termination of his lease. This right of the landlord, however, is seldom enforced with much strictness, partly because the tenant may alter and remove the plants at discretion during his lease, and thus can evade the rule of law. In the case of nursery-grounds, however, the above rule does not apply, as between landlord and tenant, for the plants are considered the stock-in-trade of the nurseryman, who puts them in the ground, not with a view to let them grow permanently, but as a convenient mode of keeping them for sale. Hence, at the termination of his lease, the tenant can remove them all.

PLANU'DÉS, MAXIMUS. See ANTHOLOGY.

PLASEN'CIA, an ancient and much-decayed, but most picturesque town of Spain, in Estremadura, 43 miles north-north-east of Caceres, stands on a steep hill, with beautiful and fertile valleys, extending on the north-west and south-east sides. It is almost wholly girdled by the clear waters of the Jerte; and the surrounding scenery, embracing city, castle, river, rock, and mountain, and over-arched by a sunny and unclouded sky, is remarkably beautiful. The city contains the picturesque remains of an ancient castle, and is surrounded by crumbling walls, surmounted by 68 towers, and pierced by six gates. Water is brought to the town by an aqueduct of 80 arches. There are seven Gothic churches, and episcopal and several other palaces, and the cathedral, an ornate Gothic edifice, begun in 1498, and some portions of which are still unfinished, while others have been altered and disfigured. The cathedral contains many noble tombs, with effigies. P., once a flourishing and important city, was founded in 1190. It now carries on some minor manufactures of cotton, woollen, and hempen fabrics, and of hats and leather. Pop. (1877) 7090.

PLA'SMA, a silicious mineral, a variety of quartz or chalcedony, of a dark-green color, black when unpolished and seen by reflected light, but very translucent when held between the eye and the light. It is very nearly allied to heliotrope or bloodstone, but has no red spots, is more translucent, and is not susceptible of so brilliant a polish. It is never found crystallized. It is a rare mineral, and the finest specimens are brought from India and China. It was highly prized by the ancient Romans, who wrought it into ornaments of various kinds; and very fine engraved specimens have been found among the ruins of ancient Rome. The ancients are said to have obtained their plasma from Mount Olympus, in Asia Minor. The name plasma is supposed to be identical with the Greek *prason*, a leek, the *r* having passed into *l*.

PLASSEY (*Palási*), a battlefield on the Bhágirathi River, 96 miles north of Calcutta. The river has now eaten away the scene of the struggle. P. is celebrated in the history of India for the great victory gained by Clive (q. v.) over Suraja Dowlah, subahdar of Bengal, 23d June 1757, a victory which really laid the foundation of British supremacy in India. The British force at the battle of P. consisted of 1000 British troops and 2000 sepoys. The subahdar's force consisted of 15,000 cavalry and 35,000 infantry, with 40 French artillerymen, and 50 large cannon.

PLASTER OF PARIS. See GYPSUM.

PLA'STERING, the art of covering walls, partitions, ceilings, &c., with a composition of lime mixed with sand and hair. It is usually done in three coats. The first coat is the solid foundation on which the rest is placed; it is therefore of a good thickness, and is hatched or crossed with lines, so as to give a bond for the next coat. The first coat is allowed to dry thoroughly; then the second coat is floated over the first, and rubbed well in with a flat board, about 12 inches square, so as to bring it all to a fair and equal surface (in Scotland this is called the 'straightening'); and before the second coat has thoroughly dried, the third or finishing coat is applied in finer materials, and in a more liquid state. In the case of ceiling cornices, mouldings, &c., plaster of Paris or stucco is generally used. This sets or hardens more rapidly than lime, and has a finer and whiter surface. Ornaments (called enrichments) are generally composed of plaster of Paris, and cast in moulds. They are then set in their places after the cornice has been made, or *run*.

PLASTERS are a class of medicinal agents which are employed externally with various objects. They are solid and tenacious compounds, adhesive at the ordinary temperature of the body, and owing their consistency—1. To the chemical combination of oxide of lead, with one or more fatty acids; or, 2, to a due admixture of wax, or fat, and resin; or, 3, to the chemical action of the component parts of the plaster on each other. Strictly speaking, the term *Plaster* should be restricted to the first class of compounds; viz., to combination of oxide of lead with fatty acids. In the British Pharmacopœia, there are directions for making 12 plasters, viz., ammoniac and mercury plaster, Belladonna plaster, cantharides plaster, chalybeate plaster, galbanum plaster, litharge (or lead) plaster, mercurial plaster, opium plaster, pitch plaster, resin plaster, soap plaster, and warm plaster.

The litharge (or lead) plaster, directly or indirectly enters into the composition of all the twelve officinal plasters, excepting those of ammoniac and mercury, cantharides, and pitch. *Lead Plaster*, which is usually sold under the name of *Diachylon*, in combination with resin, constitutes the ordinary *adhesive plaster*. The best plaster of this kind for strapping is composed of a mixture of six drachms of resin with a pound of lead plaster. The *cantharides plaster*, and the *ammoniac and mercury plaster*, are examples of the second and third varieties.

Plasters are generally kept in rolls; and when they are to be used, they are melted at a temperature of not more than 212°, and spread on soft leather. They are employed to answer two distinct indications, namely, to act *mechanically*, as by affording artificial support to weak muscular structures, by preventing threatened or tedious excoriations, by protecting parts already excoriated from the action of the air, &c.; and to act *medicinally* as stimulant, discutient, alterative, anodyne, &c.

PLA'TA, LA. See ARGENTINE REPUBLIC.

PLATA, RIO DE LA, a wide estuary of South America, between Uruguay on the north and the Argentine Confederation on the south, forms the mouth of the Parana (q. v.) and the Uruguay (q. v.) It is 200 miles long, 29 miles broad at Buenos Ayres, and 140 miles broad at its mouth, between Maldonado and Cape San Antonio. At its mouth it is, on an average, only about 10 fathoms deep; at Monte Video it is only 3 fathoms; and at Buenos Ayres about 16 feet deep. Some conception of the vast volume of water which this estuary carries to the Atlantic may be had when it is remembered that with its affluents it drains an area of 1,250,000 square miles. The strong and irregular currents, and the sudden tempests of the La P., render its navigation extremely dangerous. It is estimated that through this estuary about one-fourth of the produce of South America is brought to market. For the navigation of its affluents, see PARAGUAY, PARANA, and URUGUAY.

PLATÆ'A, or PLATÆÆ, a city in the western part of Bœotia, on the borders of Attica, at the foot of Mount Cithæron. It was about 6½ miles from Thebes. In 480 B.C., it was destroyed by the Persians, because the inhabitants had taken part with Athens in the battle of Marathon; but in the following year it was the scene of the glorious victory won by the Lacedæmonian Greeks, under Pausanias and Aristides, over the Persian hordes commanded by Mardonius—a victory that finally delivered Greece from the threatened yoke of the invader. In the third year of the Peloponnesian war (429 B.C.), it was attacked by a Theban-Lacedæmonian force—for the Platæans were firm friends of Athens—and heroically defended itself for more than two years, until it was starved into surrender. The little garrison of about 200 men were put to the sword, and the city was razed to the ground. Such of the Platæans as escaped were hospitably received at Athens. By the treaty of Antalcidas (387 B.C.), their children were allowed to go back again, and rebuild their city, after an exile of 40 years; but they were again driven out by their implacable enemies, the Thebans; and half a century elapsed before the victory of Philip of Macedon at Chæronica enabled the Platæans to finally return to their homes. After this, the city remained inhabited, probably till the latest days of the empire. It is mentioned in the 6th c. A.D. Some ruins of P. are still visible near the village of *Kokhla*.

PLATA'LEA. See SPOONBILL.

PLAT-BAND, in Architecture, a flat fascia or band, with less projection than breadth.

PLATE, in Heraldry, a Roundle (q. v.) argent. It is represented flat, and in the heraldry of Scotland is known as a *Bezant argent*.

PLATE-MARKS are legal impressions made on articles of gold or silver at the various assay offices, for the purpose of indicating the true value of the metal of which the articles are made. The marks are a series of symbols, which are embossed in a line of about three-quarters of an inch in length, and usually on every separate piece of which an article is composed. These symbols are—1. The maker's own mark or initials. 2. The standard or assay mark; viz., *for gold*, a crown, and figures denoting the number of carats fine. This means that pure gold is reckoned at 24 carats, and every part of alloy added reduces that standard number (see CARAT); so that if a piece of gold-plate or jewelry is marked with a crown and 18, it indicates that it consists of 18 parts of pure gold, and 6 parts of some other metal alloyed with it. Gold of nine carats is now legal, but as it is marked by the assay office, there can be no deception, if the public understand the plate marks. If not, they may pay for pure gold, relying upon the hall-mark, when they only receive about a third part gold. *For Silver*—England, a lion passant; Ireland, a harp crowned; Edinburgh, a thistle; Glasgow, a lion rampant. 3. The hall-mark of the district office—London, a leopard's head crowned; York, three lions and a cross; Exeter, a castle with two wings;

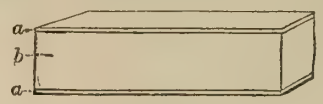
Chester, three wheat-sheaves or a dagger; Newcastle, three castles; Birmingham, an anchor; Sheffield, a crown; Edinburgh, a castle and lion; Glasgow, a tree, salmon, and ring; Dublin, the figure of Hibernia. 4. The duty-mark, indicating the payment of duty, viz., the head of the reigning sovereign. 5. Each office has also its alphabetical date-mark. In London, the assay year, which commences on the 30th May, is indicated by one of the first twenty letters of the alphabet.

The Goldsmiths' Company of London have marked thus:

From 1716 to 1756, Roman Capital Letters.
" 1756 " 1776, Roman Small Letters.
" 1776 " 1796, Old English Letters.
" 1796 " 1816, Roman Capital Letters A to U.
" 1816 " 1836, Roman Small Letters a to u.
" 1836 " 1856, Old English Letters 𝔄 to 𝔘.
" 1856 " 1876, Small Black Letters 𝔞 to 𝔲.
" 1876 onwards, Roman Capitals, distinguished from former series by shape of shield on which they are imprinted.

PLATE-POWDER, a composition used for cleaning gold and silver plate and plated articles. It is also called Rouge-powder (see ROUGE). It is made by levigating rouge with three times its weight of prepared chalk, until they are thoroughly mixed into an almost impalpable powder. Sometimes Putty-powder (q. v.) is used instead of rouge, and a little rose-pink added to color it. A plate-powder is also sometimes made by levigating quicksilver with twelve times its weight of prepared chalk, until it is thoroughly incorporated, and forms a gray powder. It puts a remarkable brilliancy on silver-pate, but is very injurious to it.

PLATING signifies the covering of an inferior metal with one of the precious metals, the object being to give the appearance of silver or gold to articles chiefly intended for table use. At present the articles are generally made of German silver, or some of the similar white-metal alloys; but formerly, copper, or an alloy of that metal with brass, was used; the disadvantage of which was that, as the coating of silver wore off, the red color of the copper became disagreeably apparent through the thin covering of silver. Gold is rarely plated on any other metal than silver, except for purposes of deception. Previous to the introduction of electro-plating, the method generally pursued was that which has acquired the name of *Sheffield-plating*, from the large extent to which it was carried on in that town. It consists in soldering on to one or both sides of an ingot of the baser metal, a thin plate of silver. The ingot is always of an oblong shape, and is most carefully prepared on the surfaces which are to receive the silver, so



that nothing shall prevent the complete union of the two. The shape and relative proportions of the ingot, and its plating of silver, are seen in the figure: *aa* is the silver on the upper and lower surfaces, for double-plated goods; *b*, the body of the ingot, of copper or white-metal alloy. The soldering is a process requiring much care and nicety: the plates of silver are thinly coated with a concentrated solution of borax, and are then applied to the prepared surfaces of the ingot, to which they are firmly bound with iron wire, and then placed in the *plating-furnace*, and subjected to a strong heat. This furnace is so arranged that the interior can be constantly watched, and whea the proper temperature is attained, the workman knows the exact instant to withdraw it.

The act of soldering is almost instantaneous, and fusion would immediately follow, if the ingot was not quickly withdrawn. When cooled, the wire is taken off, and the ingot is taken to the rolling-mill, where it is passed backwards and forwards, of course with the silver above and below, until it is rolled out into a sheet of the exact thickness required. However thin it may be made, it is found that the relative thickness between the ingot and its layers of silver is always the same. As usual in all cases of rolling or striking metal, annealing from time to time is necessary, to remove the brittleness which these operations cause.

This method does not admit of the manufacture of any portions such as ornameutal moulded borders, &c.; these had therefore to be formed separately of copper, and were coated by the process called *Silvering* (q. v.). Now, however, it is found better to make them of silver rolled thin, and fill them inside with lead, to give them solidity; by this plan is avoided the annoyance of the silver rubbing off, and exposing the copper. Sheffield-plating is still made extensively, but the manufacture is rapidly declining in presence of the newer art of electro-plating. See GALVANISM.

Within a very recent period, and since the subject of electro-plating was treated under the article GALVANISM, some very remarkable applications of the process have been discovered; for instance, it is no longer confined to the deposit of silver and gold; aluminium, silicium, titanium, tungsten, molybdenum, tin, cadmium, lead, bismuth, palladium, rhodium, iridium, and the alloys brass and bronze, are all now deposited under patent processes. Of all these, by far the most important is the deposit of the alloys, and a very large trade has sprung up in manufactures of iron coated with brass. The importance of being able to cover a metal so cheap, yet so easily corroded as cast iron, with so ornamental an alloy as brass or bronze, can hardly be overrated. Consequently the process is carried on very extensively and satisfactorily.

PLA'TINUM (Symb. Pt. equiv. 99—new system, 198—sp. gr. 21·5) is one of the 'noble metals,' which may be obtained in more forms than one. It is only found in the native state, usually occurring in small glistening granules of a steel-gray color, which always contain an admixture, in varying proportions, of several metals, most of which are rarely found except in association with platinum. Sometimes, however, it is found in masses of the size of a pigeon's egg, and pieces weighing ten or even twenty pounds have occasionally been found. The following table shows the composition of crude platinum ore as obtained from different parts of the globe. The analyses were conducted by Messrs. Deville and Debray.

	Columbia.	*California.*	*Oregon.*	*Spain.*	*Australia.*	*Russia.*
Platinum	80·00	79·85	81·45	45·70	59 80	77·50
Iridium	1 55	4·20	0·40	0 95	2·20	1·45
Rhodium.....	2·50	0·65	0·65	2·65	1·50	2·80
Palladium.....	1·00	1 95	0·15	0·85	1 50	0·85
Gold	1·50	0.55	0·85	3·15	2·40	...
Copper.....	0·65	0 75	2·15	1·05	1·10	2·15
Iron.....	7·20	4·45	4 30	6·80	4·30	9·60
Osmide of Iridium	1·40	4·95	37·30	2 85	25 00	2·35
Sand.....	4·35	2·60	3·00	35 95	1·20	1·00
Osmium and loss	....	0·05	....	0·05	0 80	2.30

Ruthenium is also almost always present, and in the above analyses is probably iucluded with the iridium, which it closely resembles.

There are two modes of obtaining platinum in the form of ingots from the ore, both of which require notice. The method which has been universally employed, till within the last five years, was that discovered by Wollaston, the leading steps of which were as follows: After the removal of the metals associated with the platinum, by the successive action of nitric and hydrochloric acids, the platinum itself is dissolved in aqua regia, from which it is precipitated by a solution of sal ammoniac in the form of a sparingly soluble double salt, the chloride of ammonium and platinum, represented by the formula $H_4NCl,PtCl_2$. This salt is washed and heated to redness, by which means the chlorine and ammonia are expelled, leaving the metal in the form of a gray, spongy, soft mass, known to chemists as *spongy platinum*. In this form, it is very finely powdered under water, is next shaped by intense pressure into a mass, and is then exposed to an intense heat in a wind-furnace, the ingot being formed by hammering it upon its two ends. (If hammered on its sides, it splits). This heating and forging must be repeated till the metal becomes homogeneous and ductile.

Deville and Debray have introduced an entirely new method for the extraction of platinum from its ores. They first form a fusible alloy of this metal with lead, by exposing the platinum ore—2 cwt. being used in a single experiment, with equal weights of galena and litharge gradually added, and a littie glass to act as a flux—to full redness in a reverberatory furnace lined with clay. The sulphur of the galena is oxidized and expelled, and the liquid alloy of lead and platinum is allowed to rest for some time, to allow the osmide of iridium, which is not affected by the preceding operations, to sink to the bottom. The upper portions of the alloy are then decanted, and cast into ingot-moulds, which are submitted to cupellation; and the metallic platinum which is left after the cupellation is melted and refined in a furnace of lime—which is employed in consequence of its being a very bad conductor of heat—by means of the oxyhydrogen blowpipe. The platinum obtained in this manner is nearly pure, and very ductile and malleable. For details regarding this process, which has been patented both in France and in this country, the reader is referred to the memoir, 'On Platinum and the Metals which accompany it,' in the *Annales de Chimie et de Physique* for August 1859.

Platinum as obtained by either of the above processes, exhibits a bluish-white metallic lustre; it is exceedingly malleable and ductile, and is very infusible, melting only before the oxyhydrogen blow-pipe, or in a very powerful blast-furnace, such as that used by Deville and Debray. It expands less by heat than any other metal, and is usually regarded as the heaviest form of matter yet known; but, according to Deville and Debray, osmium and iridium are about equally dense. It is unaffected by at-

mospheric action, and does not undergo oxidation in the air at even the highest temperatures. It is not acted on by nitric hydrochloric, sulphuric, or hydrofluoric acid, or in short, by any single acid; but in aqua regia it slowly dissolves, and forms a soluble bichloride. In consequence of its power of resisting the action of acids, it is of great service in experimental and manufacturing chemical processes, platinum spatulas, capsules, crucibles, &c., being employed in every laboratory; while platinum stills, weighing sometimes as much as one thousand ounces, are frequently used for concentrating oil of vitriol. Platinum is, however, corroded if heated with the alkalies or alkaline earths, and especially with a mixture of nitrate of potash and hydrated potash, an oxide being formed which combines with the alkaline bases.

The form of the metal known as *spongy platinum* has been already noticed. The metal may, however, be obtained in a state of subdivision much finer than that in which it is left on heating the double chloride of platinum and ammonium—namely, in the state known as *Platinum Black*. In this form it resembles soot. It may be prepared in various ways, of which one of the simplest is to boil a solution of bichloride of platinum, to which an excess of carbonate of soda and a quantity of sugar have been added, until the precipitate formed after a little time becomes perfectly black, and the supernatant liquid colorless. The black powder is then collected on a filter, washed, and dried by a gentle heat.

In its finely comminuted state, either as spongy platinum or platinum black, it possesses a remarkable power of condensing and absorbing gases, one volume of platinum black being able to absorb more than 100 volumes of oxygen. This absorption appears to be accompanied by a conversion of some or all of the oxygen into the modification known as Ozone (q. v.), since the metal becomes capable of exerting the most energetic oxidizing action, even at ordinary temperatures. For example, it can cause the combustion of a jet of hydrogen, can oxidize sulphurous acid into sulphuric acid, ammonia into nitric acid, and alcohol into acetic acid, the rise of temperature in the last case being often sufficiently great to cause inflammation. Platinum in the compact form, as foil or wire, possesses similar powers, but in a far lower degree.

Platinum may be easily alloyed with most of the metals, the alloys being in general much more fusible than pure platinum. Hence care must be taken not to heat the oxides of metals of easy reduction, such as lead and bismuth, in platinum crucibles, as, if any reduction took place, the crucible would be destroyed by the fusion of the resulting alloy. An alloy of platinum, iridium, and rhodium is found, by the investigations of Deville and Debray, to be harder, and capable of resisting a higher temperature than the pure metal; and hence is admirably adapted for the formation of crucibles, &c.

There are two *oxides* of platinum, a protoxide, PtO, and a binoxide, PtO_2, neither of which can be formed by the direct union of the elements. Excepting that the change which platinum vessels undergo when containing the caustic alkalies, &c. and exposed to a red heat, is due to the formation of a superficial layer of oxide (probably binoxide), these compounds are of little interest. The *sulphides* and *chlorides* correspond in number and composition to the oxides. Of these compounds, the bichloride ($PtCl_2$) alone requires notice. It is formed by dissolving platinum in aqua regia, and evaporating the solution to dryness; and it is obtained as a deliquescent, reddish-brown mass, which forms an orange-colored solution in water, from which, on evaporation, it crystallizes in prisms. It is also freely soluble in alcohol and ether. A solution of this salt is much used for the recognition and determination of potash and ammonia.

By the action of ammonia on protochloride of platinum (which is obtained by heating a solution of the bichloride to a temperature of 450°), several remarkable compounds are formed, which possess strong basic characters, and are of great interest in a theoretical point of view, such as Platosamine (PtH_3NO), Platinamine (PtH_3NO_2), &c.

PLA'TO, who, along with Aristotle, represents to modern Europe the whole compass of Greek speculation, was born at Athens in the year 429 B.C., shorly after the commencement of the Peloponnesian war, and the same year in which Pericles died. He was of a good family—being connected, on the mother's side, with Solon; and on the father's side, with Codrus, one of the ancient kings of Athens. He received a good education, according to the common practice of the Greeks, in music, gymnastics, and literature. His rich and gorgeous imagination is said at first to have essayed its powers in poetry; but when about 20 years of age, having become acquainted with Socrates, he threw all his verses into the fire, and consecrated his great intellect to philosophy. When he was 20 years old, the political troubles, of which the death of Socrates was only one terrible symptom, forced him to leave Athens for a season, and he resided at Megara, with Euclid, the founder of the Megaric sect. The disturbed state of his native country, doubtless, also was one cause of the frequent travels which he is reported to have made. Of these, his three visits to Sicily, during the time of the elder and younger Dionysius, are are the most celebrated and the best authenticated. That he visited Italy, is extremely probable; at all events, he was most closely connected with Archytas and the Pythagorean philosophers; though, as Aristotle (*Metaph.* i. 6) justly remarks, he borrowed from Heracleitus as well as from Pythagoras, and put a stamp of freshness and originality on all that he borrowed.

After returning from his first visit to Sicily, being then in his fortieth year, he commenced teaching philosophy publicly, in the Academeia, a pleasant garden in the most beautiful suburb of Athens, and there gathered around him a large school of distinguished followers, who maintained a regular succession after his death, under the name of the Philosophers of the Academy. He lived to the age of 82; was never married; and must have possessed some independent property, as he expresses himself strongly against teaching philosophy for fees, and we nowhere read of his having held any public office from which he could have derived emolument. Such are the few reliable facts known as to the life of Plato.

The principles of his philosophy are happily better known; for all his great works have been preserved, and have always been extensively read wherever the Greek language was known. The only danger to which the students of his philosophy have been exposed is the confusion of the doctrines distinctly taught by him with the exaggeration of these as afterwards worked out by the Neo-Platonists of Alexandria; but this is a danger which the exact critical scholarship of modern times has put out of the way for all persons who exercise common precaution in the acquisition of knowledge. The distinctive character of the Platonic philosophy is expressed by the word idealism, as opposed to realism, materialism, or sensationalism, using these words in their most general and least technical sense, the capacity of forming and using ideas being taken as an essential virtue or quality of mind, as contrasted with matter; of thought as contrasted with sensation; of the internal forces of individuals and of the universe, as contrasted with the external forms by which these forces are manifested.

As such, the ideal philosophy stands generally opposed to that kind of mental action which draws its stores principally from without, and is not strongly determined to mould the materials thus received by any type of thought or hue of emotion derived from within. In other words, the philosophy of P. is essentially a poetical and an artistical philosophy; for poetry, painting, and music all grow out of idealism, or those lofty inborn conceptions by which genius is distinguished from talent. It is also, at the same time, a scientific philosophy, for the purest science, as mathematics—on which P. is well known to have placed the highest value—is a science of mere ideas or forms conditioned by the intellect which deduces their laws; and, above all, it is essentially a moral and a theological philosophy, for practice or action, is the highest aim of man, and morality is the ideal of action; and God, as cause of all, is the ideal of ideals, the supreme power, virtue, and excellence to which all contemplation recurs, and from which all action and original energy proceed. The distinctive excellence of the Platonic philosophy is identical with its distinctive character, and consists in that grand union of abstract thought, imaginative decoration, emotional purity, and noble activity, which is the model of a complete and richly endowed humanity. The poetical element in P., so wonderfully combined with the analytical, shows itself not only in those gorgeous myths which form the peroration of some of his profoundest dialogues, but in that very dialogic form itself, of which the situation is often extremely dramatic; though this form of philosophic discussion perhaps owes its existence more to the lively temper and out-of-door habits of the Greeks, than to the special dramatic talent of Plato.

On the other hand, the defects of the Platonic philosophy arise from its essential one-sidedness, as a polemical assertion of the rights of thought against the claims of the mere senses, of the stability of the eternal type against the constant change that characterizes the ephemeral form. In his zeal to submit all that is external to the imperatorial power of internal conception, the philosopher of ideas is apt to forget the obstinate and unpliable nature of that external world which he would regulate, and after projecting a grand new scheme of society, according to what appears a perfect model, shows like the architect who, after drawing out the model of a marble temple, finds he has only bricks to build it with. For this reason, extremely practical men, and those who are compelled to reason chiefly by an extensive induction from external facts, have ever felt an instinctive aversion to the Platonic philosophy; and P. himself, by some of the strange and startling conclusions, in matters of social science, to which his ideal philosophy led, has, it must be confessed, put into the hands of his adversaries the most efficient weapons by which his ideal system may be combated.

The starting-point of the Platonic philosophy, as, indeed, it must be of all philosophy, properly so called, is the theory of knowledge. This is set forth in the *Theætetus*, the *Sophistes*, and the *Parmenides;* and in the *Cratylus*, the foundations are laid for a science of language, as the necessary product of a creature energizing by ideas. The Platonic theory of knowledge, as developed in the *Theætetus*, will be most readily understood by imagining the very reverse of that which is vulgarly attributed to Locke; viz., by drawing a strong and well-marked line between the province of thought and that of sensation in the production of ideas, and taking care that, in the process of forming conceptions, the mind shall always stand out as the dominant factor. In other words, the hackneyed simile of the sheet of blank paper, applied to the mind by extreme sensational philosophers, must either be thrown away altogether or inverted; the more active part of the operation must always be assigned to the mind. The formation of knowledge, according to P., may be looked on as the gradual and systematic elimination of the accidental and fleeting in the phenomenon from the necessary and permanent; and the process by which the mind performs this elimination—and it can be performed only by mind—is called *Dialectics*. This word, from *dialégomai*, originally signifies only conversational discussion; thence, that discussion conducted in such scientific fashion as to lead to reliable results, i. e., strictly logical.

The product of dialectics is ideas, and these ideas being the *éidê*, forms or types of things which are common to all the individuals of a species, all the species of a genus, all the genera of a family, and all the families of a class, generate classification —that is, knowledge of the permanent in phenomena—and definition, which is merely the articulate verbal expression of this permanency. The construction of the confused results of observation into the orderly array of clear conceptions, by a sort of cross-examination of the phenomena, performed by minds impassioned for truth, is exhibited as the great characteristic of the teaching of Socrates, in the *Memorabilia* of Xenophon. In the dialogues of P., the same purification of the reason, so to speak, from the clouds of indistinct sensuousness, is exhibited on a higher platform, and with more comprehensive results. For between Socrates and P., notwithstanding a deep internal identity, there was this striking difference in outward attitude—that the one used logic as a practical instrument in the hands of a great social missionary and preacher of virtue; while the other used it as the architect of a great intellectual system of the universe, first and chiefly for his own time and his own place, but, as the event has proved, in some fashion also for all times and all places.

We should err greatly, however, if we looked on P. as a man of mere speculation, and a writer of metaphysical books, like certain German professors. Neither P. nor any of the great Greeks looked on their intellectual exercises and recreations as an end to themselves. With them, philosophy did not mean mere knowledge or mere speculation, but it meant wisdom, and wisdom meant wise action, and wise action meant virtue. The philosophy of P., therefore, with all its transcendental flights, of which we hear so much, was essentially a practical philosophy; all his discussions on the theory of knowledge and the nature of ideas are undertaken mainly that a system of eternal divine types, as the only reliable knowledge, may serve as a foundation for a virtuous life, as the only consistent course of action. Virtue, with Socrates and P., is only practical reason. As in the Proverbs of Solomon, all vice is folly, so in the philosophy of P., the imperial virtue is *phronesis*—i. e., 'wisdom' or practical 'insight.' The other two great Greek and Platonic virtues—*sophrosyne*, 'moderation' or 'soundmindedness,' and *dikaiosyne*, 'justice,' or the assigning to every act and every function its proper place—are equally exemplifications of a reasonable order applied to action—such an order as alone and everywhere testifies the presence of mind. The theory of morals as worked out from such principles is, of course, as certain as the necessary laws of the reason which it expresses; and, accordingly, the Platonic morality, like the Christian, is of that high order which admits of no compromise with ephemeral prejudice or local usage.

The contrast between the low moral standard of local respectability and that which is congruous with the universal laws of pure reason, stands out as strikingly in Plato, as the morality of the Sermon on the Mount in the Gospels does against the morality of the Scribes and Pharisees. Splendid passages to this effect occurs in various parts of P.'s writings, particularly in the *Republic* and the *Gorgias*. In perfect harmony with the Platonic theory of noble action, is his doctrine with regard to pure emotion and elevated passion. Love with P. is a transcendental admiration of excellence—an admiration of which the soul is capable by its own high origination and the germs of godlike excellence, which are implanted into it from above. The philosophy of love is set forth with imaginative grandeur in the *Phædrus*, and with rich dramatic variety in the *Banquet*, of which dialogue there is an English translation by Shelly. The philosophy of beauty and the theory of pleasure are set forth with great analytic acuteness in the *Philebus*. With P., the foundation of beauty is a reasonable order, addressed to the imagination through the senses—i. e., symmetry in form, and harmony in sounds, the principles of which are as certain as the laws of logic, mathematics, and morals —all equally necessary products of eternal intellect, acting by the creation and by the comprehension of well-ordered forms, and well-harmonized forces, in rich and various play through the living frame of the universe; and the ultimate ground of this lofty and coherent doctrine of intellectual, moral, and æsthetical harmonies lies with P., where alone it can lie, in the unity of a supreme, reasonable, self-existent intelligence, whom we call God, the fountain of all force, and the creator of all order in the universe; the sum of whose most exalted attributes, and the substantial essence of whose perfection may, as contrasted with our finite and partial aspects of things, be expressed by the simple term *tò agathón*—the GOOD.

From this supreme and all-excellent intelligence, human souls are off-shoots, emanations, or sparks, in such a fashion, that they partake essentially of the essential nature of the source from which they proceed, and accordingly possess unity as their most characteristic quality, attest their presence everywhere by a unifying force which acts by impressing a type on whatever materials are submitted to it, and is filled with a native joy in the perception of such types, the product of the same divine principle of unity, wheresoever presented. The undivided unity and unifying force which we call the soul is immortal, being from its nature altogether unaffected by the changes of decay and dissolution to which the complex structure of the material human body is exposed. The doctrine of the immortality of the soul is most fully set forth in the *Phædo*, a dialogue which combines with the abstract philosophical discussion, a graphic narrative of the last hours of Socrates, which, for simple pathos and unaffected dignity, is unsurpassed by any human composition.

The most complete and systematic exhibition of the opinions of P. will be found in the *Republic*, or ideal commonwealth, of which an excellent English translation has been recently made by Davies and Vaughan. The *Republic* is not, as the title would lead us to suppose, a political work, like the *Politics* of Aristotle. It is, as Baron Bunsen well remarked, not so much a state as a church with which this great work has to do; or at least, both a state and a church; and the church is the superior and dominating element. In the *Republic*, accordingly, we find the necessity of virtue to the very idea of social life proved in the first book; then the whole process of a complete moral and scientific education is set forth with such fulness as to throw the strictly political part of the book, including the germs of what is now called political economy, very much into the shade.

The principles and government of an ideal moral organism, of which the rulers shall be types of fully developed and perfectly educated men, is the real subject of the *Republic*, which accordingly forms a remarkable contrast to the inductive results of the thoroughly practical work of Aristotle on the same subject. P.'s commonwealth is a theoretical construction of a perfect ideal state of society; Aristotle's is a practical discussion on the best form of political government possible under existing conditions. Of the value of P.'s work, both suggestively in the world of politics, and dogmatically in the region of moral and religious speculation, there can be no doubt; but as a practical treatise on politics, it is vitiated throughout, both by its original scheme, and by an inherent vice in the author's mind, which prevented him from recognizing the force of the actual in that degree which necessarily belongs to such a complex art as human government. Of this fault, the author was himself sufficiently conscious, and has accordingly, in another large political treatise, the *Laws*, endeavored, for practical purposes, to make some sort of compromise between the transcendental scheme of his *Commonwealth* and the conditions of existing society. But however he might modify individual opinions, there was a one-sidedness about P.'s mind, which rendered it impossible for him to struggle successfully with the difficulties of complex practical politics. He was too much possessed with the idea of order, and, moreover, had planted himself with too manifest a polemical attitude against Athenian democracy, to give due weight to the opposite principle of freedom, proved by experience to be so indispensable to every healthy and vigorous political development.

Physical science, in the days of P., stood on no basis sufficiently sure or broad to authorize a philosophy of the material universe with any prospect of success. Nevertheless, in his *Timæus*, the great philosopher of ideas has attempted this; and it is a work which, however valueless in the face of the grand results of modern chemical and kinetical research, will ever be consulted with advantage, as a grand constructive summary of the most important facts and theories of nature, known to the Greeks, before the accurate observations of Aristotle, and the extended mathematics of the Alexandrian school. The great question as to what matter is, and whence, P. nowhere seems to settle very clearly; but the general tendency of ancient thought was towards a dualism,

which recognized the independent existence of a not very tractable element called matter, in which P. seems to have acquiesced.

The works of P. were extensively studied by the Church Fathers, one of whom joyfully recognizes, in the great teacher of the Academy, the schoolmaster who, in the fulness of time, was destined to educate the heathen for Christ, as Moses did the Jews. A lofty passion for P. likewise seized the literary circle of the Medici at the period of the revival of letters in Italy. Since that time, the tyrannous sway of Aristotle, characteristic of the middle ages, has always been kept in check by a strong band of enthusiastic Platonists in various parts of Europe. Since the French Revolution particularly, the study of Plato has been pursued with renewed vigor in Germany, France, and England; and many of our distinguished authors, without expressly professing Platonism—as Coleridge, Wordsworth, Mrs. Browning, Ruskin, &c.—have formed a strong and a growing party of adherents, who could find no common banner under which they could at once so conveniently and so honorably muster as that of Plato.

The amount of learned labor expended on the text of Plato during the present century, has been in proportion; and in this department the names of Bekker, Ast, and Stallbaum stand pre-eminent. Professor Jowett also, in Oxford, has made P. his standard author for many years; from his hand we had, in 1871, his translation of the *Dialogues of Plato*. Mr. Grote, the historian of Greece, published his *Plato and the other Companions of Socrates* in 1864. One of the best accounts of the Platonic philosophy is given in Zeller's *Phil. der Griechen*, of which the part on *P. and the older Academy* was translated in 1876.

PLATOFF, MATVEI IVANOVITCH, COUNT, the Hetman of the Cossacks of the Don, and a Russian cavalry general, was born on the banks of the Don, 6th August 1757, and was descended from an ancient and noble family, which had emigrated from Greece. Having acquired a considerable reputation for wisdom and bravery, he was appointed by the Czar Alexander I. Hetman of the Cossacks; and subsequently, as a lieutenant-general in the Russian army, and afterwards as commander of the Russian irregular cavalry, he took a prominent part in the wars both with France and Turkey. After the French had evacuated Moscow, and retreated, P. hung upon their rear with the utmost pertinacity, wearying them out by incessant attacks, cutting off straggling parties, capturing their convoys of provisions, and keeping them in a state of continual terror and apprehension. The French historians state that Bonaparte's army suffered more loss from the attacks of P.'s Cossacks than from privation and exhaustion. He defeated Lefebvre at Altenburg.

After the rout of the French at Leipzig, he inflicted great loss upon them in their retreat, and subsequently gained a victory over them at Laon. The inhabitants of Seine-et-Marne will long remember him by the devastations and pillage committed by his undisciplined bands. He was enthusiastically welcomed by the Parisians (to their shame), and also by the English, who presented him with a sword of honor on the occasion of his visit to London in company with Marshal Blücher. The allied monarchs loaded him with honors and decorations, and the czar gave him the title of Count. He retired to his own country, there to mourn the death of his only son, who had been killed in the campaign of 1812, and died near Tcherkask in 1818. No other Russian general ever exercised such an influence over the men under his command, and their awe of him was not greater than their affection; but this was doubtless owing to the inflexible and speedy justice which he administered to them, and to the freedom with which he left them to rob and pillage.

PLATO'NIC LOVE, the name given to an affection subsisting between two persons of different sex, which is presumed to be unaccompanied by any sensuous emotions, and to be based on moral or intellectual affinities. The expression has originated in the view of Plato, who held that the common sexual love of the race, harrassed and afflicted with fleshly longings, is only a subordinate form of that perfect and ideal love of truth which the soul should cultivate. Whether such a sentiment as Platonic love can really subsist between persons of different sex, has been frequently disputed; but without pronouncing positively on a point so delicate, and depending so much on differences in our spiritual organization, it may be safely affirmed, that wherever a feeling—calling itself by this name—exists, it has undoubtedly a tendency to develop into somethiug more definite and dangerous.

PLATOO'N (probably from the French *peloton*) was a term formerly used to designate a body of troops who fired together. A battalion was commonly divided into 16 platoons, and each company into two platoons, the platoon thus corresponding to the present subdivision. The word is obsolete in this its original sense; but it survives in the expression 'platoon exercise,' which is the course of motions in connection with handling, loading, and firing the musket or rifle.

PLATTE. See NEBRASKA.

PLA'TTEN-SEE. See BALATON.

PLA'TTSBURG, a village of New York, U.S., on the west shore of Lake Champlain, at the mouth of the river Saranac, which furnishes water-power to several mills and factories. It has a custom-house, academy, and six churches. In Plattsburg Bay was fought the naval battle of Champlain, in which the British flotilla, under Commodore Downie, was defeated by the American commodore M'Donough, September 11, 1814; while the land forces, amounting to 14,000 men, under Sir George Prevost, were defeated by General Macomb. Pop. in 1870, 5139.

PLA'TYPUS. See DUCK-BILL.

PLATY'STOMA (Gr. broad-mouth), a genus of fishes of the family *Siluridæ*, having a very flat (depressed) snout, and a very large mouth with six long barbels; the skin quite destitute of scales; two dorsal fins; the eyes lateral, level with the nostrils. The species are numerous, some of them attaining a large size, many of them notable for their distinct and conspicuous markings. Several are natives of the rivers of the north-east of South America; and among these are some of the most beautiful and delicious of fresh-water fishes, as *P. tigrinum*, known among different tribes of Indians by various names—*Corutto*, *Colite*, *Oronni*, &c., which has an elongated body, light blue, transversely streaked with black and white, and a spreading forked tail. It is both taken by baited hooks and shot with arrows by Indians, as are several other species, some of which are found as far south as Buenos Ayres.

PLAU'EN, an important manufacturing town of Saxony, in a beautiful valley on the White Elster, 74 miles south of Leipzig by railway. It was the chief town of the Saxon Voigtland, and its castle was at one time the residence of the Voigt, or imperial commissioner, but is now used as the seat of justice and other courts. P. contains a gymnasium, a royal palace, and numerous educational and benevolent institutions. It carries on extensive manufactures of muslin, cambric, and jaconet goods, as well as embroidered fabrics and cotton goods. In September 1844, 150 buildings were destroyed by fire, and after that event, the town was almost wholly rebuilt. Pop. (1875) 28,756; (1880) 35,078.

PLAU'TUS, M. ACCIUS, or, more correctly, T. MACCIUS, the great comic poet of Rome, was born about 254 B.C. at Sarsina, a village of Umbria. We have no knowledge of his early life and education; but it is probable that he came to Rome while still a youth, and there acquired a complete mastery of the Latin language in its most idiomatic form, as well as an extensive familiarity with Greek literature. It is uncertain whether he ever obtained the Roman franchise. His first employment was with the actors, in whose service he saved an amount of money sufficient to enable him to leave Rome and commence business on his own account. What the nature of this business was, or where he carried it on, we are not informed; we know, however, that he failed in it, and returned to Rome, where he had to earn his livelihood in the service of a baker, with whom he was engaged in turning a hand-mill. At this time—a few years before the outbreak of the Second Punic War—he was probably about 30 years of age; and while employed in his humble occupation, he composed three plays, which he sold to the managers of the public games, and from the proceeds of which he was enabled to leave the mill, and turn his hand to more congenial work. The commencement of his literary career may, therefore, be fixed about 224 B.C., from which date he continued to produce comedies with wonderful fertility, till 184, when he died in his 70th year. He was at first contemporary with Livius Andronicus and Nævius; subsequently with Ennius and Cæcilius.

Of his numerous plays—130 of which bore his name in the last century of the republic—only 20 have come down to us. Many of them, however, were regarded as spurious by the Roman critics, among whom Varro in his treatise (*Quæstiones Plautinæ*) limits the genuine comedies of the poet to 21. With the exception of the 21st, these Varronian comedies are the same as those we now possess. Their titles, arranged (with the exception of the Bacchides) in alphabetical order, are as follows: 1, *Amphitryo;* 2, *Asinaria;* 3, *Aulularia;* 4, *Captivi;* 5, *Curculio;* 6, *Casina;* 7, *Cistellaria;* 8, *Epidicus;* 9, *Bacchides;* 10, *Mostellaria;* 11, *Menæchmi*, 12, *Miles;* 13, *Mercator;* 14, *Pseudolus;* 15, *Pœnulus;* 16, *Persa;* 17, *Rudens;* 18, *Stichus;* 19, *Trinummus;* 20, *Truculentus;* 21, *Vidularia*. As a comic writer, Plautus enjoyed immense popularity among the Romans, and held possession of the stage down to the time of Diocletian. The vivacity, the humor, and the rapid action of his plays, as well as his skill in constructing plots, commanded the admiration of the educated no less than of the unlettered Romans; while the fact that he was a national poet prepossessed his audiences in his favor. Although he laid the Greek comic drama under heavy contributions, and 'adapted' the plots of Menander, Diphilus, and Philemon with all the license of a modern playwright, he always preserved the style and character native to the Romans, and reproduced the life and intellectual tone of the people in a way that at once conciliated their sympathies. The admiration in which he was held by his contemporaries de-

scended to Cicero and St. Jerome; while he has found imitators in Shakspeare, Molière, Dryden, Addison, and Lessing, and translators in most European countries. The only complete translation of his works into English is that by Thornton and Warner (5 vols., 1767—1774). Unfortunately the text of his plays, as they have come down to us, is in such a very corrupt state, so defective from lacunæ, and so filled with interpolations, that much yet remains to be done by the grammarian and the commentator before they can be read with full appreciation or comfort. The *editio princeps* was printed at Venice in 1742. Weise and Fleckeisen have given us good modern editions; but that of Ritschl (1st ed. 1848–54; 2d ed. 1871) shows such admirable acuteness and learning as to have superseded all others.

PLAYFAIR, JOHN, a Scottish mathematician and natural philosopher, was born at Benvie in Forfarshire, March 10, 1748. His father, who was minister of the united parishes of Liff and Benvie, sent him to the university of St. Andrews at the age of 14, to study with a view to the ministry; and here P. obtained great reputation as a diligent and successful student, especially in mathematics and natural philosophy; so much so, that while a student, he for some time discharged the duties of the Natural Philosophy chair during the illness of the professor. In 1773, he entered the ministry, and succeeded his father in the parish of Liff and Benvie. During his leisure hours, he still prosecuted his favorite studies, the fruits of these labors being two memoirs, *On the Arithmetic of Impossible Quantities*, and *Account of the Lithological Survey of Schihallion*, which were communicated to the Royal Society of London. In 1782, he resigned his parochial charge to superintend the education of the sons of Mr. Ferguson of Raith; and in 1785, he became joint-professor of Mathematics along with Adam Ferguson in the university of Edinburgh; but exchanged his chair for that of Natural Philosophy in 1805. He took the part of Mr. (afterwards Sir John) Leslie (q. v.), his successor in the Mathematical chair, and published a pamphlet full of biting satire against the 'new-sprung zeal for orthodoxy.' He became a strenuous supporter of the 'Huttonian theory' in geology, and after publishing his *Illustrations of the Huttonian Theory of the Earth* (Edin. 1802), he made many journeys for the sake of more extensive observations, particularly in 1815, when he visited France, Switzerland, and Italy. He died at Edinburgh, 19th July 1819.

P., according to Jeffrey (*Annual Biography*, 1820), 'possessed in the highest degree all the characteristics both of a fine and a powerful understanding; at once penetrating and vigilant, but more distinguished, perhaps, by the caution and success of its march, than by the brilliancy or rapidity of its movements.' P. was, during the later part of his life, Secretary to the Royal Society of Edinburgh. From 1804, he was a frequent contributor to the *Edinburgh Review*, criticising the works of Laplace, Zach, and Kater, and the great trigonometrical surveys, both French and English, which had just been completed. He also wrote the articles 'Æpinus' and 'Physical Astronomy,' and an incomplete 'Dissertation on the Progress of Mathematical and Physical Science, for the *Encyclopædia Britannica*. His contributions to the *Transactions of the Royal Society of Edinburgh* are numerous and exceedingly varied, a treatise on 'Naval Tactics' even appearing among them. His separate works are the *Elements of Geometry* (Edin. 1795), containing the first six books of Euclid, with supplementary articles on Trigonometry, Solid Geometry, and the Quadrature of the Circle; and his *Outlines of Natural Philosophy* (Edin. 1812 and 1816), being the heads of his lectures delivered in the university on that subject. A third volume of the *Outlines*, completing the work, was promised but never appeared.

PLEA is a techical term in the law of the United Kingdom. In England, it had a very restricted meaning, being confined to the pleading of a defendant to an action at common law. Now in all actions in the High Court it is called the 'Statement of Defence.' —In Scotland, it is not used in the same sense, but denotes the short legal ground on which a party, whether pursuer or defender, bases his case or pleading. Hence the pleas in law are only short propositions of law. Pleas are subdivided according to their subject-matter, into pleas dilatory and peremptory, pleas of abatement, pleas to the jurisdiction. Pleas in bar are the same as peremptory pleas; but in criminal cases in England, special pleas in bar are pleas stating some ground for not proceeding with the indictment, such as a plea of former acquittal, or autrefois acquit; or of conviction, or autrefois convict; or a plea of pardon.—In Scotland, a 'plea of panel' means a plea of guilty or not guilty. Pleas of the crown was an expression anciently used to denote the divisions of criminal offences generally, as in the well-known work called *Pleas of the Crown*, by Sir Matthew Hale, and other writers. The phrase was so used because the sovereign was supposed in law to be the person injured by every wrong done to the community, and therefore was the prosecutor for every such offence.

PLEADING, as a Legal term, has two meanings—a restricted and a general meaning. In the former sense it is a generic term to denote the written formula containing the subject-matter of a litigant's demand, or claim, or of his defence or answer thereto. In its general sense, it denotes that system of rules on which the particular pleadings of litigants are framed. In the practice of English common law, the pleadings in an action were called the declaration, plea, replication, rejoinder, surrejoinder, rebutter, surrebutter, &c.—the first being a statement of the plaintiff's demand; the second, the defence thereto, and so on, each alternately answering the other, until the parties arrive at a stop, called an issue, which means a proposition of fact, which the one affirms, and the other denies. When an issue is arrived at, the parties can go no further; and the next step is to send the issue before a jury, that they may decide it. When the parties differ, not on a question of fact, but on one of law, it is called a demurrer, which must be decided by the court. These technical names have, however, been recently much changed. In the High Court of Justice, the plaintiff's pleading is called his 'Statement of Claim;' then follow the 'Statement of Defence,' the reply, &c., there being no further pleadings.—In Scotland, the pleadings of the parties are called the summons (including the condescendence), the defences or answers, the revised condescendence, the revised answers, &c. The peculiar technical rules to which the pleadings of parties must conform, are capable of being understood only by lawyers.

PLEBEI'ANS (Lat. *plebs*, from same root as Lat. *impleo*, to fill; and Gr. *plethos*, multitude), the common people of Rome; one of the two elements of which the Roman nation consisted. Their origin, as a separate class, is to be traced partly to natural, and partly to artificial causes. The foundation of Rome, probably as a frontier-emporium of Latin traffic (according to Mommsen's suggestion), would bring about the place a number of inferior *employés*, clients, or hangers-on, of the enterprising commercial agriculturists, who laid the primitive basis of the material and moral prosperity of the city. These hangers-on were the original plebeians, or non-burgesses of Rome, whose numbers were constantly increased by the subjugation of the surrounding cities and states. Thus, tradition states that, on the capture of Alba, while the most distinguished citizens of that town were received among the Roman patricians, the greater part of the inhabitants, likewise transferred to Rome, were kept in submission to the *populus* or patricians of Rome—in other words, swelled the ranks of the plebeians. Similar transfers of some of the inhabitants of conquered towns are assigned to the reign of Ancus Martius. The order of plebeians thus gradually formed, soon exceeded the patricians in numbers, partly inhabiting Rome, and partly the adjoining country. Though citizens, they were neither comprehended in the three tribes, nor in the *curiæ*, nor in the patrician *gentes*, and were therefore excluded from the comitia, the senate, and all the civil and priestly offices of the state. They could not intermarry with the patricians.

The first step (according to traditionary belief) towards breaking down the barrier between the two classes was the admission, under Tarquinius Priscus, of some of the more considerable plebeian families into the three tribes. Servius Tullius divided the part of the city and the adjacent country which was inhabited by plebeians, into regions or local tribes, assigning land to those plebeians who were yet without it. The plebeian tribes with tribunes at their head, formed an organization similar to that of the patricians. The same king further extended the rights of the plebeians by dividing the whole body of citizens, patrician and plebeian, into five classes, according to their wealth, and forming a great national assembly called the *Comitia Centuriata*, in which the plebeians met the patricians on a footing of equality; but the patricians continued to be alone eligible to the senate, the highest magistracy, and the priestly offices. These newly-acquired privileges were lost in the reign of Tarquinius Superbus, but restored on the establishment of the Republic. Soon afterwards, the vacancies which had occurred in the senate during the reign of the last king, were filled up by the most distinguished of the plebeian equites, and the plebeians acquired a variety of new privileges by the laws of Valerius Publicola. The encroachments on those privileges on the part of the patricians, began the long-continued struggle between the two orders, which eventually led to the plebeians gaining access to all the civil and religious offices, acquiring for their decrees (*plebiscita*) the force of law. Under the Hortensian law (286 B.C.), the two hostile classes were at last amalgamated in one general body of Roman citizens with equal rights. Henceforth, the term *populus* is sometimes applied to the plebeians alone, sometimes to the whole body of citizens assembled in the *Comitia Centuriata* or *Tributa*, and *plebs* is occasionally used in a loose way for the multitude or populace, in opposition to the senatorial party. See PATRICIAN.

PLEBISCITE, the name given, in the political phraseology of modern France, to a decree of the nation obtained by an appeal

to universal suffrage. Thus Louis Napoleon, for example, was chosen president, and subsequently emperor, by a plebiscite. The word is borrowed from the Latin; but the *plebiscitum* of the Romans properly meant only a law passed at the *Comitia Tributa*, i. e., assembly of the *plebs*, or 'commons,' as distinguished from the *populus*, or the 'nobles;' and although it was ultimately obligatory on both classes of the community, it, of course, could only refer to such matters as it was within the province of the *Comitia Tributa* to legislate upon, and could not fundamentally alter or destroy the constitution.

PLECTOGNA'THI, in the system of Cuvier, and also in that of Müller, an order of osseous fishes, but having the skeleton less perfectly ossified than osseous fishes generally; the skin furnished with ganoid scales or spines; and particularly characterized by having the maxillary and premaxillary bones anchylosed or soldered together. The gill-lid and rays are concealed under the thick skin, with only a small opening. The ribs are very short, and there are no distinctly developed ventral fins. The fishes belonging to this order are not many. They are regarded as a connecting link between the osseous and the cartilaginous fishes.

PLEDGE is the depositing of a chattel or movable with a creditor in security of a debt, and is a contract between the parties that the pledgee shall keep the chattel till the debt is paid. In England, when A pledges property with B for a debt, and other debts are incurred, B cannot retain the pledge for the additional debts; but in Scotland, this can be done. When chattels are pledged in England for debt, the pledgee may sell the goods, if the debt is not paid at the time agreed, or within a reasonable time after notice given; but in Scotland this can only be done by getting the authority of the sheriff and a warrant to sell the goods. Owing to the frequent occasions of poor and needy persons to pledge their goods in order to procure advances of money for temporary purposes, the legislature has enacted a code of special laws to regulate these contracts. See PAWNBROKING.

PLEI'ADÉS, in Greek Mythology, were, according to the most general account, the seven daughters of Atlas and Pleine, the daughter of Oceanus. Their history is differently related by the Greek mythologists: according to some authorities, they committed suicide from grief, either at the death of their sisters, the Hyades, or at the fate of their father, Atlas (q.v.); according to others, they were companions of Artemis (Diana), and being pursued by Orion (q. v.), were rescued from him by the gods by being translated to the sky; all authorities, however, agree that, after their death or translation, they were transformed into stars. Only six of these stars are visible to the naked eye, and the ancients believed that the seventh hid herself from shame that she alone of the P. had married a mortal, while her six sisters were the spouses of different gods. Their names are Electra, Maia, Taygete, Alcyone, Celæno, Sterope (the invisible one), and Merope.

In Astronomy, a group or constellation of six stars placed on the shoulder of Taurus, the second sign of the Zodiac, and forming, with the pole-star and the twin Castor and Pollux, the three angular points of a figure which is nearly an equilateral triangle. Many believe, from the uniform agreement that the P. were 'seven' in number, that the constellation at an early period contained 'seven' stars, but that one has since disappeared; not a very uncommon occurrence.

The name *Poetical Pleiades* is frequently applied to reunions of poets in septenary groups; and this use of the word dates from the time of Ptolemies—the originator of the first being Ptolemy Philadelphus, who, from the number of the Greek poets that flocked to Alexandria, chose out seven, whom he treated with special distinction, and denominated his *pleiad*. His example was followed by Charlemagne; and the same system was kept up by the 'Compagnie des Sept Mantenadors del gay Saber,' or the 'Compagnie des Sept Troubadours de Toulouse,' down till the 17th century. Such associations were valuable as promoting an interchange of ideas and opinions by the most eminent in the same department of letters, and creating a kind of *esprit du corps* among them.

PLEI'OCENE (Gr. more recent), the name given by Sir Charles Lyell to a section of the Upper Tertiaries, because the organic remains found in it contain between 60 and 70 per cent. of living species; a greater proportion than exists in the older Miocene, but not so great as that found in the succeeding Pleistocene.

The beds belonging to this period are very local. They have been noticed in several places in Europe, but have been chiefly studied in Suffolk, the only locality in which they occur in Britain. Here they cover the upper beds of the London Clay; and being composed of shelly sand, they have, like similar deposits, been used for fertilizing lands deficient in calcareous matter, and have received the local name of 'Crag.' They are divided into the (1) Red Crag, 50 feet; (2) Coralline Crag, 50 feet.

The Red Crag consists of beds of quartzose sands and gravel with a mixture of shells, for the most part rolled, and sometimes broken up into sand. The whole deposit, with the contained fossils, has a deep ferruginous or ochreous color. It seems to have been formed in shallow water, the currents of which have given it a very variable character, and frequently confused the stratification, as in some modern sandbanks. The fossils have a somewhat boreal character. They consist chiefly of mollusca; but there have been also found the bones and teeth of large sharks, skates, and other fish, and the ear-bones of one or more true whales.

The Coralline Crag is generally calcareous and marly, consisting of a mass of shells and polyzoa, separated in some places by thin layers of hard limestone, and coral-like masses, which occupy the position in which they lived. It is easily separated from the Red Crag by its white color. It has been formed at a greater depth and in more tranquil water than the newer deposit. The fossils have a more southern facies than those of the Red Crag, and indicate that they lived in an ocean with a higher temperature. Among these southern forms may be mentioned species of the genera Conus, Oliva, Mitra, Voluta, and Pyrula. The calcareous polyzoa are abundant and very beautiful; and several interesting forms of echini have been described. A few fossils of the same species as those occurring in the London Clay have been found in this and the Red Crag, but these are believed to have been washed out of the inferior deposits.

Mr. Searles Wood has obtained 345 species of testacea from the Coralline Crag, and 230 from the Red Crag, of which about 150 are common to both; about 70 per cent. of the newer division are also recent, and about 60 per cent. of the older.

Pleiocene deposits have been observed in the neighborhood of Antwerp and on the banks of the Scheldt, from which 200 species of shells have been obtained, two-thirds of which were already known from Suffolk. More than a half are recent species found in the northern seas, and a few are still living in the Mediterranean. Similar deposits occur in Normandy. The low hills between the Apennines and the sea on each side of Italy are formed to a considerable extent of beds belonging to this period; and the marine strata of the seven hills of Rome are of the same age. Beds of a brackish-water origin, observed on the shores of the Caspian, Aral, Azof, and Black Seas, have been referred to this period.

PLEIOSAU'RUS (Gr. literally 'more a lizard,' i. e., than the *Plesiosaurus*), a genus of fossil sea-reptiles nearly allied to the Plesiosaurus but having a very short neck, and comparatively a larger head. The jaws also are furnished with stronger teeth, which are subtrihedral in cross section, with one side flattened, and bounded by prominent lateral ridges on the more convex sides. Three species have been described. They are peculiar to the Oxford and Kimmeridge clays of the Upper Oolite Period.

PLEI'STOCENE (Gr. most recent), or NEWER PLEIOCENE, terms introduced by Sir Charles Lyell to designate the most recent Tertiary deposits, the organic remains of which belong almost exclusively to existing species. Within the last few years, no section of the earth's crust has received so much attention as the strata included under this name. The obscurity arising from great antiquity and metamorphic changes in deposits, and the consequent necessity of calling to some extent on the imagination in investigations into the older strata, have always thrown a peculiar charm round geology; but the examination of the little changed newer deposits, containing animals scarcely differing in genera from, and many of them the same even in species as, those now living, being based on simple observation, has been overlooked, although the best method in all obscure inquiries is that which starts from the known, and gradually proceeds to the unknown. The Palæozoic rocks have been carefully grouped and classified, and the fossils described and figured; while the order and contents of the Pleistocene deposits are little known. Their isolated nature to some extent accounts for this; but, on the other hand, as they exhibit the changes that have immediately preceded the present order of things, and so give us the first sure footing in our progress downwards, they deserve the most careful attention.

Not only in organic contents, but in the physical conditions under which they were deposited, the Pleistocene strata show that the earth, as regards its general temperature, was, at the time of their deposition, in a condition nearly approaching to its present. There is consequently a considerable difference in the deposits and fossils of this period in the different regions of the world. The alluvial pampas of South America and the gravels of Australia exhibit, by their structure and contents, a temperature of some warmth; while corresponding deposits of Britain and the continent show a state of cold that is scarcely conceivable at so recent a period. The whole of Northern Europe must have been under ice like the interior of Greenland at the present day. Perhaps the best classification of the deposits is one based on the relation which they bear to the temperature of the period when they were formed. The oldest Pleistocene deposits represent a time of intense cold. They were formed at the bottom of a sea

into which immense glaciers forced their way. The fine mud in which the organic remains are buried was obtained from the melting glaciers. All the shells belong to species now living in arctic or boreal seas. The Bridlington beds, near Flamborough Head, consisting of sand, clay, and pebbles, with numerous marine shells, belong to this period. Of the 63 species determined by Dr. Woodward, one-half are at present living only in seas north of Britain. The clay deposits on the east of Scotland, at Elie and Errol, lately described by the Rev. Thomas Brown, contain fossils that have a similar arctic facies. The shells of the Bridlington, Elie, and Errol deposits differ from those of the other Pleistocene strata in being much more arctic, and they consequently show that the cold had reached its climax at the time of their formation. To this period most probably belongs the boulder-clay of the south of England, which contains erratics from Scandinavia. Both the clay and the boulders seem to have been transported to their present position by floating icebergs.

The temperature, however, after a time improved, reducing the extent of the ice-covering, and driving the arctic fauna northwards from our shores. In the Norwich Crag, we find a larger proportion of southern species, only one-sixth of these being truly arctic. This deposit, found in the neighborhood of Norwich, consists of beds of sand and gravel which contain fresh-water and marine shells, and the bones of large mammalia. Contemporaneous with the Norwich Crag are the marine deposists of the Clyde, at least the older of them, for though the fossils of all the beds have hitherto been grouped together, they certainly represent two periods which differ from each other by reason of the increasing temperature. While these beds were being deposi ted around the shores, the ice was disappearing from the land. The glaciers were gradually creeping inwards, leaving an ever-increasing margin of bare land between the glaciers and the sea, which they covered with a continuous layer of mud and rubbed stones—the materials taken up in their progress over the surface—and so forming the boulder-clay of Scotland and the north of England. This is a remarkable deposit of unstratified mud, the character and color of which is influenced by the rocks on which it rests, and from which it was derived. It contains numerous rounded and polished blocks of stone of various sizes, promiscuously scattered through it, the whole seeming to be the result of an irregular pell-mell hurrying forward and deposition of the materials. It has been always a puzzle to geologists (see BOULDER-CLAY); but Mr. Geikie, in his recently published Memoir, by showing it to be the terminal moraine formed by the slowly retreating sheet of glacier-ice, has given an explanation which meets all the singular phenomena connected with it. Connected with the disappearance of glaciers, are the lateral moraines which exist on many hillsides; and perhaps a little later, the long ridges of gravel which are called Kames in Scotland, and Eskers in Ireland. The loamy deposits of the valleys of the Rhine and the Danube, known as the Loess, were formed at this time by the fine mud from the glaciers, with which every torrent rushing from the icy cavern at the termination of a glacier is charged, a process now going on, on parts of the coast of Greenland (see GLACIAL PERIOD).

When the glaciers began to disappear, mammalia again occupied the land; their remains, we have already seen, occur in the Norwich Crag. They continued to increase as the conditions for their existence improved. The caves of the British Islands and the continent were inhabited by hyenas, bears, and other wild beasts, which have left their remains buried in the mud at the bottom of the caves. The raised sea-beaches of this period contain the shells of mollusca now living in the neighboring seas. In many places around the shores of Britain and Ireland, submarine forests are met with dipping down under low water, and exhibiting the stumps and roots of trees, in the position of growth, belonging to species now living in Britain. Some of the older peat-bogs require to be placed also among the later Pleistocene deposits.

The classification, then, of these strata, which we propose, from the light thrown on them by recent observation, may be put into the following tabular form. The subdivisions are the names of recognized deposits, and though arranged in tabular series, the order is not one of strict sequence, representing the superposition of the different beds; they are all very local deposits, and many of them, though differing in character, were formed contemporaneously.

Post-Glacial.	Peat-bogs. Submarine Forests. Modern Raised Sea-beaches. Cave Deposits.
Glacial.....	Loess. Kames and Eskers. Lateral Moraines. Boulder-clay. Newer Clyde Beds. Older Clyde Beds.
Arctic.....	Elie, Errol, and Tirie Clay Beds. Bridlington Beds.

Many speculations have been made as to the causes of the remarkable change of temperature, from the comparatively warm period of the Pleiocene deposits, to the extreme cold of the early Pleistocene strata, and the subsequent gradual return to the warmer temperature of the present period. The most probable is, that it resulted from an extensive depression of the land of the northern hemisphere in some parts, and its elevation in others during the period. Deposits of glacial shells have been found more than 1000 feet above the sea-level in Wales. A depression much less than this, in the Isthmus of Panama, would give a different direction to the Gulf Stream, and so deprive Western Europe of its benignant influences. It would also put the immense sandy Sahara under water; and that it has been so at a comparatively recent period, has been clearly established by the discovery lately of existing marine shells (including *Cardium edule*) over an extensive district of the desert. Without the Sahara, the south of Europe would have no burning dry sirocco, which now melts the glaciers of the Alps; but instead, a comparatively cold sea-breeze, laden with moisture, which would to a large extent feed them. The existence of a greater quantity and a higher elevation of land near the North Pole would also depress the temperature. These and similar causes would do much, if they were not in themselves sufficient, to produce the extreme cold of the arctic period.

The classification of the British strata will suit, in a general way, the whole of the North Temperate Zone, for throughout the whole of the northern regions of Europe, Asia, and America, similar conditions existed, producing similar physical changes, and the whole region formed one zoological province inhabited by the Mammoth, Mastodon, and their contemporaries. A warmer climate prevailed at this period in South America, and the fossil animals there belong to types still peculiar to that continent, though of a size immensely greater than their living representatives. The Megatherium, Mylodon, and Megalonyx were the gigantic fore-runners of the living sloth; and the small armadilloes were anticipated by the Glyptodon. The llamas, opossums, tapirs, and prehensile-tailed monkeys are the diminutive representatives of similar forms in the Pleistocene period. The peculiar marsupial fauna of Australia had also its gigantic fore-runners during this period. The skull of one species (Diprotodon, an animal between the kangaroo and the wombat), now in the British Museum, measures three feet in length. The huge wingless Dinornis, and its allies of New Zealand, were nearly allied to the small wingless Apteryx, now living in that island.

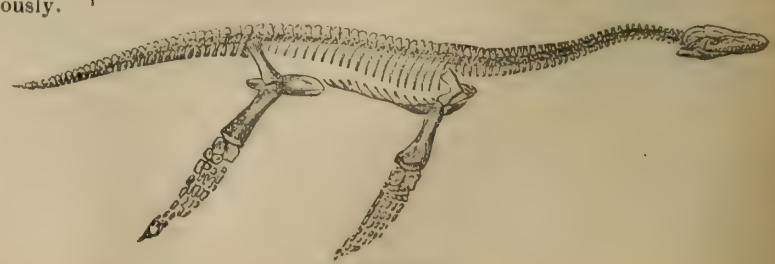
The question of the antiquity of man is intimately associated with the Pleistocene deposits. Whatever be the age of the beds in which either the remains of man or works of art have been found, it is certain that none of them pass the horizon of the boulder-clay. It is, however, equally certain that undoubted evidences of his existence contemporaneously with the mammoth and woolly rhinoceros, with the cave-lion and hyæna, have been found in Britain; and setting aside the various French and Belgian caves and gravel deposits about which geologists are, with good cause, so divided, there is evidence in the knives, pins, &c., manufactured from the bones of the large reindeer, found in caves at Bruniquel and elsewhere, that man hunted this huge extinct animal. Its contemporaries, as far as the associated remains from these caves have been determined, yet survive: these were the chamois, ibex, horse, fox, wolf, hare, raven, partridge, and salmon. However far, when measured by years, this carries back the first appearance of man on the globe, geologically speaking, the time is insignificant as compared with the vast lapse of ages represented by even a single formation; still it represents a period in which many remarkable changes have taken place.

PLENIPOTEN'TIARY. See ENVOY.

PLE'NISHING, in the law of Scotland, denotes the furniture of a house or stocking of a farm. The term is now seldom used, except in the law relating to heirship Movables (q. v.).

PLE'ONASM (Gr. *pleon*, more), a term employed in Rhetoric to denote superfluity of expression.

PLESIOSAU'RUS (Gr. near to a lizard), a remarkable genus of fossil sea-reptiles, the species of which are found in the Lias,



Plesiosaurus.

Oolite, and Cretaceous measures. Its remains are so abundant and so perfectly preserved, that we are as well acquainted with skeletons of many of its species as we are with those of any living animals. These represent a strange animal, the structure of which Cuvier considered to be the most singular, and its character the most anomalous, that had been discovered amid the ruins of former worlds. In the words of Buckland: 'To the head of a lizard, it united the teeth of a crocodile, a neck of enormous length, resembling the body of a serpent, a trunk and tail having the proportions of an ordinary quadruped, the ribs of a chameleon, and the paddles of a whale.'

The skull is small and depressed. From the nostrils backwards, it is quadrate; it suddenly contracts at the nostrils, and is continued into a parallel-sided apex, which is sometimes slightly swollen at the point. No sclerotic plates have been found in the orbits. The rami of the lower jaw are remarkably expanded at their anterior anchylosed extremity. No intervening vacuity separates the angular and surangular pieces, as in the crocodiles, but they are joined throughout, as in the lizards. The teeth occupy distinct cavities; they are sharp-pointed, long, slender, circular in cross section, and with fine longitudinal ridges on the enamel. The most striking peculiarity of the vertebræ is the great length of the neck-portion, which is composed of from 20 to 40 vertebræ. The articular surfaces of the bodies of the vertebræ are either flat or slightly convex in the center, with a concavity round the periphery. The cervical vertebræ consist of a centrum, neural arch, and two ribs, which articulate into two pits on the sides of the centrum. In the dorsal vertebræ, the ribs are articulated to diapophyses from the neural arch; and in the tail, they gradually descend again to the sides of the centrum. The tail is much shorter than in the ichthyosaur. In the abdominal region, the extremities of each pair of ribs are connected below by the development of the hæmal spine.

The two pair of limbs were equal in size and shape, with probably a single exception. The bones of the hind-limbs closely correspond in number, arrangement, and form with those of the fore-limbs, so that the descriptions of the one set answer to the corresponding bones of the other. The humerus is a stout and moderately long bone, curved slightly backwards, rounded at its proximal extremity, and flattened as it approaches the elbow joints. The radius and ulna are short and flat bones—the former straight, the latter reniform, with the concavity toward the radius. The carpus consists of six to eight flat round bones in a double row. The five metacarpals are long, slender, and slightly expanded at both ends. The numerous phalanges are alike in form, but progressively decrease in size. The radial digit has generally three; the second from five to seven; the third, eight or nine; the fourth, eight: and the fifth, five or six phalanges. The limbs were covered with integument, so as to form simple undivided paddles, as in the turtle.

The supposed habits of the plesiosaur are thus described by Conybeare: 'That it was an aquatic, is evident from the form of its paddles; that it was marine, is almost equally so, from the remains with which it is universally associated; that it may have occasionally visited the shore, the resemblance of its extremities to those of the turtle may lead us to conjecture; its motion must have, however, been very awkwark on land; its long neck must have impeded its progress through the water, presenting a striking contrast to the organization which so admirably fits the ichthyosaur to cut through the waves.

May it not, therefore, be concluded—since, in addition to these circumstances, its respiration must have required frequent access to the air—that it swam upon or near the surface, arching back its long neck like the swan, and occasionally darting it down at the fish which happened to float within its reach? It may perhaps have lurked in shoal-water along the coast concealed among the sea-weed, and, raising its nostrils to the surface from a considerable depth, may have found a secure retreat from the assaults of dangerous enemies; while the length and flexibility of its neck may have compensated for the want of strength in its jaws, and its incapacity for swift motion through the water, by the suddenness and agility of the attack which they enabled it to make on every animal fitted for its prey which came within its reach.'

The first remains of this animal were discovered at Lyme Regis in 1822. Since then, twenty-two species have been described, the specific differences chiefly resting on peculiarities in the form and structure of the vertebræ.

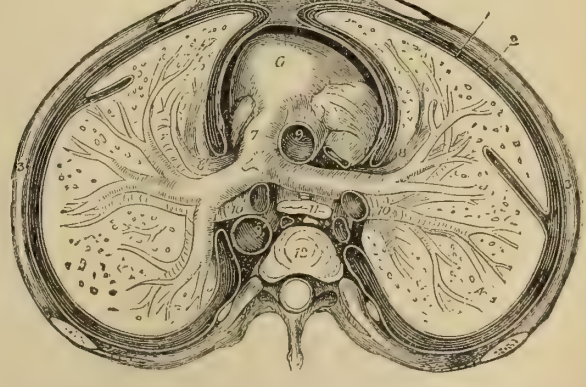
PLE'THORA (Gr. 'fulness' or 'excess'), designates a general excess of blood in the system. It may arise either from too much blood being made, or from too little being expended. The persons who become plethoric are usually those in thorough health, who eat heartily and digest readily, but who do not take sufficient bodily exercise, and do not duly attend to the action of the excreting organs. With them, the process of blood-making is always on the increase, and the vessels become more and more filled, as is seen in the red face, distended veins, and full pulse. The heart is excited and overworked, and hence palpitation, shortness of breath, and probably a sleepy feeling, may arise; but these symptoms, instead of acting as a warning, too often cause the abandonment of all exercise, by which the morbid condition is aggravated. The state of plethora thus gradually induced may be extreme without any functions materially failing, and yet the subject is on the verge of some dangerous malady, such as apoplexy, or structural disease of the heart or great vessels, or of the lungs, kidneys, or liver.

Plethora is said to be *sthenic* when the strength and irritability of the muscular fibres (especially of the heart and arteries) are fully or excessively developed. This form commonly affects the young and active, and those of sanguineous nature. The blood is rich in red cells and fibrine; and there is a tendency to general febrile excitement, active hæmorrhages, fluxes, and inflammation. A natural cure is thus often effected by the supervention of an attack of bleeding from the nostrils or from piles, or of mucous or bilious diarrhœa. The plethora is said to be *asthenic* (Gr. *a*, not; and *sthenos*, strength) when there is a deficiency of contractility and tone in the muscular fibre. In this case, the heart and vessels, instead of being excited (as in sthenic plethora) by the augmented quantity of blood, are oppressed by its load, and cannot duly expel their accumulated contents. The face is purple instead of red; the extremities cold, and the excreting organs sluggish. This form affects persons weakened by age, excesses, or previous disease. It tends to produce congestions and passive hæmorrhages, fluxes, and dropsies; and, if continued, structural changes, such as dilatation of the heart, enlarged liver, varicose veins, &c.

In *sthenic* plethora, blood-letting is the first remedy, and this, with the continued use of aperient medicine and a sparing diet, is often sufficient to complete the cure. If these means fail, recourse must be had to antimonials, salines, digitalis, and sometimes mercury or colchicum. In the *asthenic* form, Dr. Williams (to whose article on 'Plethora,' in his *Principles of Medicine*, we refer our readers for further details) observes that 'the continued use of alterative aperients and diuretics, such as mild mercurials, with rhubarb, aloes, or senna, salines and taraxacum, nitric acid, iodide of potassium, &c., may prepare the way for various tonics, such as calumba, bark, and iron.' He also recommends the use of the Cheltenham, Leamington, and Llandrindod waters; first the saline, which are aperient and diuretic; and afterwards the chalybeate, which, although tonic, usually contain enough of saline matter to keep the secretions free.

Food may be taken more freely than in the sthenic form; and in both varieties, as much exercise in the open air should be taken as can be born without causing exhaustion.

PLEU'RÆ. Each lung is invested externally by a very delicate serous membrane termed the *pleura*, which, after enclosing the whole organ, except at its root, where the great vessels enter it, is reflected upon the inner surface of the thorax or chest. That portion of the pleura which is in contact with the surface of the lung is called the *pleura pulmonalis*, or visceral layer; whilst



A transverse Section of the Thorax, showing the reflections of the Pleura, and the relative position of the Viscera, &c. (From Gray's *Anatomy*.)

1, The visceral, and 2, the parietal layer of the pleura, on the right side; 3, 3, the ribs; 4, 5, section of the right and left lungs; 6, the heart; 7, the pulmonary artery, dividing into the right and left branches; 8, 8′, the right and left pulmonary veins; 9, 9′, the ascending and descending aorta, the intervening arch being cut away; 10, 10′, the right and left bronchi; 11, the œsophagus; 12, body of dorsal vertebra; 13, the sternum.

that which lines the interior of the chest is called the *pleura costalis*, or parietal layer; while the space intervening between these two layers is called the *cavity of the pleura*. Each pleura, as will be at once seen by a reference to the figure, is a closed sac, and quite independent of the other. The interspace between the pleuræ on the right and left side, is termed the *medias-*

tinum, and contains all the viscera of the thorax excepting the lungs.

The inner surface of each pleura is smooth, glistening, and moistened by a serous fluid; the outer surface is closely adherent to the surface of the lung, to the roots of the pulmonary vessels as they enter the lung, to the upper surface of the diaphragm, and to the walls of the chest. The lobes of the lungs are separated from one another by involutions or in-foldings of the visceral layer; two such involutions—one on either side—are shown in the figure. The use of these serous sacs is much the same as that of the *Peritoneum* (q. v.); each pleura retains the lung and, to a certain extent, the greater vessels in position, while it at the same time facilitates, within certain limits, the movements of those parts which are essential to the due performance of the act of respiration.

PLEU'RISY, or inflammation of the investing membrane of the lung, is one of the most serious diseases of the chest. It is very often, but by no means invaribly associated with inflammation of the *substance* of the lung, commonly known as *Pneumonia* (q. v.). Pleurisy without pneumonia is much more common than pneumonia without pleurisy. When both are present, but pneumonia preponderates, the correct term for the affection is *pleuro-pneumonia*, although it is frequently spoken of simply as pneumonia, probably in consequence of the remedies being applied mainly to it, as the more important of the two elements in the compound malady.

The pleura being a serous membrane, its inflammation is attended with the same course of events as have been already described in our remarks on the two allied diseases, *Pericarditis* and *Peritonitis*. The inflammation is of the adhesive kind, and is accompanied by pain, and by the effusion of serum, of fibrinous exudation (the *coagulable lymph* of the older writers), or of pus, into the pleural cavity. In consequence of the anatomical relations of the pleura—one part of the membrane (the parietal) lining the firm walls of the chest, while the other part (the visceral) envelops the soft and compressible lung; and these opposed surfaces being freely movable on one another—it follows that very different effects may be produced by its inflammation. For example, the visceral layer may be glued to the parietal layer, so as to prevent all gliding movement between them, and to obliterate the pleural cavity (similarly to what often happens in *Pericarditis* q. v.); or the two surfaces which are naturally in contact, may be abnormally separated by an infusion of serum between them; or from a combination of these results, the opposite surfaces of the pleuræ may be abnormally united at some points, and abnormally separated at others.

The general symptoms of pleurisy are rigors, pain in the side, fever, difficulty and rapidity of breathing, cough, and an impossibility of assuming certain positions; and of these, the most marked is the pain or *stitch in the side*, the *Point de côté* of the French writers. From the prominence of this pain, which occupies a single spot, and is of a sharp, stabbing character, the Latin writers term pleurisy *Morbus lateris*. This spot is usually about the center of the mamma of the affected side, or just below it; but why the pain should be usually restricted to that one small spot, when the inflammation pervades a considerable extent of surface, is a question that has never received any satisfactory answer. The pain is, however, occasionally felt in other parts—as in the shoulders, in the hollow of the armpit, beneath the collar-bone, along the breast-bone, &c.

Cruveilhier observes that the pain sometimes affects the loins, and simulates lumbago; while Andral and Dr. Watson have directed attention to the fact, that the pain often affects the hypochondrium, and may be readily mistaken for a symptom of peritonitis, or (if occurring on the right side) of hepatitis. The pain is increased by percussion, by pressure between the ribs, by a deep inspiration, by cough, &c.; and the patient is often observed to suppress a natural desire to cough, or never to draw more than a short and imperfect inspiration. The cough is not invariably present, although it is an ordinary symptom. It is small, suppressed as far as possible by the patient, and is either dry, or accompanied by the expectoration of slight catarrh. If much frothy mucus is brought up, it is a sign that Bronchitis (q. v.) is also present, and the appearance of rust-colored sputa indicates the co-existence of pneumonia. Although the above named symptoms, especially when most of them occur together, afford almost certain evidence of the existence of pleurisy, yet to the physician the physical signs are still more valuable, especially those furnished by percussion and auscultation.

Pleurisy far more commonly arises from exposure to cold than any other cause, especially if a poisoned condition of the blood, predisposing to inflammation of the serous membrane, is present; but it may be occasioned by mechanical violence (as by a penetrating wound of the thorax by the splintered ends of a broken rib, &c.), or by the accidental extension of disease from adjacent parts. The disease may terminate in resolution and complete recovery; or in adhesion, which often only causes slight embarrassment of breathing: or it may end with such a retraction of one side of the chest as to render the corresponding lung almost or totally useless: or it may cause death either directly by actual suffocation, if the effusion is very copious, and is not removed by tapping; or indirectly, by exhaustion. It is seldom, however, that simple pleurisy proves fatal.

In acute pleurisy, occurring in a robust and previously healthy subject, free blood-letting should be at once resorted to. If there is a sharp stitch in the side, and the respiration is short, quick, and restrained, the patient should be bled, in the upright position, from a large orifice in the vein, until the pain is relieved, and he can draw a full breath without discomfort, or until he is about to faint; and if the pain and difficult breathing should return, and the pulse continue firm and hard, either the venesection must be repeated, or leeches must be freely applied to the painful side. The bowels should be freely evacuated, after which calomel should be given, guarded with a little opium, to the extent of producing *slight* mercurialization, with the view of checking the effusion of fluid. The more rapidly the system can be thus affected, the better, and hence it has been recommended (by Dr. Walsh) that during the first six hours a grain and a half of calomel, combined with a sixth of a grain of opium (or more, if the pain continues acute), should be given every half hour; while mercurial ointment is rubbed into the skin of the affected side, near the arm-pit, every fourth hour. Care must be taken that neither decided salivation nor narcotism is induced; and as soon as there is any evidence from the breath, or from the appearance of the gums, that the mercurial action has been established, the further administration of the calomel and the ointment must be suspended. After the pain and fever have ceased, we must facilitate the absortion of the fluid by diuretics. A pill composed of half a grain of digitalis, a grain of squills, and three grains of blue pill taken twice a day, usually acts efficiently; and the compound tincture of iodine of the London (*not* the British) Pharmacopœia, in does of twenty minims, taken, largely diluted, three times a day, has been strongly recommended.

There has been considerable discussion of late years, as to how far the operation of tapping the chest, and letting out the fluid, is justifiable in this disease. The best authorities are of opinion that in simple pleurisy it ought never to be performed unless (1) the life of the patient is in immediate danger from the continued pressure of the fluid in the sac; (2) unless all other means of getting rid of the fluid having failed, the patient is evidently losing strength daily; and (3) unless there is good reason to believe that the fluid consists of pus, in which case it should be let out. In all cases in which the operation is contemplated, a grooved needle should be introduced into the pleura. By this means, we not only ascertain the actual presence of fluid, but we discover its nature. If it be serous, it will flow readily along the groove, and trickle down the patient's side; if it be purulent and thick, a drop or two will probably be visible at the external orifice, and when the needle is withdrawn, its groove will be found to contain pus. The puncture thus made is quite harmless, and inflicts very little pain.

PLEURISY ROOT. See BUTTERFLY WEED.

PLEURODY'NIA is a rheumatic affection of the intercostal muscles, and is characterized by acute pain in the side upon taking a full breath or coughing, and by great tenderness on pressure. If it happens to be attended by slight febrile excitement, or by a cough, it is impossible to distinguish it from pleurisy, except by attending to the physical signs which characterize the latter disease. Cruveilhier maintains that 'pleurodynia is nothing more than adhesive pleurisy;' and in many cases of assumed pleurodynia, there is little doubt that the pain is due to old adhesions. The disease generally yields to local measures, such as blistering, or counter-irritation in a milder form by rubefacient liniments. A mixture of soap-liniment and chloroform rubbed over the affected part two or three times a day, often gives relief. In the more persistent cases, leeches may be applied with benefit.

PLEURONE'CTIDÆ, a family of fishes included in Cuvier's order *Malacoptirygii*, but belonging to the order *Anacanthini* of Müller's system (see MALACOPTERYGII), and remarkable for a character to which there is nothing similar in any other vertebrate animals, a want of symmetry in the head, and for swimming not with the back uppermost, like other fishes, but with one side uppermost. The peculiar structure of the head adapts it to this mode of swimming, both eyes being on that side which is uppermost. Some of the bones of the head are distorted to a very considerable degree, but there is no want of symmetry in those of the body. The sides of the mouth are unequal. The body is extremely compressed, whence the P. are popularly termed *Flat Fish*, the back and belly being mere edges fringed by the dorsal and anal fins. The pectoral fins are generally unequal, also the ventral fins, those of the lower side being smaller than those of the upper. The upper side is often brown, or of some darkish color, and variously marked; the lower side whitish. The color of the upper

side generally corresponds so much with that of the bottom, close to which these fishes swim, that they readily escape observation; and on this they seem chiefly to depend for safety, although, when hard pressed, they raise themselves in a vertical position, and suddenly throw themselves upward and forward to some distance, but then resume their ordinary posture, and as close to the bottom as possible. Their ordinary swimming is by a kind of undulating movement. They swim with great activity. They have no air-bladder. They abound chiefly where the bottom is smooth, either muddy or sandy. All of them are sea-fishes, but some are very common in brackish water, ascend rivers, and can be kept in fresh-water ponds. Many of them are in great esteem for the table. The turbot, halibut, brill, plaice, and flounder are examples of this family.

PLEU'RO-PNEUMO'NIA, in an epizootic form, first appeared amongst the horned cattle of Great Britain and Ireland in 1841. From time immemorial it had, however, been known in the great cattle-breeding plains of Central and Northern Europe. It consists in a sub-acute inflammation of the structure of the lungs and their investing membrane, shows a great tendency to early exudation, and is accompanied by low fever. It is contagious, but, like many other contagious disorders, it occasionally occurs independently of contagion, and is fostered by overcrowding, exposure to cold and wet, damp, dirty hovels and other such causes, which depress the vital powers. The symptoms come on insidiously, appetite and rumination are irregular, there is fever, dulness, a short, half-involuntary cough, with quickened breathing and pulse. In cows, the yield of milk is early diminished. After three or four days, large portions of the lungs become filled with the products of inflammation, hence the labored breathing, quick indistinct pulse, wasting, and fatal weakness. Death generally occurs in from ten to twenty days. When pleuro-pneumonia first appeared in this country, it was greatly more fatal than it has since become, and fully four-fifths of the cattle attacked died; with prompt and rational treatment, more than one-half of the affected cases now recover. But as a favorable result is uncertain, and much flesh is lost even during a slight attack, it is still advisable, when pleuro-pneumonia breaks out in a herd, to consign to the shambles any of the cattle in good condition that have mixed with those diseased.

The best treatment consists in avoiding bleeding and all reducing remedies, supporting the strength, and keeping up the action of the skin, bowels, and kidneys, in order that the poisonous products of the disease may be rapidly got rid of. For this end, the patient should be provided with a cool comfortable house, clothing to the body, bandages to the legs, a daily dose of two ounces each of nitre and common salt given in treacle and water. When the bowels are costive gentle laxatives are required. By the second or third day, counter-irritants may be applied to one or both sides, which should first be bathed with hot water and thin mustard paste, or a mixture of cantharides and euphorbium ointments well rubbed in. By the third or fourth day, or earlier, if there is weakness, arrested secretion, and coldness of the skin, give several times daily some stimulant, such as a quart of warm ale, with an ounce or two of ginger or other stomachic, some good whisky-toddy, three-ounce doses of sweet spirit of nitre, or of spirit of ammonia. Whilst the disease continues, and even during early convalescence, all food requiring rumination must be interdicted, and mashes, flour and treacle, bruised grain, or any light digestible articles substituted for the ordinary hay, straw, or roots. As pleuro-pneumonia is in many cases propagated by contagion, the sick should be separated from the sound stock; and any premises they have occupied carefully cleansed by whitewashing, and the use of M'Dougall's, Condy's, or other effectual disinfecants. When pleuro-pneumonia prevails in a neighborhood, all fresh purchases should be placed in quarantine, and kept perfectly away from the home-stock for at least three weeks. Attention to this simple precaution has preserved many farmers from pleuro-pneumonia, even while it has raged all around them.

PLEXI'METER. See PERCUSSION.

PLEYEL, IGNAZ, a musical composer of some note, born in 1757 at Rupperstahl, near Vienna. He studied music under Vanhall and Haydn, and made in early life an extensive tour in Italy, to hear the works of the best composers. In 1783, he was made *Capellmeister* of Strasburg Cathedral, and during the succeeding ten years, composed most of the works on which his popularity rests. In 1791, he visited London, and composed there three symphonies. Two years afterwards, during the frenzy of the French Revolution, he fell under suspicion, and in proof of his acquiescence in the new order of things, had to compose a musical drama for the anniversary of the 10th of August; which saved his life. After a long career in Paris as a publisher of music and pianoforte manufacturer, he retired to an estate which he had purchased near Paris, and died in 1831. His compositions, consisting of quartetts, concertantes, and sonatas, are full of agreeable melodies, sometimes light and trivial, but occasionally vigorous.

PLI'CA POLO'NICA is the name given to a disease of the scalp, in which the hairs become matted together, by an adhesive and often fœtid secretion, and which is especially prevalent in Poland, although it occasionally occurs in other countries. The hair is found, on microscopic investigation, to be invested with a fungus of the genus *Trichophyton*. The only treatment that is beneficial is the removal of the hair, and strict attention to cleanliness; but as it is popularly believed in Poland that this affection affords a security from all other sickness and misfortune, it is often difficult to persuade patients to have recourse to these means. For an account of the parasitic fungus that attacks the hair in this disease, and of the changes of structure which it induces, see Küchenmeister's *Manual of Parasites*, vol. ii. pp. 148—152.

PLINLI'MMON, or PLYNLIMMON, a mountain of Wales, on the boundary between Montgomery and Cardigan, 11 miles north-west of Llanidloes. It is 2481 feet in height. The name P. is said to be a corruption of the Celtic *Pumlumon*, signifying Five Rivers, and to be due to the fact, that five rivers have their source in this mountain: one of them is the Severn, and another the Wye. P. is a huge mountain mass, with three chief summits.

PLINTH, the square member at the bottom of the base of a column. Also the plain projecting band forming a base of a wall.

PLINY (C. PLINIUS SECUNDUS), often called Pliny the Elder, and author of the celebrated *Historia Naturalis*, was born in the north of Italy, either at Novum Comum (*Como*) or Verona, 23 A.D. Whether it was his birthplace or not, the former town was certainly his family's place of residence, since he had estates in its neighborhood; his nephew, the Younger Pliny, was born there, and inscriptions relating to members of his family have been found near it. While still young, he was sent to Rome, where his ample means and high connections secured him the best education. At the age of 23, he entered the army, and served in Germany, as commander of a troop of cavalry, under L. Pomponius Secundus, of whom, in later life, he wrote a memoir. He traveled over nearly all the frontier of that extensive province, visited the Cauci and the sources of the Danube, composed during the intervals of military duty his treatise *De Jaculatione Equestri*, and commenced a history (afterwards completed in twenty books) of the Germanic wars.

On his return to Rome in 52 with Pomponius, he entered on the study of jurisprudence; but his practice as a pleader proved him to have no great capacity for the legal profession; and accordingly, he retired to his native place, where he spent the greater part of the reign of Nero in miscellaneous authorship. It was during this period that he wrote his *Studiosus*, a treatise in three books on the training of a young orator from the nursery to his entrance on public life, and apparently intended to guide the education of his nephew; also his grammatical work, *Dubius Sermo*, in eight books. Shortly before Nero's death, we find him a procurator in Spain, where, in 71, he heard of his brother-in-law's decease, and of his being intrusted with the guardianship of his nephew, Pliny the Younger, whom he adopted on his return to Rome before 73. Vespasian, the reigning emperor, whom he had known while serving in Germany, received him as one of his most intimate friends; and it was at this period that he completed, in thirty-one books, and brought down to his own time, the Roman history of Aufidius Bassus. His mode of study at this time was a model of systematic assiduity. When living in the busy world of Rome, he would begin his studies by candlelight in autumn at a late hour of the night, and in winter at one or two in the morning. Before daybreak, he would call on the emperor, for whom he would proceed to execute various commissions; this done, he would return home, and resume his studies. A slender meal would follow; after which he would, in summer weather, lie in the sunshine, and take notes or extracts from the books which were read to him.

The practice of jotting down important facts or observations was habitual with him, and he was often heard to say that there was no book, however bad, from which some good could not be got. A cold bath, followed by a light meal and a short sleep, occupied another interval, after which he would study till the *cœna*, or dinner-time. Even at this meal, some book was read to him, on which he would make comments. When in his country residence, he studied nearly all the time, except when in the bath; and even then, while his attendants were performing the duties incident to that luxury, he would be listening to some one who read to him, or he would be dictating to his amanuensis. When on a journey, again, he was never without a secretary at his elbow, provided with a book and tablets. By this mode of life, he collected an immense mass of materials, from which he compiled his great *Historia Naturalis*, published about 77. No fewer than 160 *volumina* of notes were found at his death, two years afterwards.

The great eruption which, in 79, submerged Herculaneum and Pompeii was at its height when he was stationed off Misenum, in command of the Roman fleet. Eager to examine the phenomenon more closely, he landed at Stabiæ, where he was suffocated by the vapors caused by the eruption. He was, as his nephew tells us, corpulent and asthmatic, and sunk the more readily. None of his attendants shared his fate.

Of all his works, only his *Historia Naturalis* has come down to us. It comprehends a greater variety of subjects than we now regard as included under that title. Astronomy, meteorology, geography, mineralogy, zoology, botany, everything, in short, which is a natural or non-artificial product, finds a place in P.'s Natural History. Even to this elastic interpretation of the term, he by no means rigidly adheres; the work being interspersed with digressions on such subjects as human institutions and inventions, and the history of the fine arts. It is divided into 37 books—the first of them being a dedicatory epistle to Titus, with a table of contents of the remaining books, and embraces, as we are told in the preface, 20,000 matters of importance, extracted from about 2000 volumes. Its scientific merit is not great. There is little attempt at philosophical arrangement; the observations are nearly all taken at second-hand, and show small discrimination in separating the true from the false, or the probable from the marvelous. His meaning is often obscure, from his writing of things with which he was personally unacquainted, and from his having missed the true sense of the authors whom he cites or translates. But it cannot be denied that the work is a great monument of industry and research—most praiseworthy as having been constructed and completed amid the labor of other onerous undertakings, and amid the distractions of a life engaged in active official employment; and most valuable as supplying us with details on a great variety of subjects, as to which we have no other means of information. The best critical editions of the text are those of Sillig (8 vols. 1851–57), Ian (1854–63; new ed. 1875), and Detlefsen (1867–75). There are several editions of the text with French notes, one by Grandsagne, with notes by Cuvier and others (1829), and one by Littré (1848–50). Pliny's work has been translated into almost all European languages.

PLINY (C. PLINIUS CÆCILIUS SECUNDUS), nephew of the preceding, and son of C. Cæcilius, frequently called Pliny the Younger, was born at Novum Comum, 61 A.D. He was still young when he lost his father, and was adopted by his uncle, under whose care, and that of his mother, Plinia, and his tutor, Virginius Rufus, his education was prosecuted. Passionately devoted to literature, he wrote a Greek tragedy at the age of 13; studied eloquence under Quintilian; and became so famous for his literary accomplishments, that he acquired the reputation of being one of the most learned men of the age. His oratorical powers were also considerable; in his 19th year, he began to speak in the forum; and his services as an advocate before the court of the Centumviri and the Roman senate were in frequent request. He held numerous official appointments; served, while a young man, as *tribunus militum* in Syria, where he listened to the teachings of Euphrates the Stoic, and Artemidorus; was after-*equæstor Cæsaris;* was prætor about 93, and consul in 100, when he wrote his *Panegyricus*, an adulatory eulogium of the Emperor Trajan, and containing little information as to the author and his times. He was appointed in 103, proprætor of the province Pontica, an office which he vacated in less than two years; and he also discharged the function of curator of the banks and channel of the Tiber. He was twice married, his second wife being Calpurnia, grand-daughter of Calpurnius Fabatus, and considerably younger than her husband, by whom she was much beloved for her accomplishments and amiability. He had no issue by either marriage.

Our knowledge of P. the Younger is mainly derived from his letters or *Epistolæ*, of which there are ten books. He collected them himself, and probably wrote many of them with a view to publication. They hold a high place in epistolary literature, and give us many interesting glimpses into the life of their author and his contemporaries. P. himself appears in them to considerable advantage, as a genial and philanthropic man, enamored of literary studies, and fond of improving his estates by architectural ornament. His ample fortune was liberally bestowed; and his slaves always found in him an indulgent master. Infirm health impaired throughout life his constitution, which was naturally weak; but of the time or cause of his death, we know nothing. Of the facts contained in his letters, however, the most interesting to us are those relating to the punishment of the Christians. Death appears to have been the penalty attached even to the confession of being a Christian; although the adherents of the faith admitted no other acts, on examination, than those of meeting on a fixed day before dawn, when a hymn to Christ was sung, and taking an oath to avoid theft, adultery, breach of faith, and denial of a deposit. Nothing more unfavorable to them than this could be extorted by P. from two female slaves, reputed to be deaconesses, whom he put to the torture. P. having asked Trajan how he was to stop the spreading superstition, the emperor replied that no general rule could be laid down; that he ought not to institute a search after persons supposed to be Christians; but if any were brought before him, and the charge was proved, such were to be punished, if still impenitent. The best edition of P.'s *Panegyricus* and *Epistolæ* together, is that of Schaefer; of the *Epistolæ* alone, that of Gierig.

PLOCA'RIA, a genus of *Algæ*, of the order or suborder *Ceramiaceæ*, having a cartilaginous frond, composed of large cells, as if jointed, and dividing into slender, tufted, and densely aggregated branches. *P. helminthochorton* is the CORSICAN MOSS of the apothecaries' shops, once of some reputation as a vermifuge but now little used, and believed to be of little efficacy. It is a small plant, with a filiform entangled frond, and grows on the shores of the Mediterranean. It has a strong marine odor and a salt taste. It consists in great part of a vegetable jelly or mucilage, which renders it nutritious, and contains much chloride of sodium, sulphate of lime, and carbonate of lime. As sold in the shops, it is always much mixed with other algæ.—*P. tenax* is a small plant with filiform, branched, and somewhat gelatinous frond, much used by the Chinese as a glue. It is also used in China as an article of food.—*P. candida* is used to a considerable extent as an article of food in the East. It is popularly called CEYLON MOSS. The frond is whitish and much branched, the branches long and somewhat clustered. It is exported to China from the islands of the Indian Archipelago, forming a portion of the cargo of almost every junk. The Chinese make it into a jelly with sugar, and use it as a sweetmeat. It consists in great part of a vegetable jelly, with a considerable quantity of starch. It has been introduced into Britain as a light and nourishing food for children and invalids, and is found particularly suitable in cases of irritation of the mucous surfaces.

PLOCE'US. See WEAVER BIRD.

PLOCK (Russ. Plotzk), a town of Poland, capital of the government of the same name, occupies an elevation on the right bank of the river Vistula, 78 miles west-north-west of Warsaw. Its principal buildings are the cathedral, built in 961, the bishop's palace, theater, &c. Agriculture, and the export of grain to Danzig and other ports, are the chief employments. Pop. (1880) 22,127.

PLOCK (Russ. Plotzk), a government in the north of Poland, bounded on the north by Prussia, and on the south-west by Warsaw. Area, 3520 sq. m.; pop. (1880) 522,006, 80 per cent. of whom are Poles. Hills occur in the north and on the banks of the Narew and Vistula, which with the Bug are the chief rivers. One-third of the surface is covered with forests, and there are many marshes and lakes. The inhabitants are engaged chiefly in agriculture, and in cattle and sheep breeding.

PLOJE'SHTI, or PLOYESTI, a town of Walachia, 35 miles north-by-east from Bucharest. It is a place of considerable trade, and has a great annual wool-fair. Pop. (1880) 33,000.

PLONGÉE, in Artillery and Fortification, means a slope towards the front. Thus, in speaking of the course of a shell through the air, its plongée is from the point of greatest altitude to the point at which it strikes the earth. So, in fortification, the plongée is the top of the parapet sloping gently towards the front. The slope is ordinarily 1 in 6; but a deviation is permissible of from 1 in 9 to 1 in 4: the sharper the slope, however, the more liable is the crest of the parapet to be destroyed by an enemy's fire. Moreover, as flat a plongée as possible is desirable, that sandbags may, when required, be laid upon it to form a cover for riflemen. See FORTIFICATION, fig. 7.

PLOTI'NUS, the most original and important philosopher of the Neo-Platonic School, was born at Lycopolis in Egypt 205 A.D.; but such was his utter indifference to things human, 'being ashamed almost to live in a body,' that he never would divulge even his parentage. He would never allow his birthday to be celebrated, although he gave feasts on those of Socrates and Plato; nor would he ever permit a painter or sculptor to perpetuate his features, or, as he called it, to produce the image of an image—the body being to him only a faint image of existence. He deemed it tedious enough already to have to drag about this image whithersoever he went in this life. His body was altogether contemptible in his eyes; he would see no physician in his illness, and was very sparing in the use of food, refraining from meat, often even from bread. Strangely enough, his desire for the study of philosophy did not arise within him before his 28th year, when he repaired to Alexandria, and there, after having sat at the feet of the great masters for some time without feeling satisfied with their teachings, he at last became acquainted with Ammonius Saccas, and in him found the desired teacher. For ten years he zealously attended his lectures, and although he had agreed, with two of his fellow-students, never to make known aught of Ammonius's teachings to the world, he yet became the chief representative

and author of that school, less as a pupil than as an independent thinker, who taking his stand upon its theorems, developed them to their full extent. In 242 he joined Gordianus's expedition to Persia, in order to devote himself to the philosophy of India and Persia; but the emperor being murdered in Mesopotamia, he had to repair hurriedly to Antioch, whence, in 244, he went to Rome. His lectures here were attended not only by crowds of eager youths, but men and women of the highest circles flocked to hear him.

Not only Platonic wisdom, in Neo-Platonic garb, but asceticism and the charm of a purely contemplative life, were the themes on which he, in ever-new variations, and with an extraordinary depth and brilliancy, held forth; and such was the impression his earnestness made upon his hearers, that several of them really gave up their fortune to the poor, set their slaves free, and devoted themselves to a life of study and ascetic piety. Dying parents intrusted their children and money to him, well knowing that an honester guardian, and one more anxious for his charges, could not be found. It is hardly surprising to find that his contemporaries coupled with his rare virtues the gift of working miracles. Sixty years old, he thought of realizing Plato's dream, by founding an aristocratical and communistic commonwealth like the latter's 'Republic;' and the Emperor Gallienus was ready to grant the site of two cities in Campania for his 'Platonopolis;' but his courtiers prevented the fulfilment of this promise. P. died from a complication of diseases, in 270, at Puteoli, 66 years of age.

Although he began to write very late in life, he yet left 54 books of very different size and contents. His MS. being very carelessly written, he asked his pupil Porphyry to revise and correct it for him. The latter also divided it into six principal divisions, each subdivided again into nine books or *Enneads*. The most important parts are those which treat of Beauty, Fate, Immortality of Soul, the Good or One, the Three Original Substances of Free Will, against Gnostics of Providence, of the Genesis of Ideas, of the Influence of the Stars, of the Supreme Good, &c. The language is very unequal in the different portions, according to the mood and circumstances to which they individually owe their existence; but it always is original, compact, and graphic in the extreme.

P.'s system was based chiefly on Plato's theorem of the Ideas; only that while Plato assumed the Ideas to be the link between the visible and the invisible, or between the Supreme Deity and the world, P. held the doctrine of Emanation, that is, the constant transmission of powers from the Absolute to the Creation, through several agencies, the first of which is 'Pure Intelligence,' whence flows the 'Soul of the World,' whence, again, the souls of 'men' and 'animals,' and finally 'matter' itself. (For a fuller account of this part of P.'s system in its historical connection, see NEO-PLATONISTS.) Men thus belong to two worlds, that of the senses and that of Pure Intelligence. It depends upon ourselves, however, to which of the two worlds we direct our thoughts most and belong to finally. The ordinary virtues, as justice, moderation, valor, and the like, are only the beginning and very first preparation to our elevation into the spiritual realm; purification, or the exercise of *purifying* virtues, is a further step, to which we attain partly through mathematics and dialectic; and the abandonment of all earthly interests for those of intellectual meditation, is the nearest approach to the goal. The higher our soul rises in this sphere of intellect, the deeper it sinks into the ocean of the good and the pure, until at last its union with God is complete, and it is no longer thought but vision and ecstacies which pervade it. These are a few snatches of P.'s philosophical rhapsodies, to which may be further added his mysterious belief in a kind of metempsychosis by which souls, not sufficiently purified during life, return after death, and inhabit according to their bent, men, animals, and even plants.

He further held views of his own respecting gods and demons, whom he divided into different classes, according to their degrees; and professed faith in Mantic, astrology, and magic, the conviction of the truth of which sciences he derived from his theory of the harmony in the intellectual world, reflected by the material world. Yet it is clear from his dicta on these subjects that he did not believe in these so-called sciences in the gross sense of the herd, but that he had a vague knowledge of those mysterious laws of attraction and repulsion which go through nature. P.'s philosophy, which, as it were, tried to combine all the systems of Anaxagoras, Parmenides, the Pythagoreans, Plato, and Socrates, and the Stoa into one, was the last and boldest attempt of the ancient Greek world to explain the mystery of the creation and of existence. Its influence upon modern philosophy is remarkable. From Spinoza to Schelling, the reminiscences of P., irrespective of the drift of particular parts of their systems, recur constantly.

P.'s works were well-nigh forgotten, when Marsilius Ficinus first published a Latin paraphrase of them (Florence, 1492), which was followed by the *Ed. Pr.* of the original (Basel, 1580 and 1615). The first critical edition, however, is due to Creuzer (Oxford, 1835, 3 vols.). Others are those of Dübner (Paris, 1855) and Kirchhoff (1856). Parts of his works were translated into German by Engelhard (1820); into English by Taylor (1794 and 1817); into French by Bouillet (1861, 3 vols.). See Kirchner, *Die Philosophie des P.* (1854).

PLO'TUS. See DARTER.

PLOUGH, PLOUGHING. The first in order and importance of agricultural operations is the breaking up of the soil, and this is accomplished, in all countries where agriculture is in an advanced state, by inverting the upper stratum of earth upon which the plants grow. Such a mode also buries and destroys all weeds, leaving the surface clean and unencumbered. The inversion of the upper stratum is effected by turning over successive sods or slices, of the length of the field, and of varying thickness and depth, according to the nature of the succeeding crop, and the nature of the soil; and the implement employed for this purpose is the *plough*. The general form of the plough is known to every one, and to the unobservant eye, it appears to be a very simple and even primitive tool; nevertheless, much mechanical skill and ingenuity have been expended in perfectly adapting it to its work. It is a combination of instruments (fig. 1) fastened to a beam,

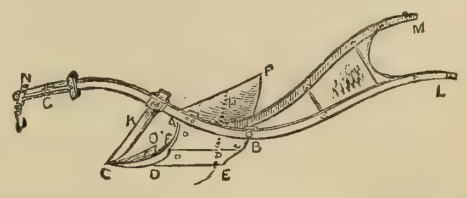


Fig. 1.

GBL; the *coulter*, K, is an iron knife-blade, for cutting the sod vertically; the *share*, CFD, which is merely a socket fitted on and not fastened to the body of the plough, has a sharp point, C, and a projecting horizontal edge, CO, on its right-hand side, its part of the work being to separate the under-surface of the sod from the subsoil; by means of the *mould-board*, H, the slice, now wholly separated from the firm ground, is raised up and turned over by the forward motion of the plough; and the *stilts*, or handles, one of which, EL, is a continuation of the beam, the other, M, being fastened partly to the former by rods, and partly to the lower portion of the framework (fig. 2, which also

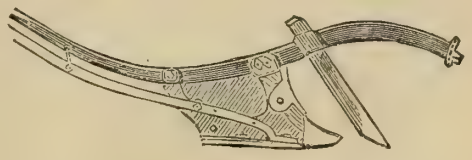


Fig. 2.

shows the point of the plough with the share removed), are for the purpose of guiding the implement.

The front part of the beam is formed with an upward curve; at its extremity, is placed the *bridle*, N, to which the horses are attached by means of swing-trees and chains or traces, and the object of which is to enable the workman to elevate or depress the line of draught, or move it to the right hand or the left, as may be found necessary. The left sides of the coulter, share, and framework ADEB, should evidently be in the same vertical plane. The form of the mould-board is of the utmost importance, and has chiefly attracted the attention of agricultural machinists since the time when improvements on the plough were first projected. Its office being to raise and turn the sod, it is necessary that the surface should slope upwards and outwards from the front, so as to apply a pressure in both directions, and, accordingly, the surface is so shaped that from the point of the share, where it is horizontal, it gradually curves upwards, till, at the extremity, P, it inclines over away from the body of the plough. The gradual change produced on the position of the furrow-slice is seen in fig. 3, where ABCD on the left-hand side, represents the slice un-

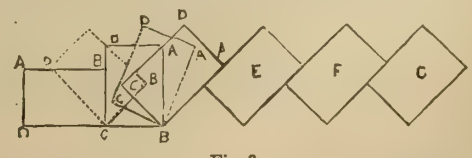


Fig. 3.

touched by the plough, AD being the line of section by the coulter; DC, by the share; BC, the open side from which the previous furrow (E) to the right-hand side has been separated; and

the four successive rectangles, ABCD to the right, illustrate the successive changes of position of the furrow as the mould-board is pushed forward under and on its left side, till it is finally left, as represented in ABCD on the right hand; E, F, G are furrows which have previously been laid in their proper position. The advantages of laying the furrows in the position shown are these: in the first place, the weedy side of each furrow being closely applied to the previous furrow, and kept pressed against it by its own weight, and the pressure of the mould-board, the weeds are completely buried; secondly, the ridged surface thus presented, affords the means of covering the seed by harrowing; and lastly, the openings below increase the amount of surface accessible to air, and drain off superfluous water.

The modern plough is wholly formed of iron; the share and the framework of malleable, and the mould-board of cast iron, or sometimes of steel; while the coulter is frequently welded with steel on the right-hand side, the better to resist attrition. In most of the English (as distinguished from the Scotch) ploughs, wheels are attached at or near the front end of the beam, a contrivance which renders the implement more steady in its motion, more easily managed, and capable of doing better work in the hands of an inferior workman; but it is generally believed, in Scotland at least, that the plough without wheels, or *swing-plough*, as it is technically termed, is greatly more efficient in the hands of a thoroughly skilled ploughman. The usual dimensions of the furrow-slice in lea or hay-stubble are 8 or 9 inches in breadth by 6 in depth; and in land for green crop, 10 inches in breadth and 7 or 8 in depth. Shallower ploughing is not unfrequently adopted, especially on thin soils, and in various parts of England. Nor is it uncommon to plough stubble-land 10 inches or more in depth.

Other kinds of ploughs are used for special purposes, such as *trench-ploughs*, which are made on the same principle as the common plough, but larger and stronger, so as to bring up a portion of the subsoil to the surface; *subsoil ploughs*, which have no mould-board, and merely stir and break up the subsoil, thus facilitating drainage; *double mould-board ploughs*, which are merely common ploughs with a mould-board on each side, and are employed for drilling turnip or potato land, for water-furrowing, and for earthing up potatoes, &c. Of each of these ploughs, there are many varieties, each maker having generally some peculiar views regarding the form and proportion of some parts of the instrument. For those who wish to study minutely the best form of plough, it will be necessary to consult works on agriculture and agricultural implements.

There is, however, one very peculiar form of plough sometimes used in various parts of England, which deserves more particular notice; this is the *turn-wrest plough*. Its chief peculiarity is, that instead of one, it has two mould-boards, one on each side, and these are alternately brought into operation, so that the furrow is always turned over in the same direction. The mould-boards are firmly fastened together in front, and kept at a constant distance from each other behind, by means of struts, while the handles are movable with reference to them; the mould-board which is intended to be used being pushed away from, and the other (which for the time does the same work as the vertical surface ADEB in fig. 1) brought nearer to the line of the beam; of course, when the next furrow is ploughed, the mould-boards exchange adjustments. This form of plough is useful in ploughing along a hill-side, as by it all the furrows can be turned over towards the hill, thus preventing the natural tendency of the soil to work itself downwards, leaving the upper portions bare. The form (fig. 4)

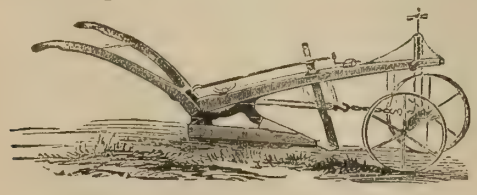


Fig. 4.

here given is the rudest and least desirable form of the turn-wrest; it is that which is used in Kent, and there esteemed. Some years ago the *double-furrow* plough was introduced. It consists of an iron frame, similar in some respects to that of a grubber or cultivator, with two breast-plates, mould-boards, and shares; the one set a little back from the other, and so far distant as it is desired should be the width of the furrow. Two or three wheels bear the implement—one in front running in the bed of the last excavated furrow, and the other one or two behind. There is a directing rod, but no stilts. The double-furrow plough was at first singularly popular, and after a few years was found on almost every farm. It was, however, soon found that, generally speaking, the weight was too much for the draught of a pair of horses, and that, even on light land, three horses were required. In fact, the depth of tillage is in practice gradually increasing; so that, unless for a grain crop after either turnips or potatoes, these ploughs have been nearly laid aside.

The operation of ploughing can only be briefly referred to. Wherever the soil has been efficiently drained, the ridges can be made wider and ploughed on the flat, high ridges being no longer necessary for carrying off the water. There are advantages in ploughing the land in uniform ridges of 18 feet wide, or with an open furrow not more than 72 feet apart, made as flat as possible. But the effects of cultivation by steam show that the fewer the open furrows the better, particularly when the land is intended for a grain crop which is to be sown by drill or broadcast with machinery, and when the crop is to be cut with a reaping-machine, as is now almost universally the case. It is curious to notice how one improvement in farm practice leads on to another. The most common mode of ploughing with horses is now simply by casting the soil two ridges in and the next two out, beginning always with the two ridges where last time was left the open furrow.

The term *feering* is applied to the commencement of a wide ridge. The process of feering differs according to the state of the land to be turned over. If there exists an old furrow or hollow, as is generally the case in lea, two shallow furrows are turned, the one against the other, and so on; along each side of this commencement the plough moves, adding furrow after furrow, and increasing in depth until the third or fourth round is reached. This constitutes what is technically called the gathering system. In newly cleaned land, or where a hollow does not appear to turn the first furrows into, two furrows are thrown out and then turned lightly in. The most common system, however, is what is known as *casting* or *cleaving*. That is, after one feering is accomplished, another is made at the other side of the ridge, and furrow after furrow is turned towards the inside of each of these feerings until the whole ridge is ploughed, and then in the center is formed the *finish* or *mids*—a furrow or trench into which the feering is turned the next time the land is ploughed.

The plough is one of the most ancient of implements, and is mentioned in the Old Testament at a very early period, iron shares being also incidentally noticed more than seven centuries B.C. The ancient Egyptian plough was wholly of wood, and in some instances consisted of little more than a pointed stick, which was forced into the ground as it was drawn forward. In fact, the earliest ploughs were neither more nor less than varieties of the *Hoe* (q. v.), worked by pressing the point into the ground instead of by percussion. The earliest form of the Greek plough, the *autoguon* (fig. 5, *a*), is an example of this; it was merely the trunk

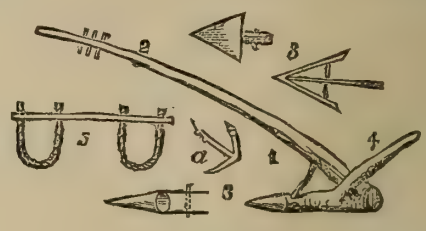


Fig. 5.

1, the Mysian plough; 2, its pole, where the oxen are attached; 3, shares of various forms; 4, the tail or handle; 5, the yoke; *a*, early Greek plough.

of a small tree, which had two branches opposite to each other, one branch forming the share and the other the handle, while the trunk formed the pole or beam. The more improved form, the *pekton*, in use among the Greeks, was not substantially different from the modern form in use in Mysia (fig. 5.). The ancient Egyptian plough in one of its early stages is represented in fig. 6,



Fig. 6.

and, like the two forms above described, is devoid of all apparatus enabling the laborer to guide it, all that he can do being to press (by his weight applied to the handle) the share into the

earth. The Egyptians, however, gradually improved the form, till it assumed the appearance of a hollow wedge formed by the two handles joined at the bottom, and with the beam fastened between the handles a little above their point of junction.



Fig. 7.

The Romans, an essentially practical nation, largely improved on the plough, adding to it the coulter and mould-board, and occasionally attaching wheels to the beam to prevent the share from going too deep into the earth (fig. 8). The plough was almost

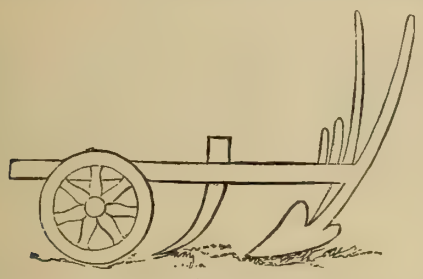


Fig. 8.

unknown among the American aborigines, though Prescott describes a mode of ploughing practised among the Peruvians, which consisted in the dragging forward of a sharp-pointed stake by six or eight men, its sharp point, which was in front, being kept down in the ground by the pressure of the foot of another man who directed it. Britain and America, and their colonies, are the only countries in which the plough has been brought to a state worthy of being considered effective, and even in Britain the most important amendments on it are not two centuries old. England took the lead in improvement by rendering the form more neat and effective, and by attaching wheels to aid in keeping the plough in a proper upright position. In Scotland, for some time after this, the plough was extremely rude and cumbrous, and usually drawn by 8 oxen, and some wooden ploughs are in use yet in the Highlands of Scotland. In the middle of the 18th c., some Dutch ploughs were imported, and being found more effective, an impetus was thus given to attempts at improvement. James Small, who may justly be regarded as the real inventor of the Scotch or swing plough, made great and important changes in the form and efficiency of the coulter, share, and mould-board, producing an implement at once lighter and vastly more efficient. All the swing-ploughs of successive makers are founded upon the basis of Small's plough. Wilkie of Uddingston (Lanarkshire) formed it wholly of iron, and his modification has been universally adopted in the modern ploughs.

Among the various improvers of this form of cultivator may be mentioned, besides Wilkie of Uddingston, Gray of the same place, Clarke of Stirling, Cunningham, Barrowman, Ponton, Sellars, Huntly (who have sent many of the swing-ploughs, for which their firm has long been famous, to Australia). In England, the improvers have chiefly been Ransomes of Ipswich (the patentee in 1785 of the cast-iron share), Howard of Bedford, Hornsby of Grantham (Lincolnshire) and Bushby of Bedale, the last of whom gained a medal for his mould-boards at the Great Exhibition of 1851. For further information concerning the plough and the mode of using it, see Morton's *Cyclopædia of Agriculture* (1856), Stephens' *Book of the Farm*, *Book of Farm Implements*, by Henry Stephens and R. Scott Burn, and other works.

Steam-ploughing.—Although it is not yet a quarter of a century since cultivation of the land by steam came into successful operation, it is about two centuries and a half ago since it was foreseen to be possible. So long ago as 1618, David Ramsey and Thomas Wildgosse took out letters-patent for engines and machinery to plough the ground without the aid of oxen or horses; and nine years afterwards, other ingenious men obtained letters-patent for machines to affect a similar purpose. It is the opinion of Mr. Woodcroft of the Patent Office, who compiled the *Abridgments of the Specifications Relating to Steam-culture*, that steam was the motive power intended to be employed; but as the first patent was taken out nearly 40 years before the Marquis of Worcester described the steam-engine in his *Century of Inventions*, the grounds for such an opinion do not seem quite satisfactory. In 1769, however, after the steam-engine had been applied to other purposes, there was lodged in the Patent Office a specification for a new machine or engine, to plough, harrow, and do every other branch of husbandry, without the aid of horses. The patentee was Francis Moore; and so confident was he of the merits of his plan, that he sold all his own horses, and persuaded his friends to do the same; 'because the price of that noble and useful animal will be so affected by the new invention, that its value will not be one-fourth of what it is at present.' Moore, however, was much too sanguine; his method of cultivating the land without the aid of animal power failed, as those of others before him had done.

The next invention necessary to mention was one by Major Pratt, patented in 1810. His plan was to have two engines, one on each headland, drawing, by means of an endless rope, an implement between them. In order to save the labor and loss of time in turning the plough at the ends, he attached two ploughs, back to back, making them work upon a fulcrum in the center of a frame, so that one could be raised out of the ground when the other was working. This was the first adoption of the balance-principle, now employed in most implements used in steam-cultivation. Major Pratt's apparatus, like those of his predecessors, never came into practical operation.

In the interval between 1810 and 1832, when Mr. Heathcoat, M.P., a Tiverton lace-merchant, patented the first steam-ploughing machinery that ever wrought successfully in the field, there were many inventions, but these being of little utility, need not be particularized. Mr. Heathcoat's machinery was principally intended for draining and breaking up soft or swampy land. It consisted of a locomotive steam-engine, with a broad, endless, flexible floor or railway attached to the wheels, so as to prevent them from sinking in the boggy soil. Opposite to this engine, an auxiliary carriage was placed, and between the two the plough was drawn backwards and forwards by an endless chain or band —engine and carriage moving along as the work proceeded. In 1836, this plough worked with tolerable success in Red Moss in Lancashire, and in 1837 it was tried near Dumfries, under the auspices of the Highland and Agricultural Society of Scotland; but here its performance, though in some degree satisfactory, was not sufficiently so to warrant the judges in awarding to it the prize of £500, which had been offered for the first successful application of steam-power to the cultivation of the soil by the Society. The apparatus was very cumbersome and expensive to work, the engine being 25 horse-power, and the number of men and boys employed in the operation no less than ten. The amount of work done was at the rate of 8¾ acres per day. Mr. Heathcoat abandoned the machine after having spent about £12,000 on it.

After Mr. Heathcoat, the inventors specially worthy of mention are Alexander M'Rae, who, arranging his motive-power in the same manner as Major Pratt, made the important addition of a barrel to the plough-frame upon which the slack-rope was to be wound up; Mr. Hannam of Burcote, who, in 1849, designed an apparatus to be driven by an ordinary portable engine, to be stationed at the corner of the field, which was surrounded with wire-ropes in the same way as will be afterwards described in Howard's method; and Mr. Tulloh Osborn, who, in 1846, patented a plan for two engines running opposite each other on the headlands, having two drums fixed to them, one for the winding of the tight, and the other for letting out the slack, gear. This apparatus was tried by the Marquis of Tweeddale for some time at Yester; but it was found, in consequence of the great power required, and other effects in detail, to be very expensive, and was ultimately given up. To the Marquis of Tweeddale, therefore, belongs the honor of being the pioneer of steam-cultivation in Scotland.

In 1855, the Messrs. Fisken of Stamfordham, Newcastle-upon-Tyne, took out a patent for a much more perfect apparatus for cultivating the land by steam than any that had previously appeared. The power was transmitted by a stationary engine to a hempen rope (the Messrs. Fisken being anxious to dispense with wire-ropes), which was worked at a high velocity, and, passing round pulleys on two self-moving anchors, turned a drum upon the plough, whose revolution imparted motion to the implement upon which it was fixed. The important features in this system were the self-propelling anchors, the arrangement of the ploughs on the balance-principle, and the mode of steerage. This plough was exhibited at the annual show of the Royal Agricultural Society of England in the year the patent was taken out, and excited great interest, but failed to obtain any award. Three years before

this, the Highland and Agricultural Society of Scotland had thought so hopefully of the idea, that a grant was voted out of its funds to assist the author in maturing his project.

In 1854, Mr. Fowler exhibited his patent steam-draining apparatus at the Lincoln meeting of the Royal Agricultural Society of England; and from this time may be dated the practical history of cultivation of the land by steam; for the idea that such an apparatus could be wrought advantageously in other field-operations entered the mind of a practical farmer, Mr. Smith of Woolston, near Bletchley; and under the direction of Mr. Fowler, he got constructed an apparatus, which, with modifications, he worked successfully.

The inventions since that time need not be enumerated. It may be stated generally that they have included plans for engines traveling over the surface of the ground, drawing ploughs or other cultivating implements along with them; engines working implements also by means of wire-ropes. The first two principles have been mostly abandoned—the one on account of the great consumption of fuel, and the large amount of wear and tear occasioned to move the engine over uneven and soft ground; and the other, on account of the expense necessary to lay down rails over a farm. The only two systems in practical operation are what are called the direct and round-about—the former where the pull of the implement is directly to and from the engine; and the latter where the implement is drawn at right angles.

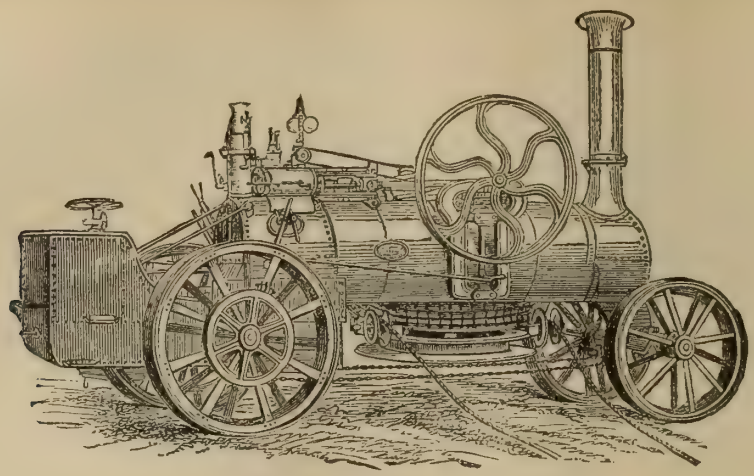


Fig. 9.—Fowler's Steam-engine.

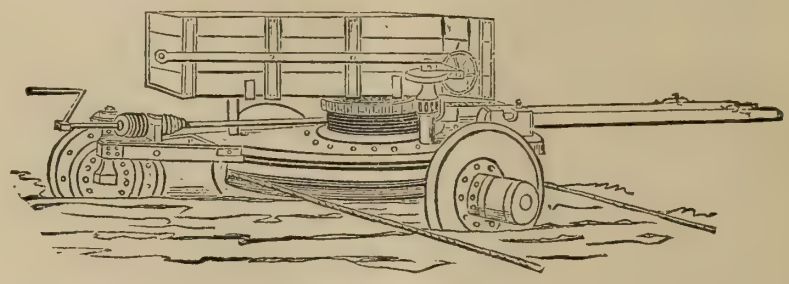


Fig. 10.—The Anchor.

The best known of these methods are Fowler's and Howard's, though, perhaps, Smith should be credited with the round-about system, but Howard's name is now much more generally given to it.

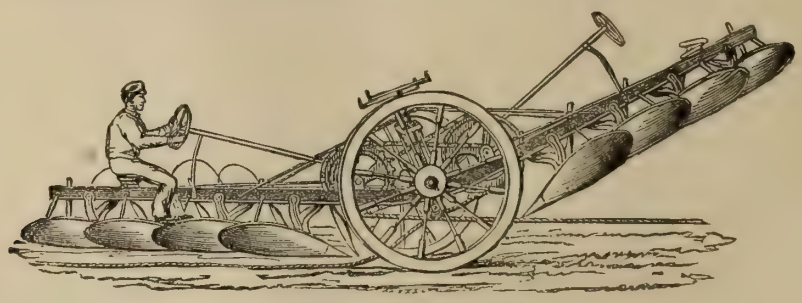


Fig. 11.—Fowler's Plough.

Fowler's system we hope to make intelligible by the aid of cuts. The principal elements are an engine, an anchor, a wire-rope, and a balance-plough. In commencing operations, the engine is placed at the end of one of the headlands of the field, and directly opposite it on the other headland is placed the anchor. Beneath the engine there is a large sheave or drum, five feet in diameter,

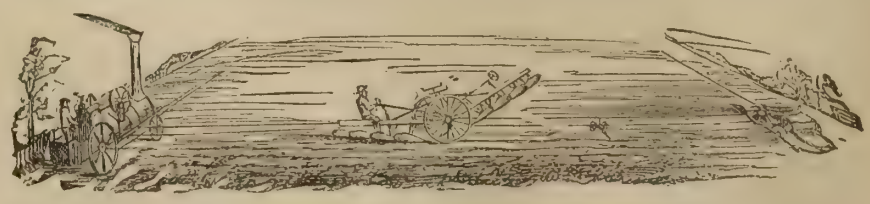


Fig. 12.—Fowler's Anchor, Engine, and Plough at work.

ing on tramways, and drawing implements after them; engines moving along opposite headlands, and working implements between them by means of wire-ropes, and stationary engines driv-

the groove of which drum is composed of a series of small leaf-like pieces of chilled cast-iron, each moving independently upon its own axis. The object of these is to prevent the rope from slipping (which it is apt to do in a plain groove under great strain), and this they do in a very ingenious manner, by closing on the rope as soon as it takes the bend—that is, as soon as the rope presses upon them—and they in the same manner open and release it immediately on the pressure being removed, or, in other words, as soon as the rope resumes the straight on the other side of the sheave. The position and nature of this drum on the engine will be understood by the accompanying cut. The anchor, as will be seen from the engraving (fig. 10), is a massive square framework of wood, mounted on six sharp disc wheels, each about two feet in diameter, which cut deep into the ground, and on the lightest land they take such hold as effectually to resist the pull of the rope which is passed round the sheave beneath. The anchor has a self-acting motion—the power being communicated

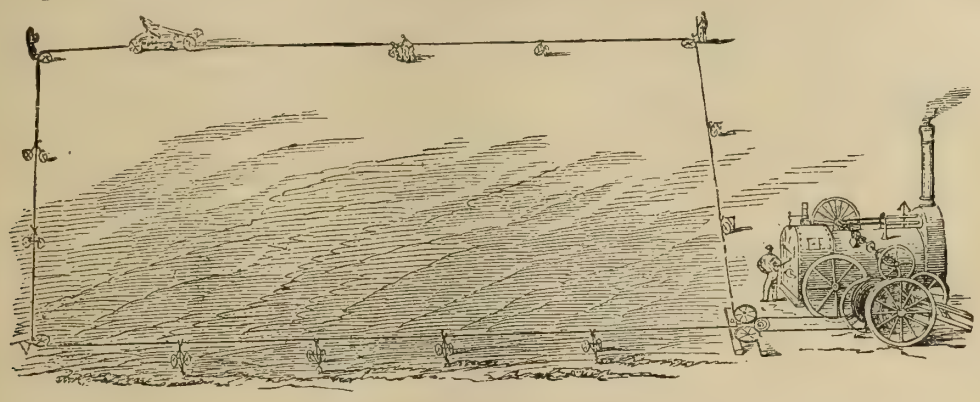


Fig. 13.—Howard's General Plan.

from the engine through the medium of the ploughing-rope—which enables it to move along the headland, and keep opposite to the engine.

The plough (fig. 11) is a framework of iron, balanced upon two large wheels. To each side of this framework there are attached four plough-bodies and coulters, so that four furrows are cut at one 'bout,' and the headland on which the anchor is stationed being reached, the end of the beam that was out of the ground is depressed (the other, of course, being raised), and the four plough-bodies that were out of the ground, and which point in the opposite direction, are inserted in the soil, and turn up the furrows on the way back to the engine. By altering the position of the plough-bodies along the frame-work, a broad or a narrow furrow can be cut at pleasure. In ordinary working, an acre an hour is accomplished. The wire-rope, by which the plough is dragged through the land, passes round the sheaves on the anchor and the engine, the ends are attached to two drums upon the plough, and by a nice mechanical arrangement, the ploughman who rides upon the implement is enabled to wind up, or let out slack if necessary, without loss of time. The wire-rope is made in lengths, which are easily disjoined, in order that it may be adjusted to irregularly shaped fields, or rather to

man at the engine, another on the plough, a third at the anchor, and the lads to look after the rope-porters. The water and coals needed for the engine must be brought by other men.

The plough-bodies can be removed from the frame, and in their place 'digging-breasts' be attached, by means of which the land is thrown up in a somewhat similar manner to that in which it is turned over by the spade. The price of the ploughing and cultivating apparatus is about £900.

At the Newcastle show of the Royal Agricultural Society, in July 1864, Mr. Fowler introduced two engines of 7-horse power, working simultaneously on opposing headlands. The expedition with which these engines were set down to and completed their work was a matter of admiration to all present, and the subject of special remark by the judges. These gentlemen say: 'The engines worked smoothly; and so far as we could ascertain, appeared to bear an equal share of work in either direction.' They got up steam in nearly half an hour less time than the 14-horse engine, and working with them, much less time was required to arrange the tackle. 'The engines were masters of their work; and acting in combination, appeared to possess more power than the large engine and anchor. . . . . The advantages of this system appear to be, that horses are not required to move tackle; that there is a saving of time in setting down, taking up, and removing from field to field [no unimportant consideration]; and that the two small engines are both available for ordinary farm-work, such as thrashing, driving, barn-work, &c.' The cost of the two engines, with the whole apparatus, ranges from £1200 to about £1500, according to the power of the engines, &c. The number of hands employed is the same as at the large anchor and engine; but as a skilled laborer is necessary, where only an unskilled laborer is needed in the latter case, the cost per day is 2*s.* more. Fowler has been very successful in gaining prizes for steam-ploughs, having won several thousand pounds in this way since 1856.

Howard's earliest system consists in a stationary engine driving a windlass, having two winding drums, with direct and reverse action, placed in front of it, round which is coiled about 1600 yards of wire-rope. By a simple lever movement, the man can drop the winding drums out of gear in an instant, a contrivance which enables him to attend to the proper coiling of the rope,

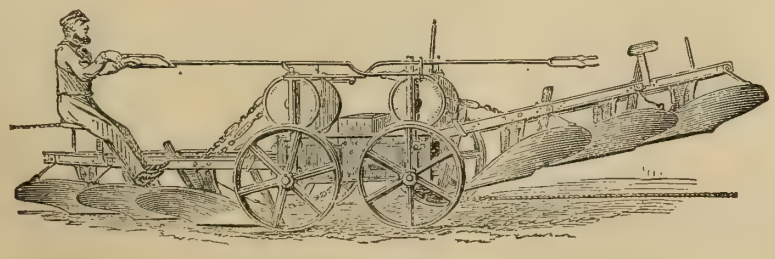


Fig. 14.—Howard's Plough.

fields that are not exact squares or parallelograms; for Fowler's method is not well adapted to such irregularities as prevent the engine and anchor being opposite each other. The rope is borne off the ground—a very necessary precaution, without which the wear and tear would be alike annoying and expensive—by a number of pulleys, or 'rope-porters' as they are called, mounted on frames. The outside ones, that is, those farthest from the work, are moved along by the action of the rope; those in front of the plough are removed by boys, and placed behind the implement as it proceeds. The *modus operandi* will be patent at a glance, from the annexed plan of working (fig. 12). To manage this apparatus three men and two boys are required—namely, a

and also to arrest, in case of accident, the plough in a moment, without stopping the engine. The engine is usually placed at the corner of the plot to be ploughed, the rope is carried round the field on rope-porters, and fixed at the corners by light anchors. A snatch-block placed in front of the windlass prevents the slack-rope running out too fast, and trailing on the ground. The plan of working given clearly illustrates the arrangement (fig. 13). The plough, as will be seen from fig. 14, is composed of two strong iron frames balanced upon four wheels, and crossing each other at their inner ends, thereby decreasing the length of the plough, and, as a matter of course, the breadth of the headland. The frames are raised and lowered in such a manner that the set

of ploughs out of work is independent of, and has no tendency to weigh or raise out of the ground the set in work. The frames are made for two, three, or four furrows, and 'diggers' or scarifiers can be attached as in the case of Fowler's. The latest improvements of a material character on the Bedford firm's steam-ploughing tackle consist of a patent self-coiling windlass and universal joint, 1600 yards of steel rope, patent 5-tined self-lifting cultivator, 2 self-moving anchors, &c. Two men and two boys are sufficient to work the set with a 12 horse-power patent ploughing and traction engine; the cost of the set is £1000. This recently introduced apparatus is very popular, and promises to be extensively employed.

Howard's double-engine system is specially adapted for letting out on hire, for large farms, and for use on the great foreign plains. The engines are placed on opposite headlands, and work a plough, grubber, or cultivator between them, similar to the principle on which Fowler's double-engine system operates. Three men and two boys are required to the working of this set. The price of a pair of 12-horse patent ploughing and traction engines, each with winding drum, together with 800 yards of steel-wire rope, and 6 rope-porters, is £1350.

In the course of the last few years, the Messrs. Howard have issued several hundred sets of steam-cultivating tackle. The Messrs. Howards' cultivator was more generally used for some time than the plough, but the mere digging of much of the land for corn, as a substitute for ploughing, was attended with disappointment; so the plough has been all but universally adopted for soil intended for grain crops.

The Fisken tackle is used to a considerable extent in various parts of the country, generally with the plough emanating under that name, and sometimes attached to three-furrow ploughs made by local manufacturers. Several of the other famed firms dispose of parts of the complete set separately. In other words, those who buy the engines and gearing do not in every case purchase the plough from the same company.

In Coleman's system, the drums upon which the rope is wound are attached to the sides of the engine, and give out and take on rope alternately. The engine moves along the headland; and the anchor, upon which there is very little strain, and which is, therefore a very light, portable article, is shifted opposite to it by a man as the work is performed; direct action being obtained here, as in the case of Fowler's. The peculiarity of the plan consists in having two implements instead of one at work, the implements being grubbers, which smash up the ground—a practice adopted by some farmers in England, in preference to turning the sod over with the plough. On commencing operations on this plan, the field is divided into two equal parts. The cultivators or grubbers work only one way—*towards* the engine. They are attached by the front to each end of a strong wire-rope, while a smaller wire-rope is fastened to their rear. The one cultivator is placed at the far side of the field where its teeth or 'tines' are inserted in the ground; and it is pulled towards the center of the field, tearing up the soil as it comes, the other meanwhile going out empty to meet it. When the latter reaches the middle of the field, the action of the engine is reversed, and it is dragged back to the engine, cultivating the land as it travels, while the other goes back to the headland empty. The pull out empty and working in is, of course, continued until the whole land has been tilled.

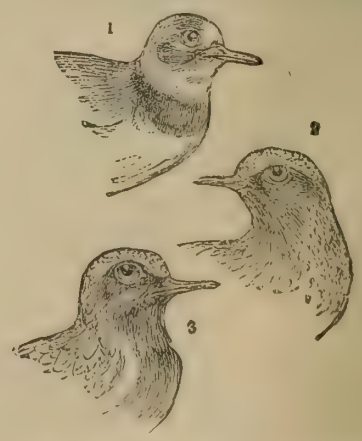
There are some other systems of steam-cultivation before the public, but in various respects they resemble those already enumerated. With Coleman's method there may be a slight saving of time at the ends, but there is, on the other hand, a trifling loss of power. In every sense of the term, the systems of the Messrs. Howard, and Fowler and Co., are the most popular. Each of these leading systems has its advocates and its advantages. It is certainly a much more expensive plan to have two engines, but yet for letting to hire it may be the best and cheapest, as they take the apparatus from one place to another, and set to work again more rapidly. It is, however, easy enough to keep one steam-engine always running at full speed, and there seems little reason to keep one engine simply to look at the other, seeing the expense is the draw-back which prevents their universal adoption. Besides, the single engine on the roundabout system is decidedly the best for working up of corners of fields, and as it does not move along headlands, it does not destroy them; but can continue working while the locomotive remains idle. On soil where there are many stones, it is better first to grub the land thoroughly, and remove the stones, before using the plough.

Where the fields are pretty large, stones not abundant, and the soil heavy, the odds are all in favor of steam cultivation. Not only is the tillage more thorough than could be otherwise accomplished, but there is a greater chance of getting the land worked in better condition. That is to say, the great speed by which the soil can be turned over—on an average, about three-fourths of an acre per hour—enables the advantages of weather and seasonable soil to be more extensively embraced. Then every farmer knows, or should know, the benefits of deep cultivation, where the soil admits; and by steam-power, more than in any other way, this great desideratum is likely to be obtained.

There is a danger, however, arising from deep ploughing, provided the increased depth is not gradually affected. For instance, if three or four inches of fresh soil is suddenly brought to the surface, and the manuring applied in the usual way, the succeeding crop, if not even crops, is often disappointing. The fresh excavation, in short, has not been fertilized unless very special treatment is bestowed. The best time to introduce the deep furrow is preparatory to the green crop, as with the bulk of the ordinary farming (Scotch especially) that is the rotation which is accompanied by the heaviest manuring of the course. Stunted crops do not now follow the introduction of steam-power, or rather deepened cultivation, to any material extent, but when the causes and cures were not so well known in the earlier days of steam-ploughing history, failures for a year or two were more notable. The high price of horses, lately developed into extravagance, together with the growing and already high rate of farm-servants' wages, have stimulated considerably the application of steam-power to the tillage of the soil of Britain. The two principal firms at Leeds and Bedford, already referred to, have an enormous demand just now from all quarters for steam-cultivating apparatus. In Britain, it is computed there are considerably over 1000 steam-tackles at work, and the exports to the continent, to some parts of America, to the East and West Indies, and to Egypt, is considerable, and growing.

PLOU'GHGATE OF LAND, in the Law of Scotland, is an expression denoting a quantity of land of the extent of 100 acres Scots. No person is qualified to kill game in Scotland who has not a ploughgate of land, and this is still the law. Paterson's *Game-laws of United Kingdom*, p. 158.

PLOVER (*Charadrius*), a genus of birds of the family *Charadriadæ* (q. v.), having a straight compressed bill; the upper mandible alone slightly inflated and slightly bent at the point; the nasal groove extending about two-thirds of the length of the bill, the nostrils longitudinally cleft near the base; the legs not very long, naked a little above the tarsal joint; no hinder toe; the wings rather long and pointed, the first quill-feather the longest. The species are numerous, and are found in every quarter of the globe; many of them are birds of passage. They chiefly frequent low moist grounds, where they congregate in large flocks, and feed on worms, molluscs, insects, &c.; but some of them visit mountainous regions in the breeding-season. They fly with great strength and rapidity, and run with much swiftness. The flesh and eggs of many of them are esteemed delicacies. One of the British species is the Dotterel (q. v.). Another is the GOLDEN or YELLOW PLOVER (*C. pluvialis*), a rather larger bird, of a blackish color, speckled with yellow at the tips and edges of the feathers; the throat, breast, and belly black in summer, whitish in winter. The Golden P. is a bird of passage, visiting in summer the north-



1, Ringed Plover; 2, Gray Plover; 3, Golden Plover.

ern parts of Europe, of the west of Asia, and of North America; and migrating to the south in winter. It is known in almost all parts of Europe, and is common in many parts of Britain, breeding in the northern parts. Great numbers frequent the sandy pastures and shores of the Hebrides and of the Orkney and Shetland Islands. It makes an artless nest, little more than a slight depression of the ground, and lays four eggs. The parent birds show great anxiety for the protection of their young, and use various stratagems to divert the attention of an enemy.

The Golden P. exhibits great restlessness on the approach of wet and stormy weather, whence its specific name *pluvialis*.—The RINGED P. (*C. hiaticula*), a much smaller bird, not so large as a song thrush, is found at almost all seasons on the shores of the

British Islands, frequenting sandy and shingly flats, from which the sea retires at ebb-tide. It is often to be seen also on the banks of large rivers, and not unfrequently of lakes and ponds. It is found in most of the northern parts of Europe and Asia, and in Iceland and Greenland. It is grayish-brown above, whitish beneath, with a collar of white round the neck, and below it a black—in winter, a brown—collar; the head marked with black and white; a white bar on the wing. Very similar, but smaller, is the KENTISH P. (*C. Cantianus*); and also similar and of similar habits is the smallest of the British species, the LITTLE RINGED P. (*C. minor*). Both of these are rare in Britain.—North America has a number of species of P., one of which, the AMERICAN GOLDEN P. (*C. Virginiacus*), very closely resembles the Golden P. of Europe; and another, the KILDEER P. (*C. vociferus*), abundant on the great western prairies, and not unfrequent in the Atlantic states, utters, when approached by man, a querulous or plaintive cry, like the lap-wing.—The name P. is often extended to species of *Charadriadæ* belonging to other genera, as *Squatarola*, in which the nasal grooves are short, the tip of the bill is tumid, and there is a rudimentary hind-toe. To this genus belongs the GRAY P. (*S. cinerea*) of Britain, a species rather larger than the Golden P., and chiefly known as a winter visitant. Its geographic distribution extends over most of the northern parts of the world.

PLUM (*Prunus*), a genus of trees and shrubs of the natural order *Rosaceæ*, suborder *Amygdaleæ* (q. v.) or *Drupaceæ;* the species of which have the stone of the fruit sharp-pointed at each end, with a longitudinal furrow passing all round, and a smooth surface, the fruit covered with a fine bloom, and the young leaves rolled up. The Common P., the Bullace, and the Sloe, are generally reckoned by botanists as distinct species, but with much doubt if they are really distinct, as the P. passes into the Bullace, and the Bullace into the Sloe by insensible gradations; although there is so wide a difference in general appearance, size of leaves, and size as well as quality of fruit, between the best cultivated plums and the sloe, that it is not without an effort we can imagine them to have sprung from a common stock. The COMMON P. (*P. domestica*) appears in a wild state in woods and hedges in many parts of England and on the continent of Europe; probably, however, often derived from the seeds of cultivated trees. It is commonly described as destitute of spines, and as further differing from the bullace in having the under-side of the leaves smooth except when they are very young; but if these characters are adopted, many of the cultivated plums must be referred to the bullace (*P. insititia*) as their original; nor does the ovate fruit afford a more certain character, some of the finest garden plums being globose or nearly so, like the bullace. The varieties called Damson (q. v.) are particularly like the bullace, except in the form of the fruit. Cultivated plums vary greatly in the size, form, color, and flavor of the fruit. The fruit of some varieties, as the *White Magnumbonum*, is two inches long; while damsons of the same shape are not quite one inch, and a single fruit of the one is equal to at least eight or ten of the other.

The best varieties of P. are among the most delicious dessert fruits; among these, the *Green Gage* (*Reine Claude* of the French) is one of the most esteemed both in Britain and on the continent of Europe, and is unsurpassed both in sweetness and in flavor. The inferior varieties are used in pies, conserves, and sweetmeats. Some of them are very austere. In moderate quantity, plums are wholesome enough; but excess in the use of them is very apt to produce colic, diarrhœa, and cholera. The danger is greater, if they are eaten before they are perfectly ripe. A very pleasant wine is made from plums; and in some parts of Europe a strong spirit is distilled from them after fermentation; but for this purpose they are mixed in the south of France, with honey and flour, and in Hungary with apples.—The dried fruit, variously known as *Dried Plums*, or *French Plums*, and *Prunes* (q. v.), is much used for the dessert; and the somewhat austere fruit of the *St. Julien Plum*, cultivated in the south of France, becomes, when dried, the medicinal prune, used as a mild laxative. The drying of plums is effected very slowly in ovens, by a heat which is gradually increased. The process requires great care. The prunes called *Brignoles* are the produce of a variety grown principally near the little town of Brignole in Provence. The P. has been in cultivation from ancient times, and the first fine varieties were probably introduced into Europe from the East. The finer varieties are propagated chiefly by budding on stocks of the coarser kinds, which are procured either from seed or as suckers from the roots of P.-trees. The coarser varieties are propagated by suckers, without budding. A free loamy soil is best for plums. They are grown as standard, espalier, or wall trees. As standards, some of the varieties attain a height of more than 20 feet, with a moderately spreading head. The fruit is mostly produced on spurs; but some of the finest fruit on the shoots of the former year.

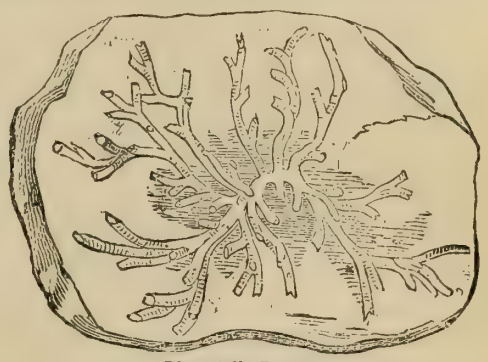
Among the varieties of P. are some which ripen their fruit early, and others which ripen late in the season. The blossom of some of the finer kinds is often protected by gardeners, like that of peaches and apricots.—The wood of the P.-tree is hard and fine-grained, and is used in cabinet-work, in turnery, and for making musical instruments.—The CASHMERE P. (*P. Bokharensis*), cultivated in Cashmere and Bokhara, is regarded as a distinct species.—The CHERRY P., or MYROBALAN P. (*P. cerasifera* or *Myrobalanus*), is a bush very similar to the sloe, with pendulous globular red fruit. It is a native of North America, but is often cultivated for its fruit on the continent of Europe. In Britain, it seldom produces fruit.—*P. maritima* is a shrub, indigenous to sandy soils on the sea-coast of North America from New Jersey to Carolina. It has a dark purple agreeable fruit, about the size of a pigeon's egg.

The COCOA P. or ICACO of the West Indies is the fruit of *Chrysobalanus icaco*, a tree of the natural order *Rosaceæ*, suborder *Chrysobalaneæ*. The fruit resembles a P., has a sweet although slightly austere taste, and is eaten both raw and preserved.—The fruit of *Parinarium excelsum*, another of the *Chrysobalaneæ*, is called Gray Plum at Sierra Leone.

PLUM, DATE. See DATE PLUM.

PLUMAGE OF BIRDS. See BIRDS and FEATHERS.

PLUMATE'LLA, a genus of zoophytes (*Polyzoa*), having the polypidom fixed, membranaceous, conferva-like, and branched; the polypes issuing from the extremities of the branches, with a crescent-shaped disc surrounded by a single series of many tentacles. The species are found in fresh water, attached to stones, &c. *P. repens* is a common British species, sometimes spreading over a square foot, and having branches three inches long, which adhere to some surface throughout almost their whole length. The tentacles are beautifully feathered with cilia on two opposite sides.

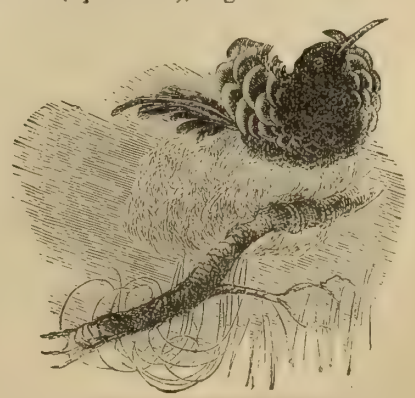


Plumatella Repens.
(From Johnston's *British Zoophytes.*)

PLUMBAGI'NEÆ, or PLUMBAGINA'CEÆ, a natural order of exogenous plants, herbaceous or half-shrubby; with leaves somewhat sheathing at the base, and often clustered; flowers in panicles or in heads; calyx tubular, persistent, plaited; corolla very thin, of one or five petals; stamens five; ovary superior, 1-celled, with a solitary ovule; styles generally five; fruit a Utricle (q. v.). There are about 160 known species, chiefly found on the sea-shores and in the salt marshes of temperate regions. Some are found also in elevated regions, in all zones. Many have flowers of great beauty, and are therefore favorites in gardens. Some are occasionally used in medicine as tonics and astringents; others, being exceedingly acrid, as vesicants, particularly species of *Plumbago*. Thrift, or Sea-pink (q. v.), is the most familiar British example of the order.

PLUMBA'GO. See BLACK LEAD.

PLUME-BIRD (*Epimachus*), a genus of birds of the family *Upupidæ* (see HOOPOE), but exhibiting points of resemblance



Plume bird (*Epimachus albus*)

both to honey-suckers and to birds of paradise. The bill is slender and arched. The plumage is magnificent and gorgeous, scarcely excelled even by that of birds of paradise. The plume-birds are natives of New Guinea and New Holland. They are variously adorned with enormously long tail-feathers, great shoulder-tufts of broad feathers, loose downy plumes, &c. One species, *E. albus*, has remarkable thread-like prolongations of the shaft of some of its plumes.

PLUMED MOTH, the popular name of a group of '*Nocturnal Lepidoptera*,' known to entomologists as *Fissipennæ* and *Pterophorites;* remarkable for having at least a pair of the wings, and often all the wings, longitudinally cleft into two or more—some-



Plumed Moth.

times six—divisions, which are beautifully fringed at the edges. The wings are similar to those of other moths in their nervures, but the membrane which usually connects the nervules is interrupted. The Plumed Moths are extremely beautiful, but often pass unobserved in consequence of their small size. Some of them have the power of folding up the wing like a fan. Although they are ranked among the *Nocturnal Lepidoptera*, some of them fly about during the brightest part of the day.

PLUMMET, a weight of lead hung on a string, and attached to a frame, for the purpose of showing the vertical line.

PLUMULA'RIA, a genus of zoophytes (*Anthozoa*); plant-like, rooted, simple, or branched; with feathery shoots and offsets; and having hydra-like polypes in small cells arranged on one side of the shoot or branch, usually in the axil of a horny spine. The species are numerous, inhabitants of the sea, some of them very



Plumularia Falcata (natural size):
a, the ovarian vesicle and four of the polype-cells of P. falcata, magnified. (From Johnston's *British Zoophytes*)

common on the British coasts, attached to stones, shells, sea-weeds, &c. They are very beautiful objects, even as seen by the naked eye, and still more when examined by the microscope; combining great delicacy with the utmost elegance. The polypes in a single P. are often exceedingly numerous; those of *P. falcata*, a very common British species, often to be found at low-water mark, have been calculated as 80,000 or 100,000 in number.

PLU'MULE. See SEED.

PLU'RALISM, in Canon Law, means the possession by the same person of two or more ecclesiastical offices, whether of dignity or of emolument. Pluralism has been held unlawful from the earliest times, and is forbidden by many ancient councils, as Chalcedon, c. x. (451 A.D.), 2d Nicæa, c. xv. (787 A.D.). This prohibition, however, was not regarded as absolute and admitting no possible exception; the natural ground of the prohibition being the impossibility, in ordinary cases, of the same individual adequately discharging the duties of more than one office. It has been held, therefore, that in cases in which this impossibility does not really exist, the union of two or more offices in the hands of one person might, speaking absolutely, be permitted without infringing the divine law. Canonists therefore distinguish 'compatible' and 'incompatible' benefices or dignities. Two benefices may be incompatible in three ways—(1) if each requires residence (*ratione residentiæ*); (2) if the duties of both fall to be discharged at one and the same time (*ratione servitii*); or (3), if the revenue of either fully suffices for the becoming maintenance of the incumbent (*ratione sustentationis*). In other cases, benefices or dignities are considered compatible, and with the due dispensation, may be held by the same person. The rules by which dispensations from the law of residence are to be regulated, as well as the penalties for its violation, whether on the part of the patron or on that of the recipient, have formed the subject of frequent legislation, as in the 3d and the 4th councils of the Lateran, in the decretals of Innocent III. and many other popes, and especially in those of the Council of Trent.

In general, it may be said that the canon law regards as incompatible (1) two benefices each having the cure of souls; (2) two 'dignities;' (3) a 'dignity' and a cure of souls; (4) a cure of souls and a simple benefice requiring a residence. In other cases than these, the pope is held to have the power of dispensing. There is no department of discipline, however, in which the tendency to relaxation has been greater or more persistent; and one of the gravest of the abuses of the church was the prevalence of pluralism of 'incompatible' benefices, even of bishoprics; and although a constant effort was made to prevent this abuse, the evasions of the law were not only frequent, but even screened from punishment. In later times, the evil has in great measure disappeared in the Roman Catholic Church.

The English law, before the Reformation, in the main coincided with the canon law; and the legislation of Henry VIII. preserved the same general spirit, only substituting the dispensing power of the crown 'for that of the pope.

By 13 and 14 Vict. c. 98, it is provided that no incumbent of a benefice shall take and hold together with it another benefice, unless the churches are within three miles of one another by the nearest road, and the annual value of one of them does not exceed £100. Nor can two benefices be held together if the population of one exceeds 3000, and that of the other exceeds 500. The word benefice in this sense includes any perpetual curacy, endowed public chapel, parochial chapelry, or district chapelry. But a dispensation or license can be obtained from the archbishop, so as to allow two benefices to be held together; and if the archbishop refuse his license, the party may appeal to the Privy Council.

A special provision is also contained whereby the head ruler of any college or hall in the universities of Oxford or Cambridge, or warden of Durham University, is prohibited from taking any cathedral preferment or any other benefice. If any spiritual person holding a benefice shall accept another benefice contrary to the statute, the first benefice shall *ipso facto* become void. At the same time, provision is made by statutes for uniting benefices where the aggregate population does not exceed 1500, and the aggregate yearly value does not exceed £500.—In Ireland, no faculty or dispensation could be granted to any spiritual person to hold two or more benefices.—In Scotland, it is contrary to an old Scotch statute for a minister of the Established Church to hold two or more charges; but the question has arisen almost exclusively with reference to clergymen appointed professors before or after an appointment to a country charge, in which case a resignation is necessary of one of the offices within a certain time after the appointment; but this disqualification does not apply to city charges.

PLUSH (Fr. *peluche*), a variety of woven cloth, having a long shaggy pile on the upper surface. Although woven like velvet, it differs from it in the greater length of the pile, and in its not being clipped or shorn to a uniform length. Formerly, it was made of a double warp, one thread being usually double worsted yarn, the other, intended to form the pile, of goat's hair, and the weft of worsted; occasionally, only worsted was used. Now, it is made very extensively of silk and cotton, the silk taking the place of the goat's hair to form the pile. This silk plush is the material now almost universally used for making gentlemen's hats, instead of beaver-hair, as formerly. It is also worked in colored silks, for many articles of ladies' attire. See WEAVING.

PLU'TARCH (*Ploutarchos*), the biographer and moralist, was born at Chæroneia in Bœotia. We can only approximate to the year of his birth. He tells us himself that he was a student of philosophy at Delphi, under Ammonius, when Nero was making his progress through Greece in 66 A.D.; and we may safely infer, therefore, that in that year he was beyond the age of puberty. He lived for some years in Rome, and in other towns of Italy, where he seems to have been much occupied with public business, and with giving lessons in philosophy—a circumstance to which he attributes his having failed to learn the Latin language in Italy, and his having to postpone his studies in Roman literature till late in life. During the reign of Domitian, he was delivering lectures

on philosophy at Rome; but we have not sufficient evidence for the statement, that he was preceptor to Trajan, or that that emperor raised him to consular rank. The later years of his life he spent at Chæroneia, where he discharged the duties of archon and priest of Apollo. He lived down to 106, the eighth year of the reign of Trajan; but how much longer is not known. He was married to an amiable wife of the name of Timoxena, by whom he had several sons, who reached manhood, and left descendants.

The work by which P. is best known is his *Parallel Lives* of forty-six Greeks and Romans. These are arranged in pairs, each pair forming one book (*biblion*), consisting of the life of a Greek and a Roman, and followed by a comparison between the two men. In a few cases, the comparison is omitted or lost. The heroes of these biographies are the following: 1. Theseus and Romulus; 2. Lycurgus and Numa; 3. Solon and Valerius Publicola; 4. Themistocles and Camillus; 5. Pericles and Q. Fabius Maximus; 6. Alcibiades and Coriolanus; 7. Timoleon and Æmilius Paulus; 8. Pelopidas and Marcellus; 9. Aristides and Cato the Elder; 10. Philopœmen and Flamininus; 11. Pyrrhus and Marius; 12. Lysander and Sulla; 13. Cimon and Lucullus; 14. Nicias and Crassus; 15. Eumenes and Sertorius; 16. Agesilaus and Pompeius; 17. Alexander and Cæsar; 18. Phocion and Cato the Younger; 19. Agis and Cleomenes, and Tiberius and Caius Gracchus; 20. Demosthenes and Cicero; 21. Demetrius Poliorcetes and M. Antonius; 22. Dion and M. Junius Brutus. In addition to these are placed in the editions after the 46th *Parallel Lives*, the biographies of Artaxerxes Mnemon, Aratus, Galba, and Otho.

P. has no equal in ancient, and few in modern times, as a writer of 'Lives.' His power lies in his felicitous grasp of the character as a whole, and his skill in keeping minor details in subordination. It is not till the reader has seen the portrait in its completeness that his attention is attracted to accessory points. 'There are biographers (says an admirable writer in the *Quarterly Review*) who deal with the hero, and biographers who deal with the man. But Plutarch is the representative of ideal biography, for he delineates both in one.' Yet with all their artistic harmony, his lives abound with anecdotes and *bon-mots* in such profusion, that they form one of our chief authorities for the table-talk of the Greeks and Romans. Their popularity in ancient, medieval, and modern times, with readers of every rank and age, is something extraordinary, and they have in consequence exerted a very powerful and a very salutary influence on the art of biography, as subsequently practised. The other writings of P., more than 60 in number, are included under the general title of *Moralia*, or Ethical Works. Several of these are not purely ethical in their tenor; while many of them are probably not by him, or if they are, do him small credit. Even in the best of the *Moralia*, there is no philosophical system to be found; their merits are not speculative, but practical; and their value consists mainly in their good sense, in the justness of their views on the ordinary affairs of human life; and in the benevolence of tone diffused throughout them. The best text of the Lives is that of Immanuel Bekker; the best translation in English is that of Dryden and others, as re-edited by Clough. The best edition of the *Moralia* is by Wyttenbach (Oxford, 1795—1800); and of the entire works, the editions of Reiske (Leip. 1774—1782) and Hutten (Tübingen, 1791—1805).

PLU'TEUS, in Classical Architecture, a wall filling up the space between two columns. Also the space between two orders, placed over one another, as in the amphitheaters, &c.

PLU'TO (Gr. *Plouton*, from *Plouteo*, to be rich), originally only a surname of HADES, as the giver or possessor of riches, is, in the Mythology of Greece, the third son of Kronos and Rhea, and the brother of Zeus and Poseidon. On the tripartite division of the universe, he obtained the sovereignty of the under-world—the realm of darkness and ghostly shades, where he sits enthroned as a 'subterranean Zeus'—to use the expression of Homer, and rules the spirits of the dead. His dwelling-place, however, is not far from the surface of the earth. P. is inexorable in disposition, not to be moved either by prayers or flatteries. He is borne on a car, drawn by four black steeds, whom he guides with golden reins. His helmet makes him invisible, whence, according to some scholars, his name of *Hades* (from *a*, priv., and *idein*, to see); although others, with at least equal probability, derive Hades from *hado* or *chado*, to receive or embrace, and translate the word the 'all-receiver.' In Homer, Hades never means a place, but always a person. Moreover, it is to be noticed that the poet does not divide the realm of the shades into two separate regions. All the souls of the dead—good and bad alike—mingle together. Subsequently, however, when the ethical conception of future retribution became more widely developed, the kingdom of the dead was divided into Elysium (q. v.), the abode of the good, and Tartarus (q. v.), the place of the wicked. This change also exercised an important influence on the conception of Pluto. The ruler of the under-world not only acquired additional power and majesty, but the very idea of his character was essentially modified. He was now regarded as a beneficent deity, who held the keys of the earth in his hand, and possessed its metallic treasures (whence his new name *Pluto* or *Plutus*), and who blessed the year with fruits, for out of the darkness underground come all the riches and swelling fulness of the soil. Hence, in later times, mortals prayed to him before proceeding to dig for the wealth hidden in the bowels of the earth.

P. married Persephone (Proserpina), the daughter of Demeter (Ceres), after carrying her off from the plains of Enna. He assisted his brothers—according to the mythological story—in their war against the Titans, and received from the Cyclops, as a reward for delivering them from Tartarus, the helmet that makes him invisible, which he lent to Hermes (Mercury) in the aforesaid war, to Perseus in his combat with the Gorgons, and which ultimately came to Meriones. The Erinnyes and Charon obey his behests. He sits in judgment on every open and secret act, and is assisted by three subordinate judges, Æacus, Minos, and Rhadamanthus. The worship of P. was widely spread both among the Greeks and Romans. Temples were erected to his honor at Athens, Elis, and Olympia. Among trees and flowers, the cyprus, boxwood, narcissus, and maidenhair were sacred to him; bulls and goats were also sacrificed to him amid the shadows of night, and his priests had their brows garlanded with cypress wreaths. In works of art, he resembles his brothers Zeus and Poseidon; only his hair hangs down somewhat wildly and fiercely over his brow, and his appearance, though majestic, as becomes so mighty a god, has something gloomy and terrible about it. There can be little doubt that he, as well as Pan (q. v.), helped to trick out the conception of the devil prevalent during the middle ages and not yet extinct. If it was from Pan that the devil derived those physical characteristics alluded to in the famous *Address to the Deil* by the poet Burns:

> O thou, whatever title suit thee,
> Auld *Hornie*, Satan, Nick, or *Clootie*,

it is no less certain that it is to P. he owes his position as 'king of Hell,' 'his Blackness,' and many of the insignia of his infernal royalty.

PLUTO'NIC ROCKS, the name given by Lyell to the Granitic Rocks, from the supposition that they were formed at considerable depth in the earth, and were cooled and crystallized slowly under great pressure. They were so designated in contradistinction to the Volcanic Rocks, which, though they have risen up from below, have cooled from a melted state more rapidly upon or near the surface. See GRANITE.

PLY'MOUTH, an English seaport and market town, and a parliamentary and municipal borough in the south-west of Devonshire, 246 miles west-south-west of London. It stands in the bight of Plymouth Sound (q. v.) between the estuaries of the Plym and Tamar. To the west of it is Stonehouse (q. v.), a township and coast-guard station, and still further west is Devonport (q. v.), the great naval and military station. The two former places, however, having become united by continuous lines of houses, have lost their individuality, and are (with Devonport, which is walled, fortified, and surrounded by a moat) now generally considered as one great town. Of this great center of fashion, trade, and naval and military preparation, P. proper, which covers an area of one square mile, may be called the city, and Devonport the west-end; while Stonehouse is an intermediate district, containing chiefly factories, barracks, victualling yards, hospitals, and other institutions. P. proper extends from Mill Bay on the west to the mouth of the Plym on the east. Its site is somewhat rugged and uneven; an eminence forming the suburbs runs along its north side, and another eminence, partly occupied by the citadel, fronts the Sound.

The chief buildings are the Royal Hotel, comprising an immense inn, assembly-rooms, a theater, and the Athenæum, all partially destroyed by fire in 1862, and rebuilt in 1863; public library, containing in its Cottonian collection 300 sketches by the old Italian masters; Guildhall, opened in 1874; St. Andrew's Church, the tower of which dates from 1490 (restored in 1874—1875); and Charles Church (1646—1658), dedicated to 'St. Charles the Martyr.' There are also several important educational establishments, some of which are endowed, as well as many charitable institutions. Mill Bay and Sutton Pool are two small inlets of the Sound, in which lie all the merchant-vessels bound for P. proper. Between these inlets, and running along the shore, is the eminence or high plateau of land, called the Hoe. From this ridge, whence the approach of the Spanish Armada is said to have been first descried, magnificent shore and sea views may be obtained. Its eastern end is occupied by the citadel, a fortress mounting 150 guns, which commands the entrance of the Cutwater (the lower estuary of the Plym), and of Sutton Pool. Mill Bay, on the west, is so deep that vessels of 3000 tons can lie at the pier at low-water. Here are the important Great Western Docks, covering an area of fourteen acres, and having a depth of 22 feet, constructed about the years 1855—1858. Close to these docks, and connected with them by a tram-line, are the railway termini.

In 1880, 3665 vessels, of 726,937 tons, entered, and 2943, of 639,455 tons, cleared the port. Commerce is carried on to a considerable extent with the Cape of Good Hope, the West Indies, and the Mediterranean; the coasting trade is also important, and the fisheries are productive. Pop. (1871) 70,091; (1881) 77,401.

P. described by Leland as being, in the reign of Henry II., 'a mene thing, an inhabitation of fishars,' was called by the Saxons Tameorworth (town on the Tamar); after the Conquest it was called Sutton (South Town); and it was not till the reign of Henry VI. that it received the name of Plymouth (mouth of the Plym). During the 14th and 15th centuries it was frequently attacked and set on fire by the French, and in 1512 an act was passed for the strengthening of its defences, which since then have greatly increased, until now the whole shores of the Sound are well defended by cannon, and a cordon of inland forts has been of late years constructed at immense cost, surrounding the Three Towns at a distance of from two to three miles.

PLYMOUTH, a town in Massachusetts, U. S., on Plymouth Bay, 37 m. S. E. of Boston, famous as the landing-place of the 'Pilgrim Fathers' from the *Mayflower*, December 11, 1620, o. s. Plymouth Rock is a granite boulder at the water's edge on which they landed. It is covered by a handsome granite canopy, and there is also a national monument to the pilgrims, completed in 1875. In Pilgrim Hall are preserved many relics of the first settlement of the country, among which are Governor Carver's chair and the sword of Miles Standish. The town has a good harbor and flourishing trade. Pop. (1870) 6238.

PLYMOUTH BRETHREN, a religious sect which sprang into existence about 1830—1835 in Plymouth, Dublin, and other places in the British islands, and which has extended itself considerably throughout the British dominions and in some parts of the continent of Europe, particularly among the Protestants of France, Switzerland, and Italy, and also in the United States of America. It seems to have originated in a reaction against exclusive High Church principles, as maintained in the Church of England, with everything of a kindred nature in other churches, and against a dead formalism associated with 'unevangelical' doctrine.

Many of the first members of the new religious communities formed in Plymouth and elsewhere were retired Anglo-Indian officers, men of unquestionable zeal and piety; and these communities began to appear almost simultaneously in a number of places. Their origin is, however, very much to be ascribed to the labors and influence of Mr. Darby, from whom the P. B. on the continent of Europe are very generally known as *Darbyites*. Mr. Darby was a barrister, moving in the highest circles of society; and under deeply religious impressions, became a clergyman of the Church of England, and lived for some time in a mud-hovel in the county Wicklow, devoting himself to his work; but afterwards left the Church of England from conscientious scruples, and became an evangelist unconnected with any church. In this character, he labored both in England and on the continent of Europe, preaching in French, English, and German. He also gave utterance to his opinions in numerous pamphlets, and in a quarterly periodical called *The Christian Witness*, which for a number of years was the 'organ' of the Plymouth Brethren. He continued for many years to visit the communities or meetings of Plymouth Brethren. His tenets, and those of the P. B. in general, are strictly Calvinistic: original sin and predestination, the efficacy of Christ's sacrifice, the merit of his obedience, the power of his intercession, the gracious operations of the Holy Spirit in regeneration and sanctification, are prominent points. Millenarian views are also generally entertained by the P. B.; and they usually practise the baptism of adults without regard to previous infant baptism. They acknowledge the sacrament of the Lord's Supper, and administer it to one another in their meetings, usually on every Sunday, or 'first day of the week;' in this, as in everything else, refusing to acknowledge any special ministers. They utterly reject confirmation.

Their most distinctive peculiarity, when contrasted with other Calvinistic churches, is their complete rejection of ecclesiastical organization. They suppose the whole Christian body in the world to have declined from truth and duty, like Israel of old, and therefore to have been 'corporately rejected of God,' and believe the true church to consist of themselves and of other chosen ones in the various Christian churches. They refuse to recognize any form of church government, or any office of the ministry; they insist much on the equal right of every *male* member of the church to 'prophesy' or preach; and in their meetings, after each hymn or prayer, there is usually a pause, that any one, moved by the Spirit, may undertake this office. They exclude persons known to have been guilty of gross sins from participation with them in the Lord's Supper, until proof is afforded of repentance. The P. B. reject every distinctive appellation but that of Christians; although a special denomination is found necessary to designate them; and, in fact, no one not holding their views could remain associated with them. A great schism took place among them in consequence of doctrines preached at Plymouth and Bristol concerning the human nature of Christ; Mr. Darby vigorously opposing what he deemed a dangerous error, and he and his adherents utterly separating from the fellowship of those who maintained or even refused to condemn it. One of the most noted (if not notable) converts to the principles of the sect was the revivalist Guinness, who was baptized in 1860 by another Plymouth brother, Lord Congleton.

On the continent of Europe, the P. B. have in many places given great trouble to the Protestant churches, by their opposition to all ecclesiastical order or organization. See works by Mrs. Grattan Guinness (1861) and Dennett; and hostile criticisms by Carson (1870), Reid (1874), and Croskery (1879).

PLYMOUTH SOUND, a well-known roadstead on the south-west of Devonshire, important as a naval station, has considerable claims to the distinction of being called, as it frequently has been, the most beautiful estuary on the English coast. Its position at the entrance of the English Channel is much in its favor. It is two and a half miles wide, and extends inland for three miles. It penetrates into the country by means of the harbors of Hamoaze and Catwater, the estuaries of the Tamar and Plym respectively. On its west side is Cawsand Bay. The shores, which present many beautiful views, rise in hills of from 100 to 400 feet, and are dotted over with woods and with villages, and bound by coasts which are generally rocky and abrupt. Mount Edgecombe Park, the beautiful seat of the Earl of Mount Edgecombe, occupies the west shore of the sound. At the mouth of the Tamar is the small island of St. Nicholas, or Drake's Island, a pyramidal rock strongly fortified. The Sound is open to the south-west, from which direction strong winds frequently blow, and violent surges are thrown in from the Atlantic. In order to protect the shipping in the harbor, a massive stone breakwater, 1700 yards in length was constructed at a cost of about £1,500,000, and completed in 1841. See BREAKWATER. On a sunken rock just inside the breakwater and at its center, a strong stone fort has been within recent years erected; and an extensive series of stone batteries has been erected at Bovisand and Picklecombe on the mainland, on either side of the entrance to the harbor. Fourteen miles south-south-west of Plymouth is Eddystone Light-house. See EDDYSTONE.

PNEUMA'TIC DISPATCH. This name is given to a mode of sending parcels, mail-bags, or telegram papers through a tube by atmospheric pressure, or by a partial vacuum. Early in the present century, Mr. Medhurst conceived the idea of some such contrivance. He proposed to construct air-tight tunnels, with carriages moving through them on rails; and these carriages were to be propelled by compressed air from behind, or else by suction in virtue of a vacuum formed in front of them. Medhurst was laughed at by his contemporaries as a visionary; but his speculations were called to mind in later years, and led to the attempts noticed under ATMOSPHERIC RAILWAY.

In 1861, was announced a *Pneumatic Dispatch* project, based on a reconsideration of the causes of failure in the earlier schemes. The conveyance of passengers and of bulky goods was not here contemplated; parcels and mail-bags were the articles held chiefly in view. To test the theory, a quarter of a mile of iron tube was experimentally laid down near Battersea, with a fair average of gradients and curves purposely given to it. The tube was about 30 inches in diameter; and it was found easy to propel a train through the tube consisting of two iron carriages of 7 cwt. each, at the rate of 30 miles an hour.

After many financial discouragements, a *Pneumatic Dispatch Company* obtained capital in 1862, and began operations in 1863. The experimental tube was removed to London, and laid down beneath the roadway of Seymour Street, Euston Square, from the Euston station of the London and North-western Railway to the N.W. District post-office in Eversholt Street—a distance of one-third of a mile. Mail-bags being succeesfully transmitted in this way, the company commenced in 1864 the construction of a tube on a larger scale, and this has since been completed. The tube is laid down from Euston Square to St. Martin's-le-Grand, by way of Tottenham Court Road, Holborn, and Newgate Street—a distance of 2¾ miles. The tube is of large size, nearly 4½ feet in diameter, laid down at as small a depth beneath the carriage-way of the several streets as the water and gas pipes will permit. It is chiefly of cast-iron; but some portions on a sharp curve are of brick. There is a large engine-house on the south side of Holborn, near Lincoln's Inn Fields, to supply all the power for working the whole tube in both directions. Rarified air in one-half of the tube draws a train of iron carriages, laden with parcels and mail-bags, from Euston Station to Holborn; and compressed air drives them through the other length of tube from Holborn to the General Post-office—there being suction in the one case, and pressure in the other. A reverse action brings trains in the other direction. The necessary amount of rarefaction in the one case, and of compression in the other, was determined by experiment;

but both are produced by means of a revolving fan of peculiar construction and large dimensions worked by a powerful steam-engine at the Holborn station. If this mode of transmission were to come into general use, there would be great saving of time in the delivery of letters and parcels, and a material lessening of the number of parcels and mail-vans and carts in the overcrowded streets of the metropolis.

It is to be regretted that a work so successful in a scientific and engineering point of view should still remain undeveloped in a commercial sense. The Postmaster-general, the railway companies, and the great carriers, have made no practical working engagements with the Pneumatic Dispatch Company; and this costly tube, with the engine-house in Holborn, has now remained silent and unused for several years. This of course has checked any extension of the system into other districts. We cannot resist the conviction that a better result will present itself sooner or later.

The problem of *passenger* conveyance within a pneumatic tube was shown to be practicable by Mr. Rammell, in an experiment tried at the Crystal Palace in 1864; but nothing further has been done in the matter.

More success has attended the introduction of a system for transmitting small rolls of paper through tubes of a few inches diameter, by pneumatic pressure. Mr. Siemens introduced it at Berlin; it was next tried with success at Paris; Mr. Latimer Clark constructed similar apparatus in London; and the plan is now in regular use in the telegraph department of the new buildings connected with the General Post-office in St. Martin's-le-Grand, while it is also used in some of the chief provincial cities and towns. In 1875 the number of tubes in London was 24, with an aggregate length of nearly 18 miles; there were 4 tubes in Liverpool, 3 in Dublin, 5 in Manchester, 3 in Birmingham, and 1 in Glasgow. Small tubes, two to three inches in diameter, are arranged for the reception of telegram forms or papers, made up into a roll, and put into a felt cylinder. The purpose is to economize time and expense in conducting the government postal telegraph business by *blowing* along the telegram forms at a rate of 30 miles an hour, instead of sending them by street conveyance.

Two parallel tubes have been laid down beneath the pavements of the streets from the General Post-office to various parts of London, and also in some of our large provincial cities and towns; additions being made to the length of the tube according as the system becomes practically developed. One tube in each pair may be called the down line, the other the up; the two are placed in connection at each end; and one steam-engine works them both. The felt cylinder very nearly fills up the tube, but still moves easily along it; this movement is brought about either by the formation of a partial vacuum in front of the cylinder, or by compressing the air behind it; and the steam-power is so applied as to produce either or both of these two results, according as convenience may suggest. An ingenious plan is adopted for accommodating one or more intermediate offices, just as local stations are accommodated between the two termini of a railway. The cylinder or *carrier* travels from end to end of the tube, unless a block or check action is purposely put in force at an intermediate station; and the mode of effecting this is one of the most beautiful of Mr. Siemens's inventions relating to the subject. Two pieces of pipe, the *receiver* and the *transmitter*, are made exactly alike, and are so pivoted together that either may be adjusted into a cavity cut in the tube, and made temporarily to form part of it. The carrier, we will suppose, is intended to stop at the intermediate stations, to admit of the removal of some telegram papers and the introduction of others. A click is heard; the carrier strikes against an obstruction in the receiver; the cavity is opened; the exchange of papers is made; the carrier is re-introduced, but into the transmitter instead of the receiver; the cavity is closed again; and the carrier resumes its journey. All this is the work of a few seconds merely. If the intermediate station has nothing to send and nothing to receive, the transmitter alone is used, and the carrier travels on without stopping.

The up-tube and the down-tube have each its apparatus of receiver and transmitter. The felt cylinder and its contents being very light, a slight rarefaction of the air in front of it, or condensation of the air behind it, is sufficient to produce a speed equal to twenty or thirty miles an hour. Practically, there is a *current* of air maintained, circulating through the two tubes and their terminal connections; wherever a carrier is placed in this current, it is blown along; and there may be two or more carriers traveling at the same time.

PNEUMATIC TROUGH, is a piece of chemical apparatus originally devised by Priestley, and now in daily requisition in every laboratory. By its means, gases can be collected in vessels for experiments or examination, and can be decanted from one jar to another with as much ease as if we were dealing with liquids. The pneumatic trough consists of a vessel of water, provided with a ledge or shelf at the depth of two or three inches from the top. The jars in which the gas is to be collected are filled with water, and placed with their mouths downward upon the shelf, which is kept a little under water, so as to prevent the entrance of air into the jars. When the edge of the jar is brought over the extremity of the tube carrying the gas, the bubbles of gas rise through the water, collect in the upper part of the jar, and displace the liquid. As soon as a jar is filled, it may be removed by sliding under its open mouth, while still under water, a plate or tray containing enough of water to cover the edge of the jar; and oxygen and many other gases may be thus preserved for hours. Another jar full of water is substituted for the removed jar. The trough is best constructed of japanned copper, and may be made of any size corresponding to that of the jars; and in the shelf a groove should be made about half an inch in width, and the same in depth, to admit the extremity of the gas-delivering tube beneath the jar.

PNEUMATICS (Gr. *pneuma*, spirit or breath, air) is the science which treats of the mechanical properties of aëriform fluids, such as their weight, pressure, elasticity, motion, &c. The great representative of the aëriform fluids is the atmosphere. The atmosphere is very frequently called 'air,' to distinguish it from the others, which are known as 'gases.' The fact of air having weight, and generally exercising pressure and resistance, was unsuspected by most of the ancients, though they were aware of the latter property in particular cases, from seeing and feeling the effects of the wind; but the idea that air in a state of rest exerts pressure on a body immersed in it, never seems to have occurred to them. Aristotle, however, asserted that air had weight, and so did several subsequent philosophers; but the truth of this opinion was not established till the time of Torricelli (q. v.), who not only showed that it had weight and exerted pressure, but also found the amount of this weight or pressure. See ATMOSPHERE. Pascal (q. v.) completed the investigation, and invented the Barometer (q. v.). The experiments of these philosophers proved that what is called 'suction' is nothing more than an effect of the pressure of the air on one side of a body, unbalanced by an equal pressure of air on the opposite side of it. To this property of air we owe the working of the various kinds of Pumps (q. v.), the Barometer (q. v.), the siphon, cupping-glass, &c. But the great distinguishing feature of aëriform bodies is the repulsive force which their molecules exercise over each other, and the consequent expansion of these bodies when pressure is removed, or compression when pressure is increased. The investigation of the expansibility and compressibility of air was carried on by means of the Air-pump (q. v.), an invention of Guericke (q. v.), and soon resulted in the discovery of a law by Boyle (about 1650), and Mariotte (1676), called *Mariotte's Law* (q. v.), which affirms that 'at a given temperature the volume of a gas is inversely as the pressure.' See GASES.

The second great law of tension and pressure is that of Dalton and Gay-Lussac (1801), which states that 'when the tension remains the same, the density of a gas varies inversely as the temperature'—that is to say, when the temperature is increased by equal increments, the bulk is increased by equal increments. The motion of gases is subject to the same laws with that of liquids, the laws which regulate the motion of liquids depending for their efficacy not on their liquidity, but on the fluidity (see FLUID) of these bodies. The flow of gases in tubes seems to be retarded by friction against the sides, in the same way as that of water is, and the diminished efflux at an orifice shows that the *vena contracta* exists for gases as well as for liquids. Abundance of examples and further explanations of the properties of air will be found under such heads as ATMOSPHERE, BALLOON, BAROMETER, DIVING-BELL, MAGDEBURG HEMISPHERES, &c.

PNEUMOGA'STRIC NERVE, or *Par Vagum*, derives the first of its names from its supplying the lungs and stomach with nervous filaments, and the second from the wandering course which it pursues. It emerges from the medulla oblongata by eight or ten filaments, which unite and form a flat cord, that escapes from the cavity of the cranium (in association with the glossopharyngeal and spinal accessory nerve) by the jugular foramen. In this foramen, it forms a well-marked ganglionic swelling, while another is observed immediately after its exit from the skull. The nerve runs straight down the neck between and in the same sheath as the internal jugular vein and the carotid artery. Below the root of the neck, its course is different on the two sides; the right nerve running along the back of the œsophagus, is distributed to the posterior surface of the stomach, and finally merges into the solar plexus; while the left nerve runs along the front of the œsophagus to the stomach, sending branches chiefly over its anterior surface.

From anatomical considerations, based on the distribution of this nerve, and from the results of experiments on animals, it may be concluded that this is a mixed nerve, containing filaments both of sensation and motion. The pulmonary branches exercise a most important influence upon the respiratory acts, for

when the pneumogastrics on both sides have been divided above the giving off of the pulmonary branches, the most severe dyspnœa comes on, the number of respirations is much diminished, and the animal breathes as if it were asthmatic; after a short time, the lungs become congested and dropsical, and the bronchial tubes filled with a frothy serous fluid; and if the cut ends of the nerves are kept apart, the animal never survives above three days. The gastric branches influence the movements of the stomach, while their destruction does not materially affect the secretion of the gastric juice or the process of chylification. Loss of voice and difficulty of breathing have been frequently traced to the pressure of an aneurism or other tumor on the recurrent or inferior laryngeal. Hooping-cough is ascribed by many high authorities to an affection of the pneumogastric nerve; and the violent spasmodic cough which accompanies enlarged bronchial glands, is probably due to the irritation of its pulmonary branches. The sympathy which exists between the digestive and the respiratory and circulating organs, is explained by the anatomical relations of this nerve. For example, both asthma and palpitation of the heart are often to be traced to some deranged state of digestion. Vomiting may be excited by irritation of the central or the distal extremities of the nerve. In disease of the brain, the vomiting, which is often an early symptom, is caused by irritation of the central extremity; and in sea-sickness, it is that extremity also which is irritated by the disturbed state of the circulation in the cranium; while by introducing emetic substances into the stomach, the vomiting is produced by the irritation of the peripheral (or distal) filaments.

PNEUMO'NIA, or Inflammation of the Substance of the Lungs, is a disease which is divided by pathologists into three distinct stages, corresponding to different degrees or periods of inflammatory action. The first stage is that of *engorgement*, in which the lung or a portion of it is gorged with blood, is of a darker color externally, and crepitates (or crackles) less under pressure than healthy lung does; the air that ought to exist in the pulmonary cells being in a great measure replaced by fluid. On cutting the engorged portion, the section is seen to be redder than natural, and to yield a great quantity of reddish and frothy serum. The most engorged portions will generally float in water, although they are heavier than healthy lung. If the inflammation continues, new characters appear. The affected portion of the lung ceases to crepitate under pressure, and sinks when placed in water, in consequence of its now containing no air. The spongy character of the lung is gone. It is now solid, and the cut surface so closely resembles that of liver, that the term *hepatisation*, first suggested by Laennec, is generally applied to this stage. On examining with the microscope a torn fragment of the hepatized lung, it will be seen to be composed of small red granulations pressing upon one another, which are doubtless the air-cells clogged up, thickened, and made red by the inflammation. In the third and most advanced stage, the pulmonary tissue remains, as in the last stage, dense, solid, and impervious to air; but its section, in place of being red, is now of a reddish-yellow, or straw, or drab, or stone color, or is of a grayish tint; and the little granulations which were red in the second stage, are now whitish or gray, from the presence of pus or matter, which permeates through the pulmonary tissue, rendering it very soft and friable. To this stage, which is in reality one of *diffused suppuration*, Laennec applied the terms *gray hepatisation*, or *purulent infiltration*.

Besides revealing to us the above information regarding the changes which the pulmonary textures undergo in the three stages of this disease, morbid anatomy teaches us that inflammation does not attack all parts of the lung on both sides indiscriminately. It is much more common on the right side of the body than the left. Of 210 cases collected by Andral, 121 were on the right lung alone, and 58 on the left side alone; while in 25 it was double (i. e., occurred in both lungs), and in six the seat was uncertain; so that pneumonia is more than twice as common on the right side as on the left, and only occurs on both sides together as often as once in eight times. According to Grisolle, however, whose *Traité Pratique de la Pneumonie* is the standard work on this disease, the relative frequency with which the right lung is affected is rather less than two to one (11 : 6). Moreover, pneumonia is considerably more common in the lower than in the upper lobes of the lung—a point of great importance in diagnosis. Of 88 cases observed by Andral, the inflammation was found to affect the lower lobe 47 times; the upper lobe, 30; and the whole lung at once, 11. Inflammation of the bronchial tubes so constantly accompanies inflammation of the tissues of the lung, that although bronchitis often exists without pneumonia, pneumonia never occurs without bronchitis. Moreover, a certain amount of pleurisy or inflammation of the investing membrane, accompanies pneumonia in a very large majority of cases.

The alterations which take place in the tissue of the lung give rise to important modifications of the ordinary sounds yielded by auscultation and percussion; the discrimination of which, however, belong to the physician.

The following are the general symptoms, as distinguished from the physical signs, of pneumonia. The disease generally commences with inflammatory fever; and pain in the side, due to pleurisy in most cases, soon supervenes. The breathing is always more or less affected, especially when the upper lobe is inflamed. According to Professor Gairdner, the dyspnœa of *pure* pneumonia is a mere *acceleration* of the respiration, without any of the heaving or straining respiration observed in bronchitis, or in cases where the two diseases are combined. Delirium is a very frequent, and always a dangerous symptom, indicating that the due arterialization of the blood is much interfered with, and that the impure circulating fluid is affecting the brain. The cough is usually dry at first, but in a few hours it is accompanied by the expectoration of sputa of so characteristic a nature as to afford almost certain evidence of the presence of the disease. On the second or third day, the expectoration, which previously consisted merely of a little bronchial mucus, consists of transparent and tawny, or rust-colored sputa, which unite in the vessel containing them into one gelatinous mass. The color is owing to the complete blending of the blood and mucus, and in proportion to the quantity of the former, the sputa is more or less deeply tinged. So long as the expectorated matter flows readily along the side of the vessel when it is tilted, there is reason to believe, unless physical signs tell us otherwise, that the inflammation is still in the first stage; but when the sputa are so viscid that the vessel may be inverted and strongly shaken without their being detached, there is reason to fear that the pneumonia has reached the second stage.

If improvement now commences, the sputa become less tenacious, less rust-colored, and gradually like the expectoration of common catarrh. But if the disease advances, the rust-colored sputa, although in less quantity, may go on to the end; or there may be no expectoration, either on account of its own tenacity, or of the patient's want of power to eject it, in which case the air-passages get gradually filled, and death from suffocation occurs; or there may be the expectoration of a fluid of the consistence of gum-water, and of a brownish-red color (resembling prune-juice), which, according to Andral, affords strong evidence that the disease is in its third stage; or, lastly, pure pus may be excreted during the third stage.

In its first and second stages, this disease is tolerably amenable to treatment. Whether, when the lung has reached the third stage, it is still susceptible of repair, we cannot tell, because we have no certain sign of the commencement or establishment of the third stage during life, although we may guess that it is established, if the face has become very pale and corpse-like; if there is the prune-juice or purulent expectoration; and if the disease has lasted for a sufficient time to have advanced so far, although it would be very difficult to state, with any approach to accuracy, what the necessary time is. The average duration of pneumonia may be placed at ten days or a fortnight.

Of the causes of this disease, very little need be said. Sometimes no cause can be traced. Very often it is the consequence of exposure to cold, especially when the body was previously heated by exercise; but why such exposure should in one person cause pneumonia, in a second, pleurisy, in a third, pericarditis, and in a fourth, peritonitis, we cannot tell.

The following is a brief outline of the treatment to be adoptrd, provided the patient was previously strong and healthy. In the first stage, free venesection, tartarized antimony (one-third of a grain to half a wine-glassful of water every hour, and the dose to be increased to a grain or more hourly, if there is no purging or vomiting, which may often be prevented by the addition of a few drops of laudanum to each dose), and antiphlogistic regimen, generally are of service. Under this system there are often signs of improvement in five or six hours, although sometimes there is no change for the better till twenty-four hours or more have elapsed. When the disease has reached the second stage, in preference to continuing the antimony, we should as speedily as possible get the system gently under the influence of mercury, in the mode recommended in the articles PERICARDITIS and PERITONITIS. If there is great depression of the vital powers, as indicated by a feeble and irregular pulse, and the other ordinary signs of sinking, it will be requisite to administer stimulants, such as wine and carbonate of ammonia, and to feed the patient on beef-tea.

There are few diseases in which it is of greater importance to watch the patient during convalescence than in pneumonia. The convalescence is often rather apparent than real, and as Dr. Watson truly observes: 'A patient can never be pronounced perfectly secure so long as any trace of crepitation remains in the affected lung, and this may often continue long; nay, it not unfrequently ceases only on the supervention of another more surely fatal though less rapid disorder—viz., tubercular consumption.'

PO (anc. *Eridanus* and *Padus*), the largest river of Italy, rises in two springs on the north and south sides of Monte Viso,

one of the Cottian Alps, close to the French frontier, and in lat. about 44° 40′ N. It flows eastward for upwards of 20 miles, when, arriving before Saluzzo, it emerges from its rocky defiles, and enters upon the plain. From Saluzzo, it flows north-north-east past Turin; and arriving at the town of Chivasso, it changes its course toward the east, in which direction it flows to its embouchure in the Adriatic. Upwards of 50 miles above its mouth, it begins to form its delta, the principal branches being the *Po della Maestra*, on the north, and the *Po di Primaro*, on the south. The unhealthy marsh of the *Valli de Commachio* extends immediately north of the Primaro branch. The Po receives from the left, the Dora Riparia, Dora Baltea, Sesia, Ticino, Adda, Oglio, and Mincio; from the right, the Tanaro, Bormida, Trebbia, Taro, Parma, Enza, Secchia, and Panaro. At Turin, the Po is about 750 feet broad; at Pavia, 1050 feet; at Cremona, 2650 feet; and below Polesella, after throwing off the Po di Primaro branch to the south, its breadth is about 850 feet. It has an entire length of 400 miles, is navigable for small barges 60 miles from its source and drains an area of nearly 40,000 square miles.

POA. See MEADOW GRASS.

POACHING, though not strictly a legal term, has so long been appropriated in popular speech to describe a well-known offence, that it is now usually adopted in legal works. It means trespassing on another's lands for the purpose of catching or pursuing game; and it is likewise extended to the cognate offence of unlawfully catching or pursuing fish in another's waters.

1. *As to poaching game.*—The general law as to who is entitled to game, and in what circumstances, is stated under the head GAME. As a general rule, the proprietor of land is the only person entitled to catch and kill the game upon the land; and where the land is let, then, in England and Ireland, if there is no express agreement to the contrary, the tenant is exclusively entitled to the game. In Scotland, the landlord is so entitled; but generally there is an express stipulation upon the subject. As regards hares and rabbits, however, the law was altered for the whole United Kingdom by the Ground Game Act, 1880, which gives to every occupier of land an inalienable right, jointly with the proprietor, to kill such ground game, under certain restrictions as to the methods of killing and the number of persons entitled to kill. This change was thought necessary from the damage done to crops by hares and rabbits, in many cases directly due to excessive preserving. The person entitled to kill the game on the land, can alone give permission to a stranger to enter and kill game there; and if this permission is not obtained, such stranger, whether qualified or not—i. e., whether he pays the government tax or not—is a poacher, if he go and kill the game. The right of the occupier under the Act of 1880 cannot be *transferred*, and does not imply the power of giving *leave* to others to kill ground game. In England, there is a Day-poaching Act and a Night-poaching Act, imposing penalties on poachers. By the Day-poaching Act (1 and 2 Will. IV. c. 32, s. 30), whoever unlawfully goes upon lands not his own to pursue or kill not only Game (q. v.), but also rabbits, woodcocks, snipes, quails, and landrails, is liable to a penalty of £2.

Any person whatever, whether interested in the lands or not, may institute the proceedings for the punishment of the poacher; and the informer is entitled to half the penalty, the other half going to the poor of the parish. When a poacher is found trespassing on lands in search of game, the person entitled to the game there, or the tenant, or a game-keeper, or servant of either, may demand the poacher's name and place of abode, and if it is refused, may arrest such poacher, and take him before a justice of the peace; but the poacher must be taken within twelve hours before the justice, otherwise he is entitled to go at large. In such a case a penalty of £5 may be inflicted. If game be found on the poachers at the time they are caught, and it appear to have been newly caught, the party who is entitled to arrest him is entitled to seize the game also. If the poacher when convicted do not pay the penalty within the time fixed by the justices, he may be committed to the house of correction for a period not exceeding two calendar months. The party may appeal against his conviction to the Court of Quarter Sessions; but he must either remain in custody in the interval, or give security for the costs. The offence of poaching is punished more severely when five or more go out together, and in such case each is liable to a penalty of £5. Moreover, if any of these five or more persons, acting in concert, be armed with a gun, and use violence, each is liable to an additional penalty of £5. As to the Night-poaching Act (9 Geo. IV. c. 69), it is provided that any person by night—i. e., between the first hour after sunset and the first hour before sunrise—unlawfully trespassing in search of game, shall for a first offence be committed by the justices to the house of correction for three months; for a second offence, shall be committed for six months, the convicted person being in each case liable to a further term of imprisonment on failure to give securities at the end of his sentence; and for a third offence, shall be guilty of a misdemeanor, and be imprisoned for two years. In case such night poachers are found on the lands and in the act, the owner or occupier of the land or his servants may arrest the poachers, and take them before justices.

If the night-poacher, when arrested, use firearms, sticks, or offensive weapons, he shall be guilty of a misdemeanor, and be punishable by two years' imprisonment in addition. In case of three or more night-poachers being armed with guns, bludgeons, or other offensive weapons, each is guilty of a misdemeanor, and is liable to imprisonment for three years. The provisions of the Night-poaching Act were, by the Act 7 and 8 Vict. c. 29, generally extended to public roads and highways, it having been found that in such places the original act was evaded, and the risk of murder greatly increased. Under the former law, it was, as already mentioned, incompetent for any person except the owner or occupier of the lands to apprehend the poacher, and even this could be done only when the poacher was caught in the act on the lands; and hence, even constables had no power to seize the poacher, though seen to be coming from such lands. But by the Poaching Prevention Act (25 and 26 Vict. c. 114), which applies to the United Kingdom, if a constable now meet a suspected poacher in any public place, whom he has reason to suspect of coming from land where he has been poaching, and of having in his possession game unlawfully got, or a gun or net, such constable may stop and search the poacher; and if game, or implements for taking game, are found on him, may seize and detain them, and summon him before the justices. When before the justices, if it be proved by circumstantial evidence or otherwise that such game was procured by poaching, or that the implements were used, the poacher may be fined in a penalty of £5, besides forfeiture of the game, and guns, nets, and other implements which he may have so used. The constable may also stop and search any cart in which he suspects there may be such game or implements. The person convicted may appeal, if he chooses, to the next Quarter Sessions, or, in certain cases, to the Court of Queen's Bench. A conviction can be obtained only in cases of actual seizure, but for a conviction it is not necessary that the poacher should be seen actually committing the offence.

As game is in the category of wild animals, the poacher is entitled to keep the game, except where it was both started and caught on one and the same person's lands. But the game may be taken from the poacher if the demand is made at the time on the land or on fresh pursuit. The law of Scotland does not materially differ from that of England, as to poachers; and the Night-poaching Act applies to it equally as to England. The Scotch Day Trespass Act (2 and 3) Will. IV. c. 68) closely agrees with the English act. But it is singular that in the case of night-poachers the game cannot be taken from the poacher, even when caught in the act and on the lands; though it can be so in England (Oke's *Game Laws*, by Bund, seventh edition, 1877, page 360; and for Ireland, page 407). The act conferring power on constables to stop and search poachers on the highway also extends to Scotland. In England the poaching of hares or rabbits by night in preserves is a misdemeanor; whereas it is only an offence punishable summarily in Scotland. On the other hand, it is not necessary for seizure by day in Scotland that the game should be recently killed. In Ireland the law as to poaching is not identical with the law of England, but substantially the law is the same. The Irish statute against trespass in pursuit of game is 37 Geo. III. c. 35. The law of the United Kingdom has often been described as too severe against poachers, inasmuch as most of the penalties, except in Ireland, are cumulative. But it is answered, that poaching is in reality only stealing under a milder name, game being as much the fruit of the soil as apples or turnips, and that the transition from habitual poaching to stealing is not only easy but inevitable. The partial administration of the law by justices, many of whom preserve game, is also objected to. As regards Scotland, this objection has been removed by the Game Laws Amendment Act, 1877, 40 and 41 Vict. c. 28.

2. *Poaching Fish* is the unlawfully entering on another's fishery in order to catch fish. The law of fisheries is not uniform in the United Kingdom. In England the general rule is that any one of the public may fish freely in the sea and in all navigable rivers; and where he can fish, he can catch salmon as well as every other kind of fish. But there is an exception to this generality, which consists in this, that as the crown could before Magna Charta (which took away such right) legally grant a several or exclusive fishery in the sea or a navigable river to an individual, and as this was, in point of fact, often granted, it follows that it is not uncommon to find, even at the present day, an individual, generally the lord of an adjacent manor, still claiming a several fishery in these places. If he can prove that he has exercised this exclusive right as far back as one or two centuries, it will be inferred that his right dates from before Magna Charta, and therefore will be legal. When such is the case, the public have no right to fish even in a navigable river or the sea at the specified places, the sole fishery being vested in this individual owner. In streams not

navigable, the rule is, that each riparian owner—i. e., the owner of the lands on the bank of the stream—has a right to a several or exclusive fishery up to the middle line of the stream. If he is owner on both sides of the stream, then he has the exclusive fishery in the whole of the stream, so far as his lands extend. As to ponds, whoever is owner of the soil, is the owner of a several fishery there, unless he has let it to another. As to lakes, it is not clearly ascertained how the fishery is to be divided between the owners of the lands abutting thereon; but much will depend on the title to the lands and the subsequent user.

As a general rule, there is no such thing as a right in the public to fish anywhere except in a tidal river or the sea, and that is subject to the exception of an individual claiming a several fishery, as before mentioned. It is often supposed that, at all events, if a highway adjoins a private stream, any one may fish in the stream or angle there; but this is a delusion. Nobody is entitled to use a highway for the collateral purpose of either fishing or poaching, the use of the highway, so far as the public are concerned, being confined to the purposes of traveling or transport. The general rule as to all several, i. e., exclusive fisheries is, that whoever goes and poaches the fish commits an offence, for which he may be summoned before justices, and fined £5, over and above the value of the fish taken; and if the fishery where he poaches is adjoining the dwelling-house of the owner of the fishery, it is a still higher offence, for it is then an indictable misdemeanor. The Poaching Code of England is contained in the Larceny Act, 1861. It is immaterial what kind of fish is caught by poachers, and how they are caught. But a milder punishment is awarded to the poaching angler, for even though he poach in a fishery adjoining the owner's dwelling-house, he incurs only a penalty of £5; and where the fishery does not adjoin a dwelling-house, he incurs a penalty of only £2. Whenever a fish-poacher is caught in the act of poaching, he may be at once apprehended, not only by the owner of the fishery, but by anybody; but this can only be done while he is on the spot or near it, for if he escape to the highway or to other lands before being arrested, he cannot then be apprehendeded, but can only be summoned before justices in the usual way. In this respect, a privelege is given to anglers, for in no case can these be arrested, if angling during the daytime; they can only be summoned for the offence. The poacher, when arrested, must be taken within a reasonable time before a justice of the peace and charged with the offence.

Though anybody may arrest the fish-poacher, still it does not follow that the fish poached can be taken from the poacher; on the contrary, the rule is the same as with reference to game, that whoever first catches the fish, whether legally or illegally, is entitled to keep it; and though game can on certain occasions be taken from the poacher, this is by reason of an express provision in the Game Act; but there is no similar provision as to poached fish, so that the poacher, whatever other punishment he may incur, does not lose his fish. With regard, however, to the poaching implements, such as nets, it is provided by an express section of the Larceny Act (24 and 25 Vict. c. 96, s. 25), that the owner of the fishery or land where the poacher is caught, or his servant, may demand, and if refused, may seize the net, rod, line, hook, or other implement used for taking the fish, but no other person can seize these. It may also be observed that the English Salmon Fishery Act (24 and 25 Vict. c. 109), though singling out salmon from all other fish for peculiar protection, does not deal specially with poachers. Its chief object is to restrain the owners of salmon-fisheries themselves from fishing at certain times and by certain means, for which purpose, a close season is declared, during which no person, whether otherwise entitled or not, can legally catch salmon. Of course, poachers are prohibited from catching salmon at the times and by the means forbidden to the owner, and in this sense come within the Salmon Acts. Thus, all persons are prohibited from poisoning salmon-rivers, from fishing salmon with lights, spears, gaffs, stroke, halls, or snatches; using fish-roe as a bait; selling or buying salmon-roe; using nets having meshes larger than two inches; from using fixed engines, fishing without a license, &c. Large powers to arrest are given to water bailiffs acting under the Freshwater Fisheries Act, 1878, 40 and 41 Vict. c. 39. These, under the Salmon Fishery Acts of 1865 and 1873, had formerly been confined to salmon rivers.

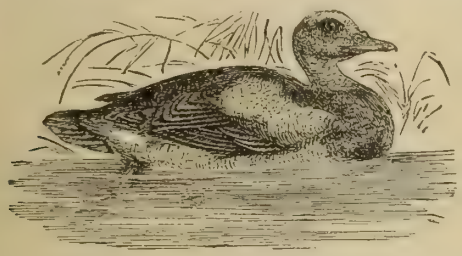
The law of Scotland differs considerably from that of England. In Scotland the fundamental rule is that no person is entitled to fish salmon (even by angling) unless he can produce a grant or charter from the crown, conferring upon him such right. Nearly all the great landed proprietors are in possession of such rights as pertinent to their lands. And the crown's original right to the salmon applies not merely to rivers, but to the sea-coasts all round Scotland. Hence the public have no right to fish with nets even in the sea, except by leave of the crown, or its grantee at the spot in question. Where a salmon-river belongs to several proprietors, the rule is that none can fish by using fixed engines; but the only legal mode is the mode of fishing by net and coble (or boat). As regards poachers of salmon, the law is contained in the act 7 and 8 Vict. c. 95. By that law, whoever poaches salmon in a river, lake, or within a mile of the sea-shore, incurs a penalty of £5, besides forfeiting the boat, net, or other engine used in catching the fish. While the law is as above stated with respect to fishing salmon with nets, even a grant from the crown is required to enable a riparian owner to angle for salmon. Hence the right of angling for salmon is not a pertinent of the property in the banks, and each owner is not entitled to angle up to the middle of the stream. Anglers, although riparian owners, or who have a permission from such, are therefore all poachers, and incur a penalty. The Scotch Salmon Acts, 25 and 26 Vict. c. 97, 27 and 28 Vict. c. 118, 31 and 32 Vict. c. 123, also forbid owners of fisheries and others fishing salmon by fixed engines, during close-time, &c. As regards other fish than salmon, the general rule is, that the riparian owner is entitled to catch all the fish he can, provided he do not interfere with the superior right of some crown grantee of the salmon-fishery.

A person who poaches trout or other fresh-water fish with a net, or by double-rod fishing, or cross-line fishing, or set lines, &c., incurs a penalty of £5, besides forfeiture of the fish caught. And he may be arrested if he is net-fishing, but not if he is fishing in another way. Moreover, a mere angler of trout, though a poacher, cannot be arrested, nor yet punished by any penalty; though he is liable to an action at law, which, however, is virtually no remedy at all. So, in the case of all poachers of trout (except angling poachers, who can neither be arrested, nor yet have their fish or fishing-rod taken from them by force), the owner of the fishery, or any person authorized by him, may seize the nets, boats, and fishing implements, if the poachers are found on the spot. See the Freshwater Fisheries (Scotland) Acts, 8 and 9 Vict. c. 26, and 23 and 24 Vict. c. 45. Though the poaching angler is only liable to an action, yet the poaching angler of salmon may be fined. The public have no right to angle from a highway adjoining a stream. Where a stream runs through a farm, the farmer has no right to angle for trout, unless the lease expressly allows it; but he cannot fish for salmon with a net, or even by angling, for it interferes with the crown grantee, if there be one. It has also been held that he cannot fish for trout with a net; but this decision is supposed to be doubtful, and would probably be qualified, if the point were raised. There are special salmon statutes for the river Tweed, and for the Solway and the Scotch rivers running into these, and for some other rivers; but these statutes do not substantially differ from the general law. In Ireland the law of poachers of fish is the same as in England in all the main points. See Paterson's *Fishery Laws;* and Oke's *Fishery Laws*, by Bund, second edition, 1878.

POCAHONTAS, the legendary 'Princess Pocahontas,' born about 1595, was the daughter of an Indian chief of Virginia. It is due to the vanity of Captain John Smith, a bustling early settler, that this red Indian woman has been embalmed in his figmentary story as a heroine of romance, in that she died of love for the said John Smith, years after she had prevented her father's braves from beating out his brains at the imminent risk of a similar visitation on her own; a fond imagination perpetuated in sculpture by Capellano, as may be seen any day over one of the doors of the Capitol at Washington. But Mr. E. D. Neill, U. S. Consul at Dublin, has recently dispelled the halo from the brow of this 'Blessed Pocahontas, and Great King's daughter of Virginia.' According to evidence adduced by this gentleman, P. first appears in history tumbling wheels in the market-place of the English fort—a prototype of our city Arabs. Next she is living with a volunteer captain called Cookham. Subsequently separate from him, she is betrayed by her uncle Patowomek (Potomak?) to Captain Argall, the unscrupulous deputy-governor of Virginia, and held by him as a hostage for the purpose of extorting from her father such terms as he required. In pursuance of this plan, John Rolfe, a married Englishman, marries her. Sir Thomas Dale, the governor, afterwards brings the 'Virginian Princess' to England, as a means of extracting money from the government of James I. for the plantation. She created a sensation of curiosity in London and at court, and died at Gravesend in 1616, aged 21. The son she bore to John Rolfe returned to Virginia. Richard Randolph, son of an 'esteemed and industrious mechanic,' is said to have married Jane Bolling, the great granddaughter of P., who is accordingly proudly referred to as an ancestress of the Randolphs and other distinguished families of Virginia. See *English Colonization of America*, by E. D. Neill (1871).

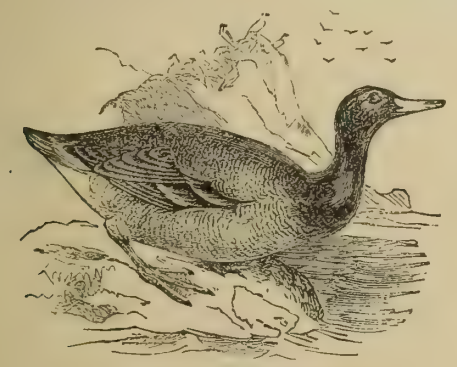
PO'CHARD (*Fuligula*), a genus of ducks of the oceanic section (see DUCK), having the bill as long, or nearly as long as the head, broad and very flat, a little dilated towards the tip, the lamellæ of the upper mandible not projecting beyond the margin, the wings and tail short, the tail rounded. The windpipe of the male in all the pochards, terminates in a lybyrinth composed partly of bone and partly of membrane. There are numerous species, some of them natives of the arctic regions; some found, at least

in winter, on the coasts of most parts of Europe, Asia, and North America; and some in the southern hemisphere.—The COMMON P. (*F.*—or *Nyroca—ferina*), also known as the DUN BIRD, and as the *Red-headed Poker* and *Red-eyed Poker*, is a frequent winter visitant of Britain. It breeds in very northern regions; and is abundant in all of them, but in winter migrates southwards, in America as far as Carolina and Louisiana, whilst in Asia it has been found even in Bengal. It is smaller than the mallard, but rather larger than the wigeon. The head and neck are bright chestnut, the eyes red, characters which at once distinguish it from every other British duck. It is highly esteemed for the table. Great numbers are sold every winter in the London market.



Pochard (*Fuligula ferina*).

– Several other species are reckoned among British birds.—The TUFTED DUCK (*F. cristata*) is a frequent winter visitant of the bays, estuaries, and lakes of Britain. It is a plump and short bird; black, with a white bar on the wing; the breast, belly, and sides white. The occipital feathers are elongated. The CANVAS-BACK DUCK (*F. Valisneria*) of North America is a species of pochard. It is very like the Common P., but is much larger, and



Canvas-Back Duck (*Fuligula valisneria*).

has the bill higher at the base, and less dilated towards the tip. The upper parts are also whiter. The Canvas-back Duck breeds in the northern parts of America, and migrates southward in flocks in autumn. It winter, it abounds particularly on the Chesapeake and its tributaries, and is also common southward to New Orleans, often collecting in very large flocks, particularly towards evening. It is very shy, but vast numbers are killed, it being in very high esteem for the excellence of its flesh.

PO'CO (Ital.), a little, a term much used in Music, as *poco animato*, rather animated; *poco forte*, abbreviated *pf.*, rather loud; *poco a poco*, signifies by degrees, little by little; *poco a poco crescendo*, becoming loud by degrees; *poco a poco rallentando*, becoming slower by degrees.

POD. See LEGUME.

PO'DAGRA. See GOUT.

PODA'RGUS, a genus of birds of the family *Caprimulgidæ*, nearly allied to the true Goat-suckers (q. v.), but having no connecting membrane at the base of the toes, and the middle toe not pectinated. Some interesting species are natives of Australia, strictly nocturnal in their habits, and remarkable for the difficulty with which they are roused from their sleep by day. *P. humeralis* may be pushed off a branch, and seems scarcely to waken so as to save itself from falling to the ground; and if two are sitting together, as is usually the case, one may be shot without its mate being much disturbed. But by night this bird is all activity.—Another species, *P. Cuvieri*, disturbs the night by a hoarse cry, resembling the syllables *More Pork*, by which name it is therefore known in New South Wales.

PODE'STÀ (Lat. *potestas*, power), an Italian municipal magistrate. The name was first applied to foreign magistrates with supreme authority, whom the Emperor Frederick Barbarossa placed over the Italian towns on subjugating them. In the 13th and 14th centuries, an officer bearing the same designation appears at first occasionally, like the Roman dictator, afterwards in most Italian cities as a permanent magistrate, appointed either by the constituent parliament, or by the Great Council; he superseded all the ordinary magistrates, the military officers, and occasionally the judges. The cause of appointing such an officer was the jealousy that subsisted between the richer citizens and the nobles; the podestà was a stranger, generally belonging to the nobility, and prohibited, during his term of office, from forming any intimate connections in the city which he governed. His chief duty was the execution of summary justice on the lawless barons; and in the great Lombard towns, he generally obtained a predominance for the citizens. Occasionally, however, the podestà became too strong for both parties, securing his re-election during a succession of years, and becoming the despotic ruler of the city.

Podestà is the name now given in many Italian towns to an inferior municipal judge.

PODGORI'TZA, a town of Montenegro, in the district ceded to Montenegro by Turkey in terms of the treaty of Berlin. It is a fortified town, and has a population of about 7500. P. is about 35 miles north of Scutari.

PO'DICEPS. See GREBE.

PODIEBRAD AND KUNSTAT, GEORGE BOCZKO OF, son of Herant of Kunstat and Podiebrad, a powerful and influential Bohemian noble, of the Hussite party, was born in 1420. While still a youth, he threw himself, with all the ardor and resolute force of his nature, into the Hussite struggles. Like the rest of his family, however, he adhered to the moderate party of the Hussites during the government of King Sigismund; but when, on the death of that monarch, the Catholic barons (1438) carried the election of Albrecht V. of Austria (II. of Germany), P. allied himself with the Utraquist Orders in Tabor, and offered the sovereignty of Bohemia to Casimir, king of Poland. Albrecht immediately declared war against him, and invested Tabor, but was forced by P. to raise the siege, and retire to Prague. From this time, P.'s influence was firmly established among the Utraquists; after Lipa, he was the first man of the party. When Albrecht died in 1439, Lipa was appointed regent during the minority of the new king Ladislas; but five years later, Lipa himself died, and P. obtained the government of the country. He, however, was not satisfied. His ambition was to acquire the royal dignity. In 1449, he one night seized the capital, drove away all the Catholic barons, and even imprisoned his colleague in the regency, Meinhardt von Neuhaus. This outrage led to a year or so's fighting—the final result of which was that P. was acknowledged governor or regent by the whole of Bohemia. On the death of Ladislas in 1457, P. managed to get himself chosen his successor, and was crowned 7th May 1458.

From this period he began to display the full power and strength of his administrative genius. He reorganized the forms of education and religion, and strove to bring about a peaceful settlement of the religious dissensions that had desolated the land. He even went the length of respectfully soliciting the papal co-operation in his humane endeavors; but his Holiness would have no dealings with this Samaritan ruler, and in December 1463 publicly proclaimed him a heretic. All the neighboring princes sent letters to Rome, exhorting or imploring the pope to moderation; but the only answer which Pius II. gave them was placing P. under the ban of the Vatican. Shortly after, Rudolf, the papal legate, excited the Catholics of Bohemia to insurrection. P. tried every means of conciliation but in vain. In September 1466, a German Catholic army burst into Bohemia, but this host of pseudo-crusaders was annihilated at Riesenberg. Once more Pius excommunicated P. ; and in addition, he induced Mathias (q. v.) of Hungary to invade Moravia. The Bohemian king appealed to a universal council, but he also prepared to meet force with force. Summoning back from abroad the banished Taborite warriors, he crushed the insurrection, and compelled his enemies to grant him an advantageous armistice. In 1467, his son Victorin, on the renewal of hostilities, invaded and devastated Austria, while the Hungarians who had invaded Bohemia were surrounded at Vilemov, and forced to cease from hostilities. In spite of the magnanimity shown by P. on this occasion, Mathias acted falsely towards him, and in the following year had himself crowned king of Bohemia and Markgraf of Moravia. P. instantly summoned the Bohemian diet, and proposed to the assembled orders that they should take the king of Poland as his successor, while his own sons should merely retain the family possessions. By this means, he obtained the Poles for allies; the Emperor Friedrich also declared in his favor, while his Catholic subjects were reconciled to him, so that the Hungarians found it advisable to conclude a peace. P. died 22d March 1471. His sons, Victorin and Henry of Münsterberg, fell back into the ranks of the Bohemian aristocracy; but in the stormy days that followed, they rendered good service to their native land.

PO'DIUM, a pedestal continued horizontally, so as to form a low wall on which columns may be set. Like the pedestal, it has a lease, die, and corona, all continued. When the podium breaks

forward so as to form a pedestal for a column, it is called the Stylobate.

PODOCA'RPUS, a genus of trees of the natural order *Coniferæ*, suborder *Taxineæ*, the order *Taxaceæ* of some botanists. The leaves, like those of the allied Gingko tree have a remarkable resemblance to the fronds of ferns. The species are natives of New Zealand, the South Sea Islands, and the Indian Archipelago. Some of them are valuable timber trees. *P. cupressina* is one of the best timber trees of Java. It is found also throughout the neighboring islands and the South Sea Islands. It is a beautiful tree, 50 to 80 feet high, with spreading pendulous branches; the wood is yellowish, and takes a very fine polish. *P. totarra*, the TOTARRA or TOTARRA PINE, is the most valuable timber tree of New Zealand. It grows in the southern parts of New Zealand, and its trunk has been known to attain a diameter of fully 12 feet. Its wood is equal to the best Baltic pine in durability and for shipbuilding. The wood of *P. elatus*, the GAGALI of the Fijians, is peculiarly elastic.

PODO'LIA, or KAMINETZ, a government of West or 'White' Russia, north of Bessarabia, and bordering on the Austrian frontier. Area, 16,170 sq. m.; pop. (1880) 2,169,500. The surface is a table-land, strewn with hills, and containing many beautiful districts. Nearly three-fourths of P. is either arable or available for pasturage. Great quantities of corn and fruits, especially melons, are produced, and the fine climate is also favorable to the growth of the vine and mulberry. Hemp, flax, and tobacco are cultivated with success, and the rearing of bees is an important branch of industry. So rich and strong is the grass in the pastures or prairies, that the cattle, of which there are immense herds, can hide themselves from view in it. The population is composed of various races, who live altogether unmixed. The Russniaks (formerly 'serfs') make up the majority, and number over a million; next come the Cossacks; and then the Jews, who are almost all traders. The aristocracy are Poles; the officials and soldiery, Russians.

PODOPHTHA'LMA (Gr. stalk-eyed), a name often applied to a section or sub-class of Crustaceans, part of the *Malacostraca* of Cuvier, including the orders *Decapoda* (Crabs, Lobsters, &c.) and *Stomapoda* (Shrimps, &c.). A distinguishing character, from which



Sentinel Crab.

they derive their name, is their stalked and movable eyes. The stalks of the eyes are short in many, but very long in some, of which a beautiful example is presented by the Sentinel Crab of the Indian Ocean.

PODOPHY'LLIN is the name commonly given to the resin obtained by means of rectified spirit from the root of *Podophyllum peltatum*, or *May-apple*, a plant common throughout the United States. This resin, which occurs as a pale greenish amorphous powder, has (as well as the root from which it is derived) been introduced into the new British Pharmacopœia, in consequence of the general favor which it has experienced during the last three or four years from the medical profession in this country. It is an active purgative, and seems to have the power of relieving the liver by exciting copious bilious discharges. As its activity seems to vary in different patients, it is better to begin with a small dose of half a grain, which may be combined with extract of henbane, with the view of preventing its griping. It is likely to prove one of the most valuable additions to our pharmacopœia.

PODOPHY'LLUM, a genus of plants variously ranked by botanists in the natural order *Ranunculaceæ*, or made the type of a small distinct order, *Podophylleæ* or *Podophyllaceæ*, differing from *Ranunculaceæ* chiefly in having a solitary carpel. The genus P. has 3 sepals, 6 to 9 petals, 12 to 18 stamens, a broad round stigma, seated almost on the top of the germen, and a many-seeded berry. *P. peltatum* is a perennial plant, with a solitary white flower in the axil of the two leaves; the fruit oval, an inch and a half long, smooth, yellowish, succulent, having a mawkish sweet and subacid taste. It is common in North America, growing in moist woods and on the shady banks of streams, and is known as MAY-APPLE, because it flowers and ripens its fruit very early in summer, also as *Hog-apple* and *Wild Lemon*. The fruit may be eaten, but is not agreeable. All the other parts are actively cathartic. See PODOPHYLLIN.

PODU'RA, a genus of small wingless insects of the order *Thysanoura* (q. v.), having a linear or cylindrical body, a distinctly articulated thorax, rather long antennæ, and a long abdomen, terminating in a tail, which divides at its extremity into two branches. They bend the tail beneath the abdomen, and by suddenly extending it, make prodigious leaps. Hence their popular name, SPRING-TAIL. The species of this and allied genera are numerous, and some are found on plants, some under stones and in other damp places, some on the surface of stagnant waters. Their bodies are covered with scales, which are extremely interesting objects, and are among the favorite test-objects for the powers of microscopes.



Podura villosa.

POE, EDGAR ALLAN, perhaps the finest and most original poetical genius as yet produced by America, was born at Boston, February 19, 1809. His father, the son of General Poe, a distinguished officer in the revolutionary army, was educated for the law, but, falling in love with a beautiful English actress, he married her and went himself upon the stage. In a few years the youthful couple died within a very short time of each other of consumption, leaving three children entirely unprovided for. Edgar, the second child, was adopted by Mr. John Allan, a rich merchant, who had no children of his own. In 1816 the boy came to England with Mr. and Mrs. Allan, and was sent to a school at Stoke Newington. In 1821 he returned to America, and attended an academy at Richmond in Virginia. In 1826 he entered the university of Charlottesville, where he was a very successful student, but quitted it at the end of a year, deeply involved in debt, chiefly incurred through his strong passion for gaming. For a year or two he now remained quietly at home; the story of his having gone to assist the Greeks in their heroic efforts to throw off the yoke of their Turkish oppressors has no other foundation than the fact that his elder brother, who had gone to sea, got into some trouble with the police at St. Petersburg, from which he was rescued by the American minister.

In 1829 Poe published a volume of poems, his first known essay in literature, under the title of *Al Aaraaf, Tamerlane*, and other poems. He now expressed a wish to enter the army, and Mr. Allan exercised his influence to secure him a cadetship in the Military Academy at West Point. Here he grossly neglected his duties, drank to excess, and was finally cashiered on March 6, 1831. In the same year he published an enlarged collection of his poems, dedicated to the United States Corps of Cadets. Upon leaving West Point, Poe returned to Richmond, and was kindly received by Mr. Allan, who had become a widower and married a second wife. It is related that Poe's conduct to this lady was such that Mr. Allan had to eject him from his house, but there is some reason to hope that this is mere calumny. It is certain, however, that Mr. Allan had some strong reason for displeasure with Poe, and at his death in 1834, he left him unmentioned in his will. Thus thrown upon his own resources, Poe devoted himself to literature as a profession. In 1833 the publisher of a Baltimore magazine having offered prizes for the best prose story and the best poem, Poe competed, and won both prizes. This led to his friendship with Mr. John P. Kennedy, one of the prize committee, who procured him literary employment in connection with the *Southern Literary Messenger* at Richmond. While there, Poe married his cousin, Virginia Clemm, a beautiful and saintly creature, as destitute as himself, who died in 1848. In 1837 he removed to New York, where he lived by contributing to the *New York Quarterly Review* and other periodicals, and where in 1838 he published *The Narrative of Arthur Gordon Pym*. In 1839 he became editor of *The Gentleman's Magazine* at Philadelphia, and published a collection of his best stories with the title, *Tales of the Arabesque and Grotesque*. The next few years were spent in similar literary employment, chiefly at New York; the year 1845 being marked by the appearance of his famous poem, *The Raven*, and 1848, by the publication of *Eureka, a Prose Poem*, in which he endeavored to elaborate a system of cosmogony.

In 1849 he went to Richmond, and it is said became engaged to a lady of considerable fortune. On the 4th of October he left Richmond by train, which he quitted at Baltimore. Some hours later he was discovered insensible in the streets, and taken to the hospital, where he died on October 7. The ordinary explanation of his condition at Baltimore is that he had met some old cronies, and drunk himself into a state of helpless intoxication.

Scarcely any such dark and disastrous career as that of Poe has a place in all the sad records of genius. From the sins and aberrations of a creature so obviously abnormal, we need not seek to 'point a moral.' There is no doubt that Griswold in his life of Poe has been guilty of imputing to him a most exaggerated state of moral depravity; but the fact remains, that the failure of his

life was mainly owing to his habits of frantic dissipation. There was about Poe a strange fascination; his friends loved him—those best who best knew him, and knew him in his wretchedest aberrations. By his wife and her mother he was regarded through all with an obstinacy of tender affection, not for an instant to be shaken.

Whatever may be thought of his morals, of his genius there will be little question. Slight in substance as for the most part it is, small in quantity, and in range limited, there is that in his poetry which ranks it above everything of this kind which his country has hitherto produced. Save for some traces of imitation in its earlier specimens, his verse is eminently a peculiar and individual product. In keen, clear, lyrical quality, the music of Poe at his best is scarcely surpassed by that of any other poet. Many of his short prose tales are wildly and weirdly impressive, though too frequently indulging by morbid preference in ghastly and painful effects. Over very much that Poe has written, alike in prose and in verse, there broods a significant shadow of misery and hopeless portentous gloom. A much more favorable view than usual of P.'s character is taken by Mr. Ingram in the memoir accompanying his edition of P.'s works (4 vols., Edin. 1874); as also in his separate biography, *Edgar Allan Poe, his Life, Letters, and Opinions* (1880). Mr. Stoddard prefixed a memoir to a collection of his poems (1875).

POERIO, CARLO, a noble Italian patriot, was born on the 10th of December 1803. His father, Giuseppe P,, Baron Belcastro, was also highly distinguished for his love of liberty and for his sufferings in her cause. Born at Belcastro, in Calabria, in 1775, he took part in the Neapolitan revolution of 1799, and suffered imprisonment on its suppression, but was released in 1802. He also took part in the revolution of 1820, for which Ferdinand handed him over to the Austrians, who assigned him as a place of abode, first Grätz, in Styria, and afterwards Florence. On the recall of the exiles by Ferdinand, in 1833, P. returned to Naples, where he spent the rest of his life, and died 15th August 1843. He left two sons, the elder, Alessandro [born in 1802, celebrated as a poet and patriot, and died (of amputation of a limb) after the battle of Mestre, 27th October 1848], and Carlo, the subject of our notice. Carlo was educated with great care under the parental roof, and trained even from infancy, by the example of his father and brother, to place the love of his country above every other affection. In 1828 he joined the liberals of Naples, and took part in the conspiracy of Avellino, for which he was imprisoned until March 1838. He was concerned in the attempt made in 1847 to extort liberty, but was discovered, and after the movement at Reggio was sent back to prison with D'Ayala, Bozzelli, De Augustinis, Assanti, and others. The revolution in Sicily, which broke out at Palermo on the 12th January 1848, set him at liberty, and he immediately gave himself to the organization of the famous demonstration of the 27th January 1848, which was destined to produce the constitution of the 10th February. Carlo was successively nominated Director of Police, and Minister of Public Instruction; but he soon resigned, and also refused the rank of Privy Councillor, offered to him by Ferdinand. He was appointed deputy to the parliament.

On the 18th July 1849, an unknown hand left in P.'s house a note to the following effect: 'Flee without a moment's delay. You are betrayed. Your correspondence with the Marquis Dragonetti is in the hands of the government.' As there had been no such correspondence, and as it was P.'s wish to maintain the combat to the last on the ground of legality, he did not flee. On the following day he was arrested, and his house was ransacked. Six days after, a letter of Dragonetti's was given him to read, in which he spoke of an invasion by Garibaldi, instigated by Mazzini and Palmerston. The letter was a forgery of the police! P. compared it with other authentic letters of Dragonetti, and proved it to have been forged. As the government could not bring him to trial on that pretext, it had recourse to a spy, Jervolino, who accused P. of being at the head of a sect—which never existed—called the Italian Unity, which aimed at proclaiming a republic, and murdering the king and the ministers. P. demanded to be confronted with Jervolino, but this was refused. When this accusation also fell to the ground, Peccheneda, who was at the head of the police, tried to induce the others who were indicted for political reasons to denounce P. as a revolutionist, promising them liberty as the reward. His design partly succeeded. He extorted from Romeo the printer, and from Margherita some false accusations, which the fear of death caused those unfortunate persons to make. But they were of no avail, and recourse was again had to the accusation made against P. by Jervolino; and although P. brought forward many clear proofs that the informer was paid by the police to do him harm, the court paid no attention to that, nor to any other of his objections, and concluded by inflicting on him the penalty of passing 24 years in irons, and of a heavy fine.

Thus Carlo P., a minister, and a member of parliament, a man of rare genius and of exemplary life, was cast into the hulks at Nisida, dressed as a felon, and dragging 15 pounds of chains; and thence, through the suspicions of the government, who dreaded his escape, he was conveyed from hulks to hulks, from Nisida to Procida, from Ischia to Montefusco, and finally to Montesarchio. Assassins and thieves were given him as companions in order to humble him, as if the virtue of the truly great man could be sullied by the presence of miscreants and cut-throats. He indignantly spurned the proposal to petition for his liberty.

The protests of the English and French diplomatists against the iniquitous state trials, which had been instituted in Naples with the sole object of condemning persons obnoxious to the king; the letters of Mr. Gladstone; the constant dread of a popular rising on behalf of the condemned political offenders, and especially of P., disturbed the mind of Ferdinand II. to such a degree that he sought some means of ridding himself of the prisoners of Montesarchio. Having failed in every attempt to force them to ask pardon, he resolved to send them to America. On the 19th January 1859, P. and 66 other prisoners, among whom were Settembrini, Spaventa, Pica, the Duke of Castromediano, Braico, Schiavoni, Argentino, Pace, Damis (all of whom became members of the Italian parliament), were conveyed to Pozzuoli, and put on board of the *Stromboli*, which immediately set sail for New York. When they reached Cadiz, P. and his companions were put on board an American vessel, the captain of which, however, was induced to land them at Cork, whence they returned, by London, to Turin. In the following year P. was elected deputy by two colleges in Tuscany, and took his seat in parliament.

When Garibaldi (q. v.) had driven out the Bourbon dynasty, P. returned to Naples. He declined the ministerial office offered to him by Cavour, and also the governorship of the southern provinces proposed to him by Constantino Nigra, but accepted the office of privy councillor. The privy council elected him its vice-president; then, being re-elected deputy, he was proclaimed vice-president of the parliament. He died in April 1867.

POET-LAUREATE. See LAUREATE.

PO'ETRY (from the Greek *poieo*, to make, or to create), according to the mere etymology of the word, signifies a creation or production of any kind; but its classical equivalent, *poiesis*, was applied by the Greeks almost exclusively to designate the artistic productions of the imagination, expressed in language. Poetry is thus not necessarily associated—as many people seem to think—with verse or rhyme. It may find expression in prose, and in point of fact has often done so, both in ancient and modern times. The Book of Ruth, for example, is decidedly poetical in substance, yet in form it is strictly prosaic. The same may be said in a still more remarkable degree of the Book of Job and the Prophetical Writings, as they appear in our English version. Jeremy Taylor, Hooker, Rousseau, Burke, Carlyle, Ruskin, Hawthorne, Emerson, and other modern prose writers, are often as richly or profoundly imaginative as poets by profession; but although the essence of poetry lies rather in the nature and adornment of the thoughts expressed than in the form of the composition, yet in general it has subjected itself to certain rules of *metre* or measure, and often also to rules of *rhyme*. The reason of this practice lies in the fact that the music so produced by the mere words is found to heighten the emotions which their meaning is calculated to produce, and thus furthers the end that the poet has in view. It is from this circumstance that the term poetry has become almost synonymous with metrical composition.

Poetical compositions are of several kinds or classes, to which particular terms are applicable; the principal are the Epic (q. v.), the Lyric (q. v.), and the Drama (q. v.). To the first of these belongs the Ballad (q. v.); to the second belong the Song (q. v.) in all its varieties, serious and comic, the Hymn (q. v.), Ode (q. v.), Anthem (q. v.), Elegy (q. v.), Sonnet (q. v.), &c.; the third embraces Tragedy and Comedy. Besides these three principal kinds, others of less consequence may be mentioned, such as Didactic Poetry (q. v.), Satirical Poetry (see SATIRE), in which, however, imaginative and ideal elements in general mingle so sparingly that the stricter kind of critics exclude them from the circle of poetry altogether. The theory of P., or Poetics (a branch of Æsthetics, q. v.), has been largely discussed in every cultivated language. Histories of the P. of the several nations are numerous: Rosenkranz and Zimmermann have given us universal histories of poetry.

POGGE (*Aspidophorus Europæus*), a fish of the family *Scleroge nidæ*, or *Mailed Cheeks*, and nearly allied to the Bullhead (q. v.), but having the body cuirassed with large bony scales from the head to the tail, so that it is in form nearly a pyramid with eight faces. The head is thicker than the body, with points and depressions, the snout furnished with short recurved spines. The P. is also known on the coasts of England as the *Armed Bullhead;* and on the coasts of Scotland by the names *Lyrie*, *Pluck*, and *Noble*. It is pretty common on the British coasts. It is seldom

more than six inches long. Notwithstanding its uncouth appearance, its flesh is good.

POGGENDORF, JOHANN-CHRISTIAN, a German physicist, was born at Hamburg, 29th December, 1796. He studied pharmacy, chemistry, and physics; and was professor of physics at Berlin from 1834 till his death. In 1838 he became a member of the Academy of Sciences. His chief discoveries were in connection with electricity and galvanism, and these are reckoned of great value; he also invented a multiplying galvanometer for measuring the calorific action of currents. From 1824 onwards he edited the *Annalen der Physik und Chimie*, contributing to this collection many important memoirs. He was one of the triad (Liebig and Wöhler being the other two) who prepared the *Dictionnaire de Chimie* (Brunswick, 1837—1851). The two works published by himself are the *Linien zu einer Geschichte der exacten Wissenschaften* (Berlin, 1853), and *Biographisch-litterarisches Wörterbuch zur Geschichte der exacten Wissenschaften* (Leip. 1858—1863, 2 vols.). P. died in January 1877.

POGO'NIAS, a genus of acanthopterous fishes, of the family *Sciænidæ*, having two dorsal fins, one of them deeply notched, and many small barbels under the mouth. The fishes of this genus are found on the coasts of warm countries; and are remarkable for the sounds which they emit, which somewhat resemble those of a drum, and have obtained for them the name of DRUMFISH. It is not known how these sounds are produced; but sailors in vessels anchored near the shore, where species of this genus abound, are often prevented from sleeping, until they have become habituated to them. Some of the species attain a large size, one hundred pounds or more, and are excellent for the table.

POI'NDING (same root as Eng. *pound*), in the law of Scotland, means the seizing and selling of a debtor's goods under process of law, or under the warrant of a *debitum fundi*, in order to pay the debt. It is either real or personal. Real poinding is the attaching of goods or movables on the land over which some real or heritable security exists. It is one mode in which heritable security is made effectual. Thus, the superior of lands can poind the ground to obtain payment of his feu duties; and the holder of a heritable bond can do the same in order to recover his debt. Personal poinding is the mode in which a decree of the court is made effectual by the messenger or bailiff seizing the movables of the debtor. They are then appraised or valued, and the messenger reports his execution to the sheriff, or other judge ordinary, who grants warrant to sell the goods by public roup after advertisements. The net amount of the sale is paid over to the creditor, or if no purchaser bid for them, they are delivered to the creditor at the appraised value. There is also another kind of poinding, called a poinding of stray cattle, which takes place whenever the cattle of a stranger trespass on lands, in which case the owner or occupier of the lands can seize them *brevi manu*, and keep them as a security until the damage done by the cattle is paid to the owner of the land. By an old Scotch statute, the owner of the cattle is bound to pay, besides the damage, half a merk for each head of cattle, and for the damage, penalty, and expense of keeping the cattle, the owner of the land can detain the cattle until payment. The poinder must, however, take care to keep the cattle in a proper place, and feed them. In England, the word poinding is not used, the corresponding term being Distraining, or Distress (q. v.).

POINT, in Heraldry, a triangular figure issuing from the dexter and sinister base of the shield. It is common in French and German heraldry, and occurs in the shield of Hanover, which was a part of the royal arms of Great Britain from the accession of George I. till that of our present sovereign. A shield charged with a point is in heraldic drawing hardly distinguishable from one parted per cheveron.



Point.

POINT-A-PITRE, a town of the French West India island Guadeloupe, capital of the division of Grande-Terre, on the Little Cul-de-Sac, 20 miles north-east of Basse-Terre. The town is well built, and has a safe and spacious harbor. It is the center of the commerce of the colony. Pop. 14,000.

POINT-BLANK. See GUNNERY. The point-blank range of a cannon varies from 200 to 300 yards.

POINT DE GALLE, a fortified town and seaport on the south-west extremity of the island of Ceylon, stands on a low rocky promontory of the same name, in lat. 6° 1′ N., long. 80° 12′ E. The harbor, formed by a small bay, the entrance to which is about a mile in width, is good, although there are numerous rocks, and a pilot is required to conduct vessels to the anchorage. Among the principal edifices, are the fort—a mile in circumference—the old Dutch church, a Roman Catholic chapel, an excellent Orphan Asylum, barracks and light-house, 103 feet above sea-level. This town has become important within recent years, and specially since the organization of the Peninsular and Oriental Steam-Navigation Company. Vessels plying between Suez and Bombay and Calcutta, Australia, China, Penang, and Singapore, call here to coal and to tranship passengers. It is the seat of government of the southern province of the colony of Ceylon. Gold and silver ornaments, workboxes, &c., are made with great taste and nicety by the native workmen. Pop. (1871) 47,954.

POINTED ARCHITECTURE. See GOTHIC ARCHITECTURE.

POINTER, a kind of dog nearly allied to the true Hounds (q. v), but not reckoned one of them. It is remarkable for its habit of *pointing* at game; its whole body, and particularly its head, indicating the position of the game to the sportsman; and a well-trained P. will remain long immovable in the attitude of pointing, not going forward to disturb the game which its exquisite power of scent has enabled it to discover. It is recorded of two pointers that they stood an hour and a quarter without



A Pointer standing at Game.

moving, whilst Mr. Gilpin painted them in the act. The P., when he scents game, stops so suddenly and completely, that even the fore-foot, already lifted, remains suspended in the air. Without the P., the sportsman would have comparatively little success in the pursuit of grouse; but the dog performs for him the laborious task of 'beating' the wide moors. Well-trained pointers will scarcely point at anything except 'game;' but inferior dogs often point at almost any living creature the odor of which affects their nostrils. The habit of pointing once acquired appears to become hereditary, so that very young pointers often exhibit it in great perfection. It has been explained, with the crouching of the Setter, as 'the natural start of surprise or interest which all dogs give when coming suddenly upon the scent or sight of their natural prey; modified by cultivation, and by transmission through many generations, each, by education, improving upon the capabilities of the former.'—See Bell's *British Quadrupeds*.

The breed of pointers now most common in Britain is believed to be crossed with the foxhound, to which there is considerable resemblance in colors as well as in form. The figure is very muscular, the hair short, the ears pendulous, the upper lips moderately large, the tail pointed and destitute of brush. Dogs of this breed are very active, and capable of long-sustained exertion. The original breed, the *Spanish P.*, probably brought to Spain from the East, is of more bulky form, less active habit, and less capability of continued exertion. The P. is very forward and familiar in its manners, but is both affectionate and intelligent, although it has a reputation of inferiority in these respects to many other kinds of dogs.

POINTS OF THE ESCUTCHEON, in Heraldry. In order to facilitate the description of a coat-of-arms, it is the practice to suppose the shield to be divided into nine points, which are known by the following names: A, the dexter chief point; B, the middle chief; C, the sinister chief; D, the collar or honor point; E, the fess point; F, the nombril or naval point; G, the dexter base point; H, the middle base point; and I, the sinister base point. The dexter and sinister sides of the shield are so called, not in relation to the eye of the spectator, but from the right and left sides of the supposed bearer of the shield.



Points of the Escutcheon.

POISON UDER, POISON IVY, POISON OAKS, POISON SUMACH, AND POISON VINE. SEE SUMACH.

POISONING, SECRET, a mode of taking away life by poisons so slow in their operation that the gradual sinking of the victims under their influence closely resembled the effects of disease or the ordinary decay of nature. It has been practised in all ages, and several undoubted and numerous supposed instances of it are mentioned by Greek and Roman writers. It was not, however, till the 17th c. that this atrocious practice became of frequent oc-

currence; but from this time it rapidly increased, spread over Western Europe like an epidemic, and became gradually a regular branch of education among those who professed a knowledge of chemistry, magic, or astrology. These persons regarded the knowledge of the mode of preparing secret poisons as of the highest importance, and many of them realized large sums by the sale of their preparations, and occasionally of the secret of their composition. It was in Italy and France that this art was chiefly practised and brought to the highest perfection; but it seems also to have prevailed in England to a considerable extent, for we find that, in the 21st year of Henry VIII.'s reign, an act was passed declaring the employment of secret poisons to be high treason, and sentencing those who were found guilty of it to be boiled to death. The only undoubted instance of this crime which appears prominently in English history is the murder of Sir Thomas Overbury (q. v.) by Viscount Rochester (the favorite minion of James VI.) and his wife, the divorced Countess of Essex; though many suppose, and with some show of probability, that James VI. himself was a victim to similar nefarious practices on the part of Villiers, Duke of Buckingham; and undoubtedly such was the popular impression at the time, for Dr. Lamb, a conjurer and quack, who was believed to have furnished Buckingham with the poisons, was seized by the angry populace in Wood Street, Cheapside, London, and beaten and stoned to death. But it was in Italy where this mode of poisoning was most prevalent. There, judging from the writings of various authors it seems to have been looked upon as a not unjustifiable proceeding to get rid of a rival or enemy by poison; and from the time of the Lombard invasion down to the 17th c., Italian history teems with instances which sufficiently show that poison was both the favorite weapon of the oppressor, and the protection or revenge of the oppressed.

The Borgias are generally singled out and held up to the horror and detestation of mankind; but as far as their poisonings are concerned, they merely employed this method of destroying their adversaries a little more frequently than their neighbors. To show the popular feeling on this subject, we may instance the case mentioned in the memoirs of Henry II., fifth Duke of Guise, of a soldier who was requested to rid the duke of Gennaro Annese, one of his opponents in Naples. *Assassination* was the mode proposed to the soldier, but he shrank with horror from the suggestion, stating at the same time that he was quite willing to *poison* Annese. It was shortly after the date of this story (1648) that secret poisoning became so frequent; and the Catholic clergy, despite the rules of the confessional, felt themselves bound to acquaint Pope Alexander VII. with the extent of the practice. On investigation it was found that young widows were extraordinarily abundant in Rome, and that most of the unhappy marriages were speedily dissolved by the sickness and death of the husband; and further inquiries resulted in the discovery of a secret society of young matrons, which met at the house of an old hag, by name Hieronyma Spara, a reputed witch and fortune-teller, who supplied those of them who wished to resent the infidelities of their husbands, with a slow poison, clear, tasteless, and limpid, and of strength sufficient to destroy life in the course of a day, week, month, or number of months, as the purchaser preferred. The ladies of Rome had been long acquainted with the 'wonderful elixir' compounded by La Spara; but they kept the secret so well, and made such effectual use of their knowledge, that it was only after several years, during which a large number of unsuspected victims had perished, and even then through a cunning artifice of the police, that the whole proceedings were brought to light.

La Spara and thirteen of her companions were hanged, a large number of the culprits were whipped half-naked through the streets of Rome, and some of the highest rank suffered fines and banishment. About half a century afterwards, the discovery was made of a similar organization at Naples, headed by an old woman of threescore and ten, named Toffania who manufactured a poison similar to that of La Spara, and sold it extensively in Naples under the name of *acquetta*, and even sent it to all parts of Italy under the name of 'Manna of St. Nicola of Bari,' giving it the same name as the renowned miraculous oil of St. Nicola, to elude discovery. This poison, now best known as the 'Acqua Tofana' or 'Acqua di Perugia,' is said by Hahnemann to have been compounded of arsenical neutral salts; while Garelli states that it was crystallized arsenic dissolved in a large quantity of water; but both agree that it produced its effect almost imperceptibly, by gradually weakening the appetite and respiratory organs. After having directly or indirectly caused the death of more than 600 persons, Toffania was at length seized, tried, and strangled in 1719. From this time the mania for secret poisoning gradually died away in Italy.

About the middle of the 17th c., this horrible practice seems to have first become prevalent in France, and under similar circumstances, the agents being married women, and their husbands the victims; and as in Italy, the extent to which the practice was carried was first made known by the clergy. The government, acting on the information thus obtained, seized and imprisoned in the Bastille two Italians named Exili and Glaser, who were suspected of having been the manufacturers and vendors of the poisons. Glaser died in prison; but Exili, becoming acquainted with another prisoner named St. Croix, communicated to him his secret, which the latter made considerable use of after his release, compounding in particular the poison known as 'succession powder,' which subsequently became so celebrated. It was the same St. Croix who played such a prominent part in the tragical history of the Marquise de Brinvilliers (q. v.).

Penautier, the treasurer of the province of Languedoc, and the Cardinal de Bonzy, were both pupils of St. Croix, and managed, the one to pave the way for his own advancement, and the other to rid himself of his numerous creditors, by the administration of poison; but the great influence of these men, and the want of direct evidence, barred all proceedings against them. Secret poisoning now became fashionable; the passions of jealousy, revenge, avarice, and even petty spite, were all satisfied in the same way, and as a necessary consequence, other offences decreased in proportion. The prisons teemed with suspected criminals, and the 'Chambre Ardente' was instituted for the special purpose of trying these offenders. In Paris, this trade was chiefly in the hands of two women named Lavoisin and Lavigoreux, who combined with the ostensible occupation of midwife that of fortune-teller, and foretold to wives the decease of their husbands, to needy heirs that of their rich relatives, taking care at the same time to be instrumental in fulfilling their own predictions. Their houses were frequented by numbers of all classes, both from Paris and the provinces, among whom were the celebrated Marshal de Luxembourg (q. v.), the Duchess de Bouillon, and the Countess de Soissons; the two former of these, however, went merely from curiosity. Lavoisin and her confederate were at last discovered, tried, and condemned, and burned alive in the Place de Grève, 22d February 1680; and from 30 to 50 of their accomplices were hanged in various cities of France. So common had this atrocious practice been, that Madame de Sévigné, in one of her letters, expresses a fear lest the term 'Frenchman' and 'poisoner' should become synonymous. For two years after the execution of the two Parisian poisoners, the crime continued to be largely committed, being fostered by the impunity with which offenders of high rank were allowed to escape; and it was not till more than 100 persons had died at the stake or on the gallows, that the government succeeded in suppressing it.

The mania for secret poisoning has not since been revived to the same extent, though isolated instances of its practice have occasionally been discovered, particularly in England, where, within the last 40 years, very extraordinary disclosures have at different times been made of the prevalence of this frightful crime among the laboring classes in several of the rural districts. For further information consult Beckmann's *History of Inventions*, the historians of the period of James I.'s reign, *the French Causes Celebres*, and Mackay's *Popular Delusions*.

POISONS. A poison is commonly defined to be a substance which, when administered in small quantity, is capable of acting deleteriously on the body; but this definition is obviously too restricted, for it would exclude numerous substances which are only poisonous when administered in large doses, as nitre, and the salts of lead, antimony, &c. A person may be as effectually poisoned by an ounce of nitre as by five grains of arsenic, and hence the quantity required to kill must not enter into the definition. Dr. Taylor suggests the following as the most comprehensive definition that can be given: 'A poison is a substance which, when taken internally, is capable of destroying life without acting medicinally on the system;' but this definition is not perfect, for it does not include poisons that act by absorption when applied to a thin and delicate membrane, as glanders, syphilitic poison, &c., or those which must be introduced directly into the circulation by a puncture or abraded surface, as the poison of insects, scorpions, and serpents, the wourali poison, and that of animals suffering from hydrophobia. Omitting, for the present, the consideration of the cases not included in Dr. Taylor's proposed definition, we may consider poisons as divisible into three classes, according to their mode of action on the system—viz., *Irritants*, *Narcotics*, and *Narcotico-Irritants*.

The *Irritants*, when taken in ordinary doses, speedily occasion intense vomiting and purging, and severe abdominal pain. They act chiefly on the stomach and intestines, which they irritate, inflame, and frequently corrode, and may thus occasion ulceration, perforation, or gangrene. Amongst those which possess corrosive properties, are the strong mineral acids, caustic alkalies, corrosive sublimate, &c.; whilst among the pure irritants which exert no destructive chemical action on the tissues with which they come in contact, may be mentioned arsenic, cantharides, carbonate of lead, &c. The *Narcotics* act specially on the brain and spinal cord. Amongst their most common symptoms are giddiness, headache, obscurity of sight or double vision, stupor, loss of

power of the voluntary muscles, convulsions, and, finally, complete coma. Moreover, many of the narcotic' poisons present special spmptoms, in some cases strongly resembling pure special diseases. Thus there is an almost exact similarity in the symptoms of poisoning by opium and apoplexy, whilst prussic acid and some other poisons give rise to symptoms closely resembling those of epilepsy. These poisons have no acrid, burning taste, nor do they usually give rise to vomiting or diarrhœa, and, excepting a slight fulness of the cerebral vessels, they leave no well-marked post-mortem appearance. They are few in number, and none of them belong to the mineral kingdom. The *Narcotico-Irritants* have, as their name implies, a mixed action. 'At variable periods,' says Dr. Taylor, 'after they have been swallowed, they give rise to vomiting and purging, like irritants, and sooner or later produce stupor, coma, paralysis, and convulsions, owing to their effect on the brain and spinal marrow. They possess the property, like irritants, of irritating and inflaming the alimentary canal. As familiar examples, we may point to nux vomica, monkshood, and poisonous mushrooms. . . . . The fact of the symptoms occurring after a meal at which some suspicious vegetables may have been eaten, coupled with the nature of the symptoms themselves, will commonly indicate the class to which the poison belongs. Some narcotic irritants have a hot, acrid taste, such as the aconite or monkshood; others an intensely bitter taste, as nux vomica and its alkaloid strychnia.'

For a notice of the most important rules to be observed by the physician in all cases of suspected poisoning, both with respect to the symptoms and the inspection of the body, we refer to any of the standard works on poisoning, or on medical jurisprudence.

Under the head of *Irritant Poisons* may be included, (1.) Mineral Acids, as sulphuric, nitric, and hydrochloric acids; vegetable acids, and other salts, as oxalic acid, binoxalate of potash, and tartaric acid (in doses of half an ounce or more); the alkalies, as pearl-ash (carbonate of potash), soap lees (carbonate of soda), ammonia and its sesquicarbonate; and metallic compounds, as white arsenic (arsenious acid), yellow arsenic (orpiment), corrosive sublimate, bicyanide of mercury, pernitrate and other salts of this metal, acetate of lead (sugar of lead) in doses of an ounce and upwards, carbonate of lead (white lead), sulphate of copper (blue vitriol), subacetate of copper (verdigris), arsenite of copper (commonly known as *Scheele's green* or *emerald green*, and much employed under the name of *extract of spinach* for coloring confectionery), tartarized antimony, chloride of antimony (butter of antimony), chloride of zinc (Sir W. Burnett's Fluid), nitrate of silver (lunar caustic), sulphate of iron (copperas or green vitriol), and bichromate of potash. (2.) Vegetable Substances, viz., colocynth and gamboge in large doses, savin, croton oil, the leaves and flowers of the common elder (*Sambucus nigra*), &c.; and (3.) Animal Substances, such as cantharides, to which must be added the occasional cases in which sausages, and certain fish and molluscs, usually quite innocuous, act as irritant poisons.

The *Narcotic Poisons* include opium, hydrocyanic (or prussic) acid, oil of bitter almonds, cyanide of potassium, henbane, especially the seeds, alcohol, ether, chloral, and chloroform; while *Narcotico-Irritant Poisons* are nux vomica, meadow saffron (*Colchicum*), white hellebore, foxglove, common hemlock, water hemlock (*Cicuta virosa*), hemlock water-dropwort (*Œnanthe crocata*), fool's parsley, thorn-apple, monkshood or wolf's bane, deadly nightshade, tobacco, Indian tobacco (*Lobelia inflata*), the bark and seeds of the common laburnum, the berries and leaves of the yew-tree, and certain kinds of fungi.

The cases in which they are antidotes qualified to neutralize chemically the action of the poison are few in number. For the *mineral acids* we must prescribe chalk or magnesia in water, with the view of neutralizing them, after which milk should be given freely. The *alkalies aad their carbonates* must be neutralized by vinegar and water, or lemon-juice mixed with water, after which milk should be given. For *oxalic acid* the antidote is chalk or magnesia in water, by which an insoluble oxalate of lime or magnesia is formed. For *arsenic*, the hydrated peroxide of iron has been regarded as an antidote, but its efficacy is doubtful. Vomiting should be excited by the administration of a scruple of sulphate of zinc in warm water, and after the stomach has been well cleared out, demulcent fluids, such as flour and water or milk should be given. *Corrosive sublimate* combines with albumen (white of egg), and forms an insoluble inert mass; *nitrate of silver* is neutralized by chloride of sodium (common salt) dissolved in water; *tartarized antimony* is to a great degree rendered inert by the administration of decoction of bark or gall-nuts; and *acetate of lead* is rendered inert by the administration of sulphate of magnesia, which converts it into an insoluble sulphate of lead. In all cases of suspected poisoning, in which the nature of the poison is not known, the safest course is at once to produce vomiting by sulphate of zinc, or in its absence by a dessert-spoonful of flour of mustard suspended in tepid water, and to continue the vomiting till all the contents of the stomach are discharged, after which milk should be given freely.

Most of the known gases—except hydrogen, nitrogen, and oxygen—have a poisonous action when inhaled into the lungs; but in these cases death, if it ensues, is popularly said to be due to *suffocation*, although strictly speaking a person who dies from the effect of carbonic acid, or sulphuretted hydrogen, or of any other noxious gas, is in reality just as much poisoned as if he had taken oxalic acid or arsenic. *Carbonic acid* (q. v.), although seldom employed as an instrument of murder, is a frequent cause of accidental death, and in France is a common means of self-destruction. It is established by numerous experiments that air containing more than *one-tenth* of its volume of carbonic acid, will, if inhaled, destroy life in man and the higher animals. In its pure state it cannot be inhaled, because its contact with the larynx causes spasmodic contraction of the glottis; but when diluted with two or more volumes of air, it can be breathed, and produces symptoms of vertigo and somnolency; and so great a loss of muscular power, that the individual, if in an erect or sitting position, falls as if struck to the ground. The respiration, which at first is difficult and stertorous, becomes suspended. The action of the heart is at first violent, but soon ceases, sensibility is lost, and the person now falls into a comatose or death-like state. Those who have been resuscitated usually feel pain in the head and general soreness of the body for some days, and in a few severe cases, paralysis of the muscles of the face has remained. As a winter seldom passes without several deaths being recorded from coal or charcoal being employed as fuel in ill-ventilated rooms (often without any kind of chimney), it is expedient that every one should know what is to be done in such an emergency. The patient must, of course, be at once removed from the poisonous atmosphere, after which artificial respiration should be had recourse to. If the skin is warm, cold water may be poured on the head and spine; while if the surface be cold, a warm bath should be employed.

When respiration is re-established, venesection will often relieve the congestion of the vessels of the brain. The inhalation of oxygen gas is said to have been of service in these cases. *Carbonic oxide*, which exists largely in coal gas, is at least as active a poison as carbonic acid, and is doubtless the principal cause of the effects produced by the inhalation of diluted gas. Both carbonic acid and carbonic oxide act as powerful narcotic poisons. *Sulphuretted hydrogen*, which occurs abundantly in foul drains, sewers, cess-pools, &c., is a gaseous poison whose effects are often noticed. Nothing certain is known of the smallest proportion of this gas required to destroy human life; but air containing only one eight-hundredth of its volume of this gas will destroy a dog; and when the gas exists in the proportion of one two-hundred-and-fiftieth, it will kill a horse. Dr. Taylor states that the men who were engaged in the construction of the Thames Tunnel suffered severely from the presence of this gas, which was probably derived from the action of the water on the iron pyrites in the clay, and which issued in sudden bursts from the walls. By respiring this atmosphere, the strongest and most robust men were in the course of a few months reduced to an extreme state of exhaustion, and several died. The symptoms with which they were first affected were giddiness, sickness, and general debility; they became emaciated, and fell into a state of low fever accompanied by delirium. In this case the dilution was extreme; when the gas is breathed in a more concentrated form, the person speedily falls, apparently lifeless. It appears to act as a narcotic poison when concentrated; but like a narcotico-irritant when much diluted with air.

The action of the vapor of *hydrosuphate of ammonia*, which is also commonly present in cesspools, is probably much the same as that of sulphuretted hydrogen. The experiments of Dr. Herbert Barker, show, however, that these matters do not produce similar symptoms on dogs (*On Malaria and Miasmata*, p. 212).

Many of the gases, which are only found as products of the laboratory, are in the highest degree poisonous, as arseniuretted hydrogen, cacodyl, &c.; but as few persons run the risk of inspiring them, it is unnecessary to enter into any details regarding it.

We now turn to the consideration of the poisons not included in the definition, which, for want of a better, we have adopted. The poisons that may affect the body by direct introduction into the circulation, through a puncture or abrasion, may be derived from the mineral, the vegetable, or the animal kingdom; but, with a few exceptions (as, for example, Wourali Poison, q. v.), the poisons derived from the mineral and vegetable kingdoms would act as efficiently if introduced into the stomach as if injected into the circulating blood; while the animal poisons act only by direct introduction into the blood, and are inert when introduced into the stomach. Poisoned wounds derived from the dissection of recently dead bodies, commonly known as *dissecting wounds*, are occasionally attended with the most alarming symptoms, and often terminate fatally. In the case of Dr. Pett, quoted by Travers in his work *On Constitutional Irritation*, the symptoms on the third day were 'a haggard and depressed countenance; violent shiverings, followed by some degree of heat; extreme alter-

ation in appearance; countenance suffused with redness; the eyes hollow and ferrety; some difficulty of breathing, which was sudden, irregular, and amounting almost to sighing; excessive torpor, and the whole aspect resembling one who had taken an overdose of opium: on the following day there was extreme exhaustion and feebleness, and death ensued on the fifth day.' The symptoms produced by the bites and stings of insects, arachnidans, and serpents, and the treatment that should be adopted, are described in the article VENOMOUS BITES AND STINGS. The poisoned wounds derived from diseased animals are sufficiently discussed in the articles GLANDERS and HYDROPHOBIA.

In point of Law, the use of poison to kill or injure a human being or certain animals, renders the poisoner amenable to the criminal courts. With regard to the sale of poisons, the legislature found it necessary to put some restrictions on one description—viz., arsenic—in order to prevent persons obtaining it with facility, and in such a manner as to avoid detection. The 14 and 15 Vic. c. 13, requires every person who sells arsenic to enter in his books the date and quantity and purpose of its use, and later acts apply this rule to other poisons. It is not to be sold to one who is unknown to the vendor unless in presence of a witness who is known, and whose place of abode is recorded in the book. The arsenic must also be mixed with soot or indigo, in the proportion of ½ oz. of soot or indigo to the lb. All the boxes, bottles, &c., must be labelled 'Poison.' Those who offend as to arsenic incur a penalty of £20; but in ordinary prescriptions, poisons may be used in the ordinary way by duly qualified medical practitioners. As to the restriction on the sale of other poisons, see CHEMIST. The offences committed by those who administer poisons to mankind are as follow: Whoever causes death by poison commits murder, for the means are immaterial if the death was caused by such means with a felonious intent. Where death is not caused, nevertheless whoever administers poison, or causes it to be administered to any person, with intent to commit murder is guilty of felony, and is liable to penal servitude for life, or for not less than three years. Moreover, whoever attempts to administer poison, or other destructive thing, to any person with intent to commit murder, is guilty of felony, and is punishable in the same way. These offences are committed whether the poison administered, or attempted to be administered, does injury or not; and it is a sufficient committing of the offence if the poison is put in such a place that a party was likely, and was intended to take it. Moreover, even though murder was not intended, but merely an intent to endanger life or inflict grievous bodily harm, still the offence is felony, and is punishable by penal servitude varying from three to ten years. There is also a similar punishment for the attempt to administer any stupefying drug.

Not only is it a crime to administer, or attempt to administer poison to human beings, but if cattle are maliciously killed by poison, the offence is felony, punishable by penal servitude of from three to fourteen years. So to kill by poison any dog, bird, beast, or other animal, ordinarily kept in a state of confinement, is an offence punishable by justices of the peace with imprisonment for six months, or a fine of £20 over and above the injury done. If any person lay poison on lands to kill game, he incurs a penalty of £10. And though tenants of farms, when entitled to kill the game on the estate, may kill hares without having taken out any game certificate, yet they are prohibited from killing such hares by poison. Moreover, by a recent act, 26 and 27 Vic. c. 113, extending to the United Kingdom, whoever sells, or offers to sell poisoned grain, seed, or meal, incurs a penalty of £10. Whoever sows, lays, or puts on ground such poisoned grain incurs a like penalty. The use of poisoned flesh is also prohibited. But the sale or use of solution, material, or ingredient for dressing, protecting, or preparing any grain or seed for agricultural use only, if used *bonâ fide*, is not interfered with.

POISSON, SIMEON-DENIS, a celebrated French geometer, was born at Pithiviers, in the dep. of Loiret, 21st June 1781; and displaying an aptitude for mathematics, he was received into the Ecole Polytechnique in 1798. The striking talent he thus early exhibited attracted the notice of Lagrange and Laplace, both of whom anticipated for him a brilliant future. In 1802, he became a professor in the Polytechnique; in 1808, a member of the Bureau des Longitudes; in 1809, Professor of Mechanics to the Faculty of Sciences; member of the Institute in 1812, &c.; and this list of distinction was crowned in 1837 by his elevation to the dignity of a peer of France. He died in 1840. P.'s whole life was devoted to the prosecution of scientific research, and the fruits of his pen number about 300 Memoirs, inserted in the publications of the Ecole Polytechnique, of the Academy of Sciences, and other scientific journals. A complete summary of these labors by P. himself is published by Arago (*Notices Biographiques*, vol. ii.). Of the separate treatises published by P., the following are the chief: *Traité de Mécanique* (2 vols. 1833); *Nouvelle Théorie de l'Action Capillaire; Théorie Mathématiqae de la Chaleur* (1835); *Mémoire sur le Mouvement des Projectiles dans l'Air, en ayant égard à la Rotation de la Terre* (1839); and lastly the celebrated work, *Sur l'Invariabilité des Moyens Mouvements des grands Axes Planétaires.*

P. is fairly considered one of the chief founders of the science of mathematical physics, which was brought by him to great perfection, especially in what concerns statical electricity and magnetism. Many other ingenious discoveries and speculations are dispersed throughout his writings.

POITIERS, earlier *Poictiers*, a corruption of the Latin *Pictavium*, so-called by the Gallic tribe, the *Pictavi*, who inhabited the district in Cæsar's time, is one of the oldest towns in France; it is the capital of the department of Vienne, and formerly of the province of Poitou. It occupies the summit and slopes of a little eminence, round the base of which flow the Clain and the Boivre, is encircled by walls and towers, and has a very dull appearance. Pop. (1881) 35,710. It is connected by railway with Tours, from which it is 63 miles distant, and Bordeaux. Before the revolution, P. had an immense number of churches, chapels, monasteries, and nunneries; even yet these are sufficiently numerous. The principal are the church of St. Jean (now converted into a *Musée*), one of the oldest Christian monuments in France; and the cathedral of St. Pierre, one of the finest in France, belonging (in part) to the 12th c., and in which, or in the older edifice that occupied its site, 23 councils were held—the first in the 4th, and the last in the 15th century. It also contains the ashes of Richard Cœur-de-Lion. Its university, founded by Charles VII. in 1431, was also abolished after 1789, but its place has been supplied by a university-academy with two faculties. P. possesses, besides, a very celebrated lyceum, and a variety of other educational institutions, a public library of 25,000 vols. and MSS., a museum, and several learned societies, of which the most distinguished is that for the cultivation of the antiquities of Western France. In and around P. are numerous Celtic and Roman remains. In the vicinity, Alaric II., the Visigoth, was defeated and slain by Clovis in 507.

Somewhere between P. and Tours a great battle took place in 732, between the Franks under Charles Martel (q. v.) and the Moors under Abd-ur-Rahmân. The Moors were routed with enormous slaughter—375,000 of them (according to one old exaggerating chronicler) being left dead on the field; later still (in 1356), at Maupertuis-le-Beauvois, about 5 miles north of P., Edward the Black Prince, with some 12,000 or 14,000 Englishmen and Gascons, beat 60,000 of the troops of King Jean of France, and took the monarch himself and one of his sons prisoners.

POITOU, a former province of Western France, is now mainly comprised in the departments of Deux Sèvres, Vendée, and Vienne. It was divided into Upper and Lower P., and had for its capital Poitiers (q. v.). P. first became a possession of the English crown when Eleanor, Countess of P. and Duchess of Aquitaine, after her divorce from Louis VII. of France in September 1151, married, on Whitsunday following, Henry of Anjou, afterwards Henry I. of England. Philippe-Auguste reconquered the province in 1204, and in 1295 it was formally ceded to France. By the peace of Bretigny, in 1360, it again reverted to England, but was soon after retaken by Charles V., who gave it to his brother, the Duke of Berri. It was subsequently incorporated with the French crown.

POI'TRINAL, or PECTORAL, in ancient armor, was the horse's breastplate, formed of metal plates riveted together as a covering for the breast and shoulders.

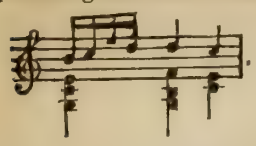
POKHU'RN, a town of India, in the Rajpoot state of Jodhpoor, 340 miles south-west of Delhi. It is situated close to a deserted town of the same name, the site of which is marked by a very conspicuous temple in an elevated situation. P. has a considerable trade and a pop. of about 15,000.

PO'LA, the most important naval station of Austria, and one of the most beautiful havens in Europe, belongs to the Markgrafate of Istria. The town occupies an eminence overlooking the Adriatic Sea, 75 miles by sea south of Trieste. The bay is thoroughly sheltered, and is spacious enough to accommodate the largest fleet. The town is surrounded by bastioned walls, is protected by numerous batteries, and is overlooked by the citadel by which it and the bay are commanded. Pop. (1880) 25,173.

P., a very ancient town, is said to have been founded by the Colchians, who were sent in pursuit of Jason. It was destroyed by Julius Cæsar, but rebuilt by Augustus at the request of his daughter Julia, on which account it was hamed *Pietas Julia*. In ancient times it had 30,000 inhabitants, and was a station of the Roman fleet. It contains numerous and interesting Roman remains, among which are a beautiful and well-preserved amphitheater, 436 feet long, and 346 broad. A temple and several ancient gates are also extant. See Allason's *Antiquities of Pola* (Lond. 1819).

POLA'CCA, or POLONAI'SE, a Polish national dance of slow movement in ¾ time. It always begins and terminates with a full bar, and a peculiar effect is produced by the position of its

cadence. the dominant seventh in the second crotchet of the bar preceding the triad on the third crotchet:



The charateristic features of the polacca are sometimes adopted in a Rondo, or other lively and brilliant composition which is then said to be written *Alla Polacca.*

POLACCA, or POLACRE, a species of vessel in use in the Mediterranean, with three masts and a jib-boom; the fore and main-masts being of one piece ('pole-masts'), and the mizen-mast with a top and top-mast. They generally carry square sails, though a few are rigged with a peculiar form of sail to which the term *polacre* is also applied. The fore and main-masts have, of course, neither tops, caps, nor cross-trees.

PO'LAND, called by the natives *Polska* (a plain), a former kingdom of Europe—renowned in medieval history, as the sole champion of Christendom against the Turks; and till recently, an object of general and profound sympathy throughout Western Europe, from its unprecedented misfortunes—was, immediately previous to its dismemberment, bounded on the N. by the Baltic Sea from Danzig to Riga, and by the Russian provinces of Riga and Pskov; on the E. by the Russian provinces of Smolensk, Tchernigov, Poltava, and Kherson; on the S, by Bessarabia, Moldavia, and the Carpathian Mountains; and on the W. by the Prussian provinces of Silesia, Brandenburg, and Pomerania. Its greatest length from north to south was 713 English miles; and from east to west, 693 miles, embracing an area of about 282,000 English square miles; an area which, in 1880, had a population of 24,000,000. This extensive tract forms part of the great central European plain, and is crossed by only one range of hills, which springs from the north side of the Carpathians, and runs north-east through the country, forming the water-shed between the Baltic and Black Sea rivers. The soil is mostly a light fertile loam, well adapted for the cereal crops, though here and there occur extensive barren tracts of sand, heath, and swamp, especially in the eastern districts. Much of the fertile land is permanent pasture, which is of the richest quality; and much is occupied with extensive forests of pine, birch, oak, &c. Rye, wheat, barley, and other cereals, hemp, wood, and its products, honey and wax, cattle, sheep, and horses, inexhaustible mines of salt, and a little silver, iron, copper, and lead, constitute the chief natural riches of the country; and for the export of the surplusage of these products, the Vistula, Dnieper, Duna, and their tributaries afford extraordinary facilities.

The kingdom of P., during the period of its greatest extent, after the accession of the grand-duchy of Lithuania in the beginning of the 15th c., was subdivided for purposes of government into about 40 palatinates or voivodies, which were mostly governed by hereditary chiefs. The people were divided into two great classes—nobles and serfs. The noble class, which was the governing and privileged class, included the higher nobles, the inferior nobles (a numerous class, corresponding to the knights, gentry, &c., of other countries), and the clergy, and numbered in all more than 200,000; the serfs were the merchants, tradesmen, and agriculturists, and were attached, not, as in other countries, to masters, but to the soil. The serfs were thus much less liable to ill-usage, and retained more of human energy and dignity than the generality of slaves. The nobles were the proprietors of the soil, and appropriated the larger portion of its products, the serfs in many cases receiving only as much as was necessary for the support of themselves and their families. The nobles were chivalrous, high-spirited, hospitable, and patriotic; the serfs, who had also a stake, though a small one, in the independence of the country, were patriotic and good-natured, but sluggish. The present population of the provinces included in the P. of former days, consists of Poles, Lithuanians, Germans, Jews, Russians, Roumanians, gipsies, &c. The Poles, who number 15,600,000, form the bulk of the population; the Lithuanians, 2,100,000 in number, inhabit the north-east of the country; the Germans, of whom there are 2,000,000, live mostly in towns and in villages apart by themselves, and bear the usual character for economy, industry, and that excessive love and admiration for the 'Fatherland,' which guided their politics during the last days of Polish independence; the Jews are very numerous, being reckoned at 2,200,000, but here they are poorer and less enterprising than in other countries; the remainder is composed of Russians (who are few in number, excepting in some of the eastern districts), Russian soldiery, Roumans, gipsies, Magyars, &c. Of Roman Catholics, there are about 9,400,000; Greeks, United and Non-united, 7,900,000; Protestants (mostly Lutherans, and Germans), 2,360,000; the rest are Jews, Armenians, Mossems, &c.

History.—The Poles are ethnologically a branch of the Slaves (q. v.). The name appears first in history as the designation of a tribe, the Polani, who dwelt between the Oder and Vistula, surrounded by the kindred tribes of the Masovii, Kujavii, Chrobates, Silesians, Obotrites, and others. In course of time, the Polani acquired an ascendancy over the other tribes, most of whom became amalgamated with the ruling race, whose name thus became the general designation. Polish historians profess to go as far back as the 4th c.; but the lists of rulers which they give are probably those of separate tribes, and not of the combined race now known as Poles. At any rate, the history of P., previous to the middle of the 9th c., is so largely adulterated with fables, as to be little trustworthy. Ziemovicz, said to be the second monarch of the Piast dynasty, is considered to be the first ruler whose history is to any extent to be relied upon; and it was not till a century after, when his descendant, Micislas I. 962—992), occupied the throne and became a convert to Christianity, that P. took rank as one of the political powers of Europe. Micislas (as was the general custom among the Polish rulers) divided his dominions among his sons; but one of them, Boleslas I. (992—1025), surnamed 'the Great,' soon re-united the separate portions, and extended his kingdom beyond the Oder, the Carpathians, and the Dniester, and sustained a successful war with the Emperor Henry II. of Germany, conquering Cracovia, Moravia, Lusatia, and Misnia. He also took part in the dissensions among the petty Russian princes. Under him, P. began to assume unity and consistency; commerce, the impartial administration of justice, and Christianity, were encouraged and promoted; and about the same time, the distinction between the nobles or warrior class (those who were able to equip a horse) and the agriculturists was distinctly drawn.

Boleslas was recognized as 'king' by the German emperors. After a period of anarchy, he was succeeded by his son, Casimir (1040—1058), whose reign, and that of his warlike son, Boleslas II. (1058—1081), though brilliant, were of little real profit to the country. The latter monarch having with his own hands murdered the Bishop of Cracow (1079), P. was laid under the papal interdict, and the people absolved from their allegiance; Boleslas accordingly fled to Hungary, but being, by order of the pope, refused shelter, he is said to have committed suicide (1081). Boleslas III. (1102—1139), an energetic monarch, annexed Pomerania, defeated the pagan Prussians, and defended Silesia against the German emperors. A division of the kingdom among his sons was productive of much internal dissension, under cover of which, Silesia was severed from P., though still nominally subject to it. Ultimately, Casimir II. (1177—1194) re-united the severed portions, with the exception of Silesia, and established on a firm footing the constitution of the country. A senate was formed from the bishops, palatines, and castellans, and the rights of the clergy and of the peasantry were accurately defined. His death was the signal for a contest among the various claimants for the throne, which was speedily followed, as usual, by a division of the country, and during this disturbance Pomerania emancipated itself from Polish rule. About the same time, the Teutonic Knights were summoned by the Duke of Masovia to aid him against the pagan Prussians; but they soon became as formidable enemies to P. as the Prussians, and conquered great part of Podlachia and Lithuania. The Mongols swept over the country in 1241, reducing it to the verge of ruin, and defeating the Poles in a great battle near Wahlstatt. From this time, P. began to decline; various districts were ceded to the markgrafs of Brandenburg, while many districts began to be colonized by Germans. Numbers of Jews, persecuted in Western Europe about this time, took refuge in Poland.

Wladislas (1305—1333), surnamed *Lokietek* (the Short), again restored unity to the country, judicial abuses and all illegally acquired privileges were abolished, and the first diet (1331) assembled for legislative purposes. In conjunction with Gedymin, Grand Duke of Lithuania, a vigorous war was carried on against the Teutonic Knights, on returning from which the aged monarch (he was now 70 years old) experienced a triumphant reception from his subjects, who hailed him as the 'father of his country.' His son, Casimir III. the Great (1333—1370), greatly increased the power and prosperity of P. by cultivating with zeal the arts of peace, amending the laws, and consolidating his territories by profitable exchanges with the neighboring powers. In the latter part of his reign, he was compelled to defend sundry new acquisitions against the Tartars, Lithuanians, and Wallachians, which he did successfully. With Casimir, the Piast dynasty became extinct, after a sway of 510 years, according to the old Polish chroniclers. His nephew, Lewis the Great, king of Hungary, succeeded him, by the will of the deceased monarch and the election of the diet; but during his reign, P. was treated merely as an appanage of Hungary. On his death without male heirs, the crown fell to Jagello (Wladislas II.), Grand Duke of Lithuania, the son-in-law of Lewis, who founded the dynasty of the *Jagellons* (q. v.) (1386—1572), and for the first time united Lithuania and P., thus doubling the extent, though not the pop-

ulation of the kingdom. However, his successor Wladislas III., was acknowledged only in P. proper, the Lithuanians preferring the rule of the younger son, Casimir. Wladislas was also chosen king of Hungary, and fell at the battle of Varna, being succeeded in P. by Casimir IV. (1444—1492), who again united it to Lithuania. Casimir recovered West Prussia from the Teutonic Knights, and compelled them to do homage to East Prussia, rewarding the inferior nobles, or warrior class, with more extensive privileges, putting them on an equality of rank with the great chiefs of the realm, and at the same time necessarily oppressing the peasantry.

Manufactures and commerce revived to a wonderful extent during his reign in the western provinces. The brief reigns of his three sons were marked only by the increased power of the two houses of the diet, which had by this time absorbed all but the symbols of supreme authority, and had converted P. from a monarchy to an oligarchy (the king possessing little power beyond what his personal influence gave him). Sigismund I. (1506—1548) surnamed the Great, the fourth son of Casimir, raised the country to the utmost pitch of prosperity. Generous and enlightened, he was beloved by the masses, whom he endeavored to benefit physically and mentally, while his firmness and justice commanded the respect of the turbulent nobles. He wisely kept aloof from the religious quarrels which distracted Western Europe, by allowing his subjects perfect freedom of choice in matters of religion; he was, however, forced into a war with Russia, in which he lost Smolensk; but he was partly compensated by obtaining lordship over Moldavia. His son, Sigismund II., Augustus, was a successor worthy of him. During his reign many abuses were rectified, and the extraordinary privileges of the higher nobles were curtailed or abolished; Lithuania was finally joined indissolubly to P., and from this time there was to be but one diet for the united realm; each retained, however, its own army, titles, treasury, and laws. Lithuania was at the same time reduced by the annexation of Podlachia, Volhynia, and the Ukraine, to Poland. Livonia was conquered from the Knights Sword-bearers (a community similar to, though much less distinguished than the Teutonic Knights); and the power, prosperity, and opulence of the state seemed to guarantee its position as the most powerful state in Eastern Europe for a long time to come. The population almost doubled itself under the two Sigismunds; but this dynasty, whose sway was so happy for P., ceased with them; and the warrior class having tasted the sweets of freedom, determined to preserve it by rendering the monarchy elective.

The election was made by the two chambers of the diet—viz., the senate or chamber of the chief nobles, and the chamber of nuncios, or representatives of the inferior nobles. He who was chosen king possessed the right of assembling the diet, but had to give a list of the subjects to be discussed; and the representatives, before setting out, were instructed as to the side they were to support. The diet only lasted six weeks, and its decisions were required to be unanimous; so that if the *liberum veto* (the right of forbidding the passing of any measure) were freely exercised even by a single member, all legislation was at a stand-still. The evil effects of these regulations were not so much felt at first, as the members were characterized by honesty and zeal for the general good; but latterly, when venality and subservience to the neighboring powers began to show themselves, all the measures necessary for protecting P. from dependence on her neighbors were, by a few corrupt and treacherous representatives, rendered of no avail. The first elective monarch was Henry of Valois (III. of France, q. v.), who, however, soon abandoned the throne for that of France, and was succeeded by Stephen Bathory (1575—1586), voivode of Transylvania, a man of energy and talent, who carried on war successfully against the Russians, who had attempted to seize Livonia, pursued them into the very heart of their own country, and compelled the czar to sue for peace; he also subdued the semi-independent Cossacks of the Ukraine, and to some degree introduced civilization among them. His successor, Sigismund III. (1586—1632), who was succeeded by his sons, Wladislas IV. (1632—1645) and John Casimir (1648—1672), was of the Vasa family, and was the crown-prince of Sweden; but his election, far from cementing a bond of union between the two countries, only embittered former dissensions.

These three Swedish monarchs were most unworthy successors to P.'s ablest king, as they had neither talents for governing nor characters and sentiments congenial to a warlike nation; on the contrary, their policy was weak, tortuous, and vacillating. Yet they were always quarrelling with their neighbors, declaring war with Russia, Sweden, or Turkey, in the most imprudent and reckless manner, and often without valid pretext. But the Polish armies, though as little fostered and cared for as the other portions of the nation, were everywhere victorious; the Swedish and Muscovite armies were successively annihilated; Moscow was taken, and the Russians reduced to such an abject condition, that they offered to make Sigismund's son, Wladislas, their czar. Sweden made a similar offer to another son of the Polish monarch; but the latter's absurd behavior lost for P. this rich result of her great victories; and the foolish policy of the whole three not only rendered fruitless all the lavish expenditure of Polish blood and treasure, but lost to the country many of her richest provinces, and left her without a single ally; while their religious bigotry commenced that reign of intolerance and mutual persecution between the various sects which was the immediate cause of P.'s downfall. To show the power of the Poles at this period, it will be sufficient to notice that Great P., Little P. (Galicia, Podolia, Ukraine, &c.), Livonia, Lithuania (including Samogitia and Black and White Russia, Polesia, and Tchernigov), Pomerelia and Ermeland, Courland, Moldavia, Bukovina, Walachia, Bessarabia, and Prussia, were either integral parts of the Polish monarchy, or were subject to it. The imprudent attempt of the Swedish sovereigns to amend the constitution only excited the suspicion of the nobles, and led to a further curtailment of royal authority. During the reign of this dynasty, Walachia and Moldavia were snatched by the Turks from under the Polish protectorate; Livonia with Riga was conquered (1605—1621), along with part of Prussia (1629), by Sweden; and Brandenburg established itself in complete independence.

The Cossacks, who had been goaded almost to madness by the atrocious oppression and religious persecution, rose in rebellion to a man, put themselves under the protection of Russia, and ever afterwards proved themselves the most inveterate enemies of the Poles. In the reign of John Casimir, P. was attacked simultaneously by Russia, Sweden, Brandenburg (the germ of the present kingdom of Prussia), the Transylvanians, and the Cossacks; the country was entirely overrun; Warsaw, Wilna, and Lemberg taken; and the king compelled to flee to Silesia. But the celebrated staff of Polish generals was not yet extinct; Czarniecki's sword was as the breath of the destroying angel to P.'s enemies; and after being defeated in detail, they were ignominiously expelled from the country. But in the subsequent treaties, Ducal or East Prussia was wholly given up to Brandenburg; almost all Livonia to Sweden; and Smolensk, Severia or Tchernigov, and the Ukraine beyond the Dnieper, were given to Russia. Michael Wisniowiecki (1668—1674), the son of one of the group of famous generals above alluded to, but himself an imbecile, was (contrary to his own wish—for he was well aware of his own deficiencies) elected as their next monarch; a war with Turkey, concluded by an ignominious peace, was the chief event of his reign. But the senate rejected the shameful treaty, the Polish army was again reinforced, the Polish monarch resigned the command to John Sobieski the Hetman (q. v.), and the Turks were routed with great slaughter at Choczim (1673). After some dissensions concerning the election of a successor, John (III., q. v.) Sobieski (1674—1696) was chosen; but his reign, though it crowned the Poles with abundance of the laurel wreaths of victory, was productive of no good to the internal administration. As Sobieski's successor, the Prince of Conti was legally elected, and proclaimed king; but the cabinet of Versailles allowed this splendid opportunity of becoming supreme in Europe to escape; and Augustus II. of Saxony, a protégé of the House of Austria, entered P. at the head of a Saxon army, and succeeded in obtaining the throne.

Augustus, unlike all his predecessors, never seemed to identify his interests with those of his Polish subjects; and though he gained their hearts by promising to reconquer for P. her lost provinces, yet this promise was chiefly made as an excuse for keeping his Saxon army in the country, in violation of the *pacta conventa* (the 'Magna Charta' of Poland). His war with the Turks restored to P. part of the Ukraine and the fortress of Kaminiec; but that with Charles XII. brought nothing but misfortune. The war with Sweden was unpopular in P.; in fact, the Poles of the eastern provinces received Charles with open arms; but his attempt to force upon them Stanislas Leszynski as their king severely wounded their national pride. Augustus returned after the battle of Poltava (q. v.); his rival retired without a contest; a close alliance was formed with Russia, and the Russian troops which had campaigned in P. against the Swedes were, along with the Saxon army, retained. The Poles demanded their extradition, but in vain; and the Russian cabinet interfered (1717) between the king and his subjects, compelling both parties to sign a treaty of peace. This was the commencement of P.'s dependence on Russia, and her consequent decline. By the instigation of Peter the Great, the Polish army was reduced from 80,000 to 18,000; and the country was further weakened by the diffusion of effeminacy, immorality, and prodigality, through the evil example and influence of the court. Religious fanaticism also more fully developed its most odious features during his reign, and the massacre of the Protestants at Thorn (1724) and the legalized exclusion of them from all public offices was the result. The succeeding reign of Augustus III. (1733—1763) was of the same character; the government fell more and more under Russian influence, and its political relations with other countries gradually ceased. Towards the end of his reign, the more enlightened of the Poles, seeing the radical defects of the constitution, the want of a strong

central government, and the dangers of the *liberum veto*, entered into a league to promote the establishment of a well-organized hereditary monarchy. But the conservative or republican party was equally strong, and relied on Russian influence; and the conflict between these parties became more embittered from the fact, that the monarchists supported the Jesuits in disqualifying all dissenters from holding public offices, while the republican party supported the dissidents.

The dissidents dated their grievances from 1717, but the great conflict between them and their opponents did not break out till 1763. The cabinets of St. Petersburg and Berlin now (1764) presented to the Poles Stanislas Poniatowski as their king. This gross insult, intensified by the incapacity of Stanislas for such an office, could not be borne in quiet; the king and the Russian ambassador were compelled in the diet to listen to the most spirited protests against Russian interference; but the intense national spirit of the Poles only recoiled upon themselves, for the Russian ambassador craftily incited them to insurrection, and kept alive their mutual dissensions. The monarchic, or Czartoryski party (so called because it was headed by a Lithuanian prince of this name) had succeeded in abolishing the *liberum veto*, and effecting many other improvements; but they at the same time more severely oppressed the dissidents; and Russia, finding that the political policy of this party was speedily releasing P. from her grasp, joined the party of the dissidents as the champion of religious toleration! Her ambassador caused the chief leaders of the Catholic party to be secretly kidnapped, and sent to Siberia, and compelled the republicans to accept the protectorate of Russia. The 'Confederation of Bar' (so called from Bar in Podolia) was now formed by a few zealous patriots, an army was assembled, and war declared against Russia. The confederates were supported by Turkey, which also declared war against the czarina; and Russia, alarmed at the appearance of affairs, proposed to the king and diet an alliance, which both firmly refused. Frederic the Great of Prussia, who had formerly gained the consent of Austria to a partition of P., now, in 1770, made the same proposal to Russia, and in 1772, the *first partition* was effected; Stanislas and his diet claiming the mediation and assistance of the other powers of Europe without effect. He was forced in the following year to convoke a diet for the purpose of recognizing the claims of the three partitioning powers to the territories they had seized, but few members appeared, and these preserved perfect silence.

The territories seized by the three powers were as follows:

	Eng. sq. Miles.	Pop.
Russia	42,000	1,800,000
Prussia	13,000	416,000
Austria	27,000	2,700,000

The whole country was now aroused to a full sense of its danger; and the diet of the diminished kingdom labored to amend the constitution and strengthen the administration by a liberal code of laws and regulations, which gave political rights to the cities, civil rights to the peasantry, and rendered the kingly authority hereditary. In this they were encouraged by Prussia, whose king, Frederick William, swore to defend them against Russia; but in 1791, Catharine II., after great labor, obtained, by means of intrigues and bribery, the services of *five* (out of 200,000) of the Polish nobility, who protested against the new constitution which had just (May 3, 1791) been established, and drew up a document at Targowitz (q. v.), which they forwarded to the Russian court. Catharine, thus armed with a pretext for interference, advanced her army, and Prussia proving traitorous, a second fruitless resistance to the united Prussians and Russians, headed by Joseph Poniatowski (q. v.) and Kosciusko (q. v.), was followed by a *second partition* (1793) between Russia and Prussia, as follows:

	Eng. sq. Miles.	Pop.
Russia	96,000	3,000,000
Prussia	22,000	1,100,000

which the diet were forced to sanction at the point of the bayonet. The Poles now became desperate; a general rising took place (1794); the Prussians were compelled te retreat to their own country, and the Russians several times routed; but then a new enemy appeared on the scene. Austria was chagrined at having taken no part in the second partition, and was determined not to be behindhand on this occasion; her army accordingly advanced, compelling the Poles to retreat; and fresh hordes of Russians arriving, Kosciusko, at the head of the last patriot army, was defeated; and the sack of Praga, followed by the capture of Warsaw, finally annihilated the Polish monarchy.

The *third and last partition* (1795) distributed the remainder of the country as follows:

	Eng. sq. Miles.	Pop.
Russia	43,000	1,200,000
Prussia	21,000	1,000,000
Austria	18,000	1,000,000

King Stanislas resigned his crown, and died broken-hearted at St. Petersburg in 1798. The subsequent success of the French against the Russians, and the tempting promises of the Emperor Napoleon to reconstitute P., rallied round him a faithful army of patriots, who distinguished themselves in the campaigns of the French against Russia and Austria; but all that Napoleon accomplished in fulfilment of his promise was the establishment, by the treaty of Tilsit (1807), of the *Duchy of Warsaw*, chiefly out of the Prussian share of P., with a liberal constitution, and the Elector of Saxony at its head. The duchy was an energetic little state, and under the guidance of Prince Joseph Poniatowski, wrenched Western Galicia from Austria (1809), at the same time furnishing a numerous and much-valued contingent to the French armies; but the advance of the grand allied army in 1813 put an end to its existence. After the cessions by Austria in 1809, the duchy contained 58,290 English square miles, with a population of about 4,000,000. Danzig was also declared a republic, but returned to Prussia (February 3, 1814).

The division of P. was re-arranged by the Congress of Vienna in 1815, the original shares of Prussia and Austria were diminished, and that part of the duchy of Warsaw, which was not restored to Prussia and Austria, was united as the *kingdom of P.* (see next article) to the Russian empire, but merely by the bond of a personal union (the same monarch being the sovereign of each), the two states being wholly independent of and unconnected with each other; and the other parts of P. were completely incorporated with the kingdoms which had seized them. The partition of P., as thus finally arranged, was as follows:

	Extent in Eng. sq. Miles.	Pop. [in 1859].	Present Political Divisions.
Russia	220,500	16,000,000	Provinces of Courland, Witebsk, Kovno, Vilna, Grodno, Minsk, Mohilev, Volhynia, Kiev, Podolia; and the *Kingdom of Poland* [q. v.].
Prussia	26,000	3,000,000	Posen, most of W. Prussia, and several districts in E. Prussia.
Austria	35,500	5,000,000	Galicia, Bukovina, Zips, &c.

while, as if in mockery of its spirit of independence, the town of Cracow, with a small surrounding territory, was declared free and independent, under the guardianship of Austria. The czar at first gave a liberal constitution, including biennial diets, a responsible ministry, an independent judiciary, a separate standing army, and liberty of the press; and he seemed to take pride in his title of king of P.; but his brother Constantine, having been appointed military governor, speedily put an end to the harmony between the czar and the Poles, and drove the latter into insurrection. Their discontent at first found vent in secret societies; but on November 30, 1830, Constantine and his Russians were driven out of Warsaw, and a general insurrection of the people, headed by the aristocracy, took place. Prince Czartoryski was appointed president of the provisional government, and military leaders, as Radzivil, Dembinski, Bem, &c., were soon found; but a general want of energy in the administration, dilatoriness on the part of the military leaders, and the checking of the spread of the insurrection till fruitless negotiations had been entered into with Nicholas, were errors fatal to the success of the Poles.

From January 1831 till September 8th of the same year, a series of bloody conflicts were fought, in which the Prussians and Austrians, with pitiable subservience, aided the czar. At first, the Poles were successful; but the taking of the capital by Paskevitch (q. v.) soon ended the war, which was followed, as a matter of course, by imprisonment, banishment, confiscation, and enforced service in the Russian army. From this time, the independence of P. was suppressed, and in 1832 it was declared to be an integral part of the Russian empire, with a separate administration headed by a viceroy of the czar's choosing; the constitution and laws were abrogated; strict censorship of the press and the Russian spy police-system established in all its vigor; the country was robbed of its rich literary collections and works of art; and the most severe and arbitrary measures taken to Russianize the people.

The outbreaks of 1833 and 1846 were punished by the gallows. Simultaneous disturbances (1846) in the Prussian and Austrian portions of P. were summarily suppressed; their leaders in Prussia were imprisoned, and only saved from death by the revolution of March 1848 at Berlin; and those in Austria were butchered by the peasantry, who preferred the Austrian to a national government. On the 6th of November 1846 the republic of Cracow was incorporated with Austria. After the accession of the Czar Alexander II. in 1855, the condition of the Poles was considerably ameliorated; an act of amnesty brought back many of the expatriated Poles, and various other reforms were hoped for, when, in 1861, another insurrection broke out. Its origin is curious, and gives a thorough insight into the relations between the Poles and their Russian rulers.

A large multitude (30,000) had assembled in the neighborhood of the battle-field of Grochow (where two battles had been fought

in the spring of 1831), to pray for the souls of those who had fallen; they were engaged in prayer and in singing religious chants, when they were charged by the Russian cavalry and gens d'armes, several of them killed, and numerous arrests made. This event excited intense national feeling throughout the country, and other national demonstrations, attended with similar massacres on the part of the Russians, produced such an intense dislike to the latter, that most of the Poles in the Russian service either resigned or deserted. The Russians immediately had recourse to the most severely repressive measures, forbidding all assemblages even in the churches, punishing those who appeared to mourn the death of relatives killed in the previous massacres, or who wore garments of certain shapes or colors. The application of the Polish nation to the czar (February 28) for the re-establishment of the Polish nationality, was rejected, but certain necessary reforms were promised. These reforms were on the whole very liberal, and tended greatly to allay the general excitement; but the Russian government was very naturally not trusted by the Poles, and new disturbances broke out in October of the same year. P. was then declared in a state of siege, and General Luders appointed military commandant under the Grand Duke Constantine, the nephew of the Grand Duke Constantine above mentioned. The country continued in a state of commotion without any very decided outbreak; attempts were made to assassinate the Grand Duke and the other Russian officials; and on January 13, 1863, Lithuania and Volhynia were also put in a state of siege.

The Committee of the National Insurrection issued its first proclamation in February 1863; and a week afterwards, Mieroslavski raised the standard of insurrection in the north-west, on the Posen frontier. The Insurrection Committee continued to guide the revolt by issuing proclamations from time to time; and many districts of Augustovo, Radom, Lublin, Volhynia, and Lithuania, were speedily in insurrection. It was a mere guerrilla war, and no great or decisive conflicts took place; but the sympathy of Europe was largely enlisted on behalf of the Poles. Remonstrances from Spain, Sweden, Austria, France, and Britain conjointly and repeatedly, Italy, the Low Countries, Denmark, and Portugal, were wholly disregarded by the czar's ministers, and mutual reprisals continued; incendiarism and murder reigned rampant; the wealthier Poles were ruined by fines and confiscations; and the whole populations of villages were put to the sword by the Russians; while murders and assassinations marked the reign of terror of the National Committee. At last, with the officious assistance of Prussia, and the secret sympathy and support of Austria, the czar's troops succeeded in trampling out (1864) the last embers of insurrection. Great numbers of men, women, and even children, concerned in, or supposed to have favored the revolt, were executed; crowds were transported to Siberia; and these vigorous measures seem to have restored 'tranquillity, but it is the tranquillity of the desert.' Contemporary with this last outbreak, symptoms of similar disaffection were distinctly noticeable in Prussian P., but a strong force of soldiery in the border districts towards Russia, prevented any outbreak. It deserves to be noticed, that with the exception of the single revolt of 1846 (which perished almost of itself), no rebellion has ever taken place in the portion of P. belonging to Austria.

POLAND, Kingdom of, a province of European Russia, which was united to that empire in 1815—though the title of kingdom was left, and a peculiar form of government long continued to distinguish it from the other provinces—is surrounded by Prussia, Austria, and Western Russia or Russian Poland, and contains 48,863 English square miles, with a population (1880) of 7,104,760. In 1867, there were 4,326,473 Roman Catholics, 783.079 Jews, 331,233 Protestants (Lutherans and Reformed), and 259,192 Greek Church (mostly united). The surface of the country is in general very level, with now and then a hill, or rather undulation, which relieves the uniformity of the scene. In Radom, however, there is a range of hills, some peaks of which attain a height of 2000 feet above sea-level. The chief river of P. is the Vistula, which enters the country by its southern boundary, and flows first north and then north-west, making its exit near Thorne; two of its tributaries, the Wieprz and the Pilicia, belong wholly, and a third, the Bug, partially to Poland. The Warta, one of the tributaries of the Oder, drains the west, and the Niemen, the north-east districts. The Vistula and the Niemen are wholly navigable in P.; and the Bug, Narew, and Warta are so for a considerable portion of their course. By these means of communication, the exports of the country are collected at Danzig, Stettin, Memel, and Tilsit, on the Baltic, and the imports introduced into the country. The climate is severe, the summers being very hot, and the winters excessively cold. The soil very much resembles that of the other parts of the former kingdom of Poland, producing magnificent crops of wheat, rye, barley, oats, and buckwheat, the usual leguminous plants, hemp, tobacco, flax, and orchard-fruits. Upwards of 13,000 square miles are covered with forests, and fully 8000 square miles are waste.

Since 1867, Poland is divided for administrative purposes into 10 governments—viz.:

Governments.	Eng. sq. Miles.	Pop. in 1873.
Kaliscz	4197	687,371
Kielce	3621	536,146
Lomza	4400	495,105
Lublin	6260	734.018
Piotrkov	4484	682,495
Plock	3995	490.143
Radom	4755	546.945
Siedlce	5295	550,103
Ssuwalki	4650	542,750
Warsaw	5433	1,090,973
Total	47,090	6,356,049

The population is about 128 to the square mile, being more than three times as dense as that of the rest of European Russia. A large proportion of the country population employ themselves in the rearing and breeding of horses, cattle, and pigs; sheep are not so common; but swarms of bees abound, and there is a large export trade in honey. The population of the town is largely employed in wool-spinning and the manufacture of woollen cloth, cotton and linen spinning and weaving, the production of liqueurs, oil, vinegar, glass and earthenware, paper, beer and porter, &c. The most of the commerce is in the hands of the Jews. P., which had a separate government till 1864, was in that year deprived of the last remnant of its administrative independence. After the suppression of the revolt (see preceding article), the country was placed under eight military governors; in 1867, the administration was committed to a commission sitting at St. Petersburg; and by an ukase, dated February 23, 1868, the government of P. was absolutely incorporated with that of Russia. The total value of Polish industries in 1873 was £12,000,000, a very large sum, considering that the population is chiefly agricultural. In the same year the commerce of P. reached £25,683,-874. The Warsaw daily press has an issue of 24,000 copies; and there are 31 scientific and literary periodicals. Besides, newspapers are published in the other principal towns.

POLAR CIRCLE, or ARCTIC CIRCLE. See Arctic.

POLAR EXPEDITIONS. Under this head are classed all those voyages of discovery which have been made towards the north and south poles, and to the regions within the Arctic and Antarctic Circles. The north polar regions present a much greater land-surface than those around the south pole, and on this account possess a higher temperature, and offer a more valuable field for discovery, for which reasons, as well as by reason of their greater proximity, polar expeditions have been far more frequently directed to the north than to the south.

Arctic Expeditions.—Polar expeditions were commenced with a view to discover a shorter route to the golden realms of the East; but the first attempts were made by coasting along the north of Europe and America. See North-east and North-west Passages. It was not till 1603 that the first arctic exploring expedition, consisting of one vessel, the *Godspeed*, commanded by Stephen Bennett, started for a voyage of northern discovery; and this, as well as the succeeding expeditions of Bennett, were devoted to morse-hunting rather than to geographical investigation. In 1607, Henry Hudson (q. v.) was sent out by the Muscovy Company to penetrate to the north pole, but he was stopped about the north of Spitzbergen (in lat. 81° 30′) by the ice. The succeeding voyages of Jonas Poole in 1610, 1611, and 1612, and of Baffin in 1613, were not primarily voyages of discovery, and they added nothing to the previous knowledge of the polar regions; but in the expedition of Fotherby and Baffin up Davis' Strait, in the following year, the latter discovered a northern outlet to the bay called by his own name, which was denominated Smith's Sound. Fotherby was sent out again in 1615, and attempted to pass through the sea which lies between Greenland and Spitzbergen, but was again baffled, and compelled to return, after correcting some erroneous observations of Hudson. These seven expeditions were all sent out by the Muscovy Company; and the cargoes of seal-skins, oil, teeth, &c., which they brought back helped to defray the expense of their outfit.

For the next century and a half, the attempts to reach the north pole were not resumed; but the extraordinary zeal in the cause of naval discovery which sprung up in the beginning of George III.'s reign, produced two renewed efforts. The first of these was made in the spring of 1773 by an expedition, consisting of two vessels, under Captain John Phipps (afterwards Lord Mulgrave), and fitted out by the Admiralty purely for scientific purposes. Phipps sailed along the shore of Spitzbergen till he was stopped

by the ice at Cloven Cliff; he then coasted backwards and forwards along the ice-field for nearly a month, trying the various narrow openings, some of which were two leagues in depth, till he found one which took him into open water. By a sudden change in the climate, he was frozen in, and only extricated his ships after severe labor. The highest point to which he reached was lat. 80° 48′ N., less by 49 miles than the most northerly latitude attained by Hudson; and though he had a more than usual amount of difficulties to encounter, yet his failure, along with that of Captain Cook, who attempted to reach the pole by Behring's Strait, but only penetrated to lat. 70° 45′ N., greatly disheartened other explorers. The offer of £5000 by the British parliament to the crew that should penetrate to within 1° of the pole, awaked no competition; but in 1806, Mr. Scoresby, then mate of a Greenland whaler from Hull, reach a point directly north of Spitzbergen, in lat. 81° 30′ N., and therefore only about 510 geographical miles from the pole. In following expeditions, the same enterprising navigator made many geographical explorations of Jan Mayen's land and the east coast of Greenland, largely adding to our knowledge of the character and products of the arctic regions.

The subsequent expeditions of Buchan and Franklin in 1818, of Clavering in 1823, of Graab (Danish) in 1828, of De Blosseville (French) in 1833, may be considered as failures, as far as geographical discovery is concerned; for, omitting the French expedition, the fate of which is still involved in mystery, none of them reached so high latitudes as the previous English expeditions. After the failure of Buchan and Franklin's expedition, the impossibility of ever reaching the pole was generally accepted in this country as fact; but Mr. Scoresby, in a Memoir which he communicated to the Wernerian Society, endeavored to prove that this supposed impossibility was by no means such; in fact, that a journey to the pole could be made without any enormous amount either of difficulty or danger. The principal obstacle to be encountered being the alternation of ice-fields and water, which prevented all advance either by ships or sledges, Mr. Scoresby proposed the use of a vehicle which could be used either as a sledge or boat, and recommended a team of dogs to draw it, they being lighter (for conveyance by water, and for traveling over thin ice) and more tractable than reindeer. After some time, this suggestion began to receive a considerable share of attention, and Captain Parry (celebrated for his discoveries in the polar seas north of America) was put in command of an expedition fitted out in accordance with Scoresby's plans. He sailed from England in the *Hecla*, on March 27, 1827; but it was the 22d of June before the exploring party quitted the ship, which was left on the north shore of Spitzbergen, in charge of a small crew, and betook themselves to the boats; and in spite of the advanced season of the year, they in the first two days advanced to 81° 13′. Here they began to encounter many difficulties; the ice-fields were small, and near each other, necessitating a constant conversion of the vehicle from a sledge to a boat, which could not be effected without unloading it, an operation which consumed much time.

This hardship, however, was endurable; but, to Parry's intense chagrin, he discovered, about the 22d of July, that the ice over which they were traveling was moving southward as rapidly as they were advancing north, so that on the 24th, after having traveled apparently 22 miles in the three previous days, they found themselves in the same latitude as on the 21st. Under these circumstances, Parry resolved to return, which he accordingly did, reaching his ship on the 21st of August. The highest point reached by him was 82° 40′. A new land, about 200 miles north of Nova Zembla, to which the name Franz Joseph Land has been assigned, was discovered by the Austro-Hungarian Polar Expedition of 1872—1874, under Lieutenants Weyprecht and Payer. Its south coast lies about the 80th parallel, and it was explored, by means of sledges, up to 82° 5′ N., while the land was seen extending as far as 83° N. In 1854, two American explorers passed through Smith's Sound, and reached Cape Constitution in 82° 27′ N. lat., and saw, as they thought, a boundless open polar sea. The *Polaris* sailed in July 1871 from New London, U. S., and reached 82° 16′ N. The supposed polar sea being a sound entering Kennedy Channel, gave hopes of reaching the Pole through Smith's Sound. An English Arctic Expedition under Captain Nares sailed in 1875, and, through Smith's Sound, reached the highest latitude ever attained, 83° 20′. Unable to penetrate further, it returned in 1876. See N.E. and N.W. PASSAGES.

Antarctic Expeditions.—The attempts to penetrate to the south pole are of a very recent date, mainly because a knowledge of the southern polar regions is only valuable to Europeans from a scientific point of view. Cook and Furneaux are the first navigators who are known to have crossed the Antarctic Circle, but the former penetrated only to lat. 71° 10′ S. and neither made any discoveries of importance.

Bellinghausen, a Russian navigator, reached lat. 70′ S. in 1819, and two years after, discovered Alexander's Land and Peter's Land, then the most southerly islands known. In 1823, Captain Weddell reached lat. 74° 15′ S., long. 34° 16′ W., and saw beyond him an open sea to the south, but made no important additions to our geographical knowledge. In 1831, Captain John Biscoe discovered Enderby Land; and in 1839, the sealing-schooner, *Eliza Scott*, from New Zealand, discovered Sabrina Land (q. v.); and in the same year, the United States' expedition, under Captain Wilkes, set out on a career of exploration, which resulted in the discovery (January 1840) of what he with reason supposed to be a continuous coast-line, though an ice-line of from 8 to 12 miles in width prevented him from establishing its continuity beyond dispute. The (supposed continental) coast stretched from Ringold's Knoll on the east, to Enderby Land on the west, and was distinguished by the absence of currents to disturb the ice-barrier, and by a much less precipitous character than belongs to islands. In 1840, a French expedition, under D'Urville, discovered a line of coast lying directly south from Victoria (Australia) on the Antarctic Circle. But the most important discoveries of all were achieved by Captain (afterwards Sir James) Clarke Ross, who made three several voyages in 1841—1843, discovering Victoria Land (q. v.), and tracing its coast from lat. 71° to lat. 78° 10′ (the highest southern latitude ever attained). In his third voyage, Ross proved that the lands discovered by D'Urville were islands of inconsiderable magnitude; and his antarctic expedition has besides supplied much important information to the students of natural history, geology, and above all of Magnetism (q. v.). Ross's geographical discoveries have since been confirmed; but a large extent of surface within the Antarctic Circle still remains unexplored.

POLARIZA'TION OF LIGHT. A ray of light from the sun or a lamp, which has not been reflected or refracted in its course to the eye, possesses no properties by which one *side* of it can be distinguished from another; if, for instance, it be divided into two by a colorless doubly-refracting crystal, such as Iceland spar, these two rays will be of apparently equal intensity in whatever position the crystal be placed (REFRACTION, DOUBLE). But if the ray has been reflected from a surface of glass or water, it is found that in general the intensities of the two rays into which it is divided by the doubly-refracting crystal are not only unequal, but dependent upon the position of the crystal with reference to the plane in which the light was previously refracted or reflected. This is a conclusive proof that the light has undergone some change by reflection or refraction, so that it is no longer the same all round, but possesses *sides* (in the language of Newton), or (in modern phraseology) is *polarized*. Perhaps the most complete illustration of this very important fact is to be found by using two doubly-refracting bodies—two small crystals of Iceland spar, for instance—and pasting on a side of one of them a slip of paper with a pin-hole in it. On looking through this crystal, the covered side being turned towards a bright body, we see two images of the pin-hole, *equally* bright. Look at these through the second crystal, each is in general doubled; we see four images of the pin-hole, but these are generally *unequal* in brightness; and by turning either of the crystals round the line of sight as an axis, we find that there are positions, at right angles to each other, in which only *two* images are visible. If we turn further, the lost images appear faint at first, and gradually becoming brighter, while the others become fainter in proportion; till, when we have completed a quarter of a revolution, the new images alone remain, the others having disappeared. From this it follows that each of the rays into which a single beam of light is decomposed by double refraction possesses *sides*, or is polarized; and to such an extent as to be incapable of being again doubly refracted in certain positions of the second crystal.

By taking advantage of the difference of the refractive indices (REFRACTION) of the two rays produced by Iceland spar, and the close agreement of one of them with that of Canada balsam, Nicol constructed his 'prism,' which is one of the most useful pieces of polarizing apparatus. It consists of two pieces of Iceland spar cemented with Canada balsam, and *allows only one of the two rays produced by double refraction to pass through*. When we look at a flame through two Nicol's prisms in succession, we find that the amount of light transmitted depends on their relative position. If they are *similarly* placed, we have the maximum amount—viz., half the incident light; if they are *crossed*, that is, if one be made to rotate through a right angle from the position last mentioned, *no* light, not even the most powerful sunlight, can pass through the transparent combination. There are certain doubly-refracting bodies, such as tourmaline, iodosulphate of quinine, &c., which by absorption stifle one of the two rays into which they divide a beam of light; and which act therefore precisely as Nicol's prism does. But they have the great disadvantage of *coloring* the transmitted light very strongly; and this renders them unfit for the study of the gorgeous phenomena of color (perhaps the grandest displays in optics) which are produced by polarized light. But for the verification of the facts to

which we now proceed, a tourmaline or a Nicol's prism will do equally well, and will be called the analyzer. And first as to the reflection of light, a cause of polarization first detected by Malus.

If we examine by the analyzer light reflected from water, unsilvered glass, polished or varnished wood, jet, &c., we find that it is more or less completely polarized; but that there is a particular angle for each substance, at which if light be reflected (see REFLECTION) from its surface it is completely polarized; that is, can be completely stopped by the analyzer in certain positions, just as a ray which has passed through a Nicol's prism. It was discovered by Brewster that this angle, called the *polarizing angle*, has its tangent equal to the index of refraction of the reflecting body: or, in another form, the reflected light from a surface of glass, water, &c., is completely polarized when its direction is perpendicular to that of the corresponding refracted ray. The light reflected from the second surface of a glass plate is also completely polarized at the same angle; and one of the most useful polarizers which can be made is a pile of thin glass plates, from the surfaces of which light is reflected at the proper angle, which is for ordinary window-glass about 54°. The light which passes through the glass plates is partially polarized, and its polarization is more nearly complete the greater the number of plates employed. And it appears that these rays are polarized in planes perpendicular to each other—i. e., that the analyzer which extinguishes the reflected ray has to be turned through 90° to extinguish the refracted ray.

In order that we may arrive at some ideas as to the nature of polarization, we must consider on the basis of the Undulatory Theory of Light (q. v.) *how* a ray of light can have sides. If we take, for a comparison, waves of sound, as we know that in them (SOUND) the particles of air move back and forward in the line in which the sound travels, we see that a beam of sound cannot possibly have sides, since the motions of the particles of air in it are precisely the same from whatever side we consider them. Next take waves in water, where we see the water rising and falling as the undulation (*not* the water) travels uniformly onward in a horizontal direction; and this at once gives the required analogy.

So far as phenomena of Interference (q. v.; see also DIFFRACTION) are concerned, waves, whether in air or in water, present them, so that they merely show us that light depends on undulations, but not the kind of undulation. But when, from the facts of polarization, we find that a ray of light can have sides, we see that the vibrations of the luminiferous medium must be *transverse to the direction of the ray*. Common light, then, consists of vibrations which take place indifferently and in succession in all directions transverse to that of the ray; while light which is completely polarized has its vibrations limited to a *particular* transverse direction. A Nicol's prism allows no light to pass through it except that which vibrates in a particular transverse direction, depending upon the position of the axes of the pieces of Iceland spar of which it is made. Light which has passed through one Nicol's prism is sifted so as to contain none but such transverse vibrations, and will of course pass freely through a second prism, or be completely or partially stopped by it; according as the two prisms are similarly situated, or turned so that the directions of the vibrations they can transmit are inclined at right angles, or any other angle.

It is not yet settled what the direction of these vibrations is in any particular case; whether they take place *in*, or *perpendicular to*, the plane of polarization; and the point is extremely important in the theory of the subject, though not to the explanation of the ordinary experimental results. To explain the nature of this difficulty, we merely mention the simple case of polarization by reflection on a glass plate. Do the vibrations of the reflected ray take place *perpendicular to* the plane of reflection (i. e., parallel to the reflecting surface), or do they take place *in* the plane of reflection? Some high authorities are in favor of the latter hypothesis, but the general opinion of scientific men at present unquestionably leans to the former. Many delicate experiments have been made to decide the question, but their results have been irreconcilable with each other.

From the results which we have just arrived at, it is evident that the oscillations, or vibrations of the luminiferous medium, of which light consists, are similar to those of the bob of a Pendulum (q. v.), the ray in this case being supposed to proceed vertically downwards. Polarized light consists of vibrations analogous to those of the ordinary pendulum, backward and forward in a line. But we have seen that any motion of the pendulum may be compounded of two such motions in planes perpendicular to each other. This is analogous to the decomposition of common light by a doubly-refracting crystal into two rays polarized at right angles. But we find in nature, and can produce artificially, motions of the luminiferous medium resembling exactly the elliptic, and circular, motions of the (conical) pendulum. They occur in nature in all cases of reflection from metallic surfaces, and also from the surfaces of highly refractive bodies, such as diamond, &c. The easiest artificial method of procuring them is to allow polarized light to pass through a thin plate of a doubly-refracting crystal, such as a film of mica. Thus, if OA be the direction of vibration of the polarized light, the ray moving perpendicularly to the paper, O*a*, O*b*, the directions (at right angles to each other) of vibration of the two rays into which it is divided by the mica, we have only to let fall from A perpendiculars on O*a* and O*b* to determine the extent of the resolved vibrations in these directions. Now if the two rays moved equally rapidly through the mica, they would simply recombine on leaving it into a single plane polarized ray, whose vibrations would be represented by OA as before. But, in general, one of the rays is retarded more than the other, and the combination of two such oscillations is seen by geometrical considerations to give an ellipse whose center is at O, and which touches each side of the rectangle of which A*a* and A*b* are half sides. The limiting forms of these ellipses are, of course, the diagonals of the rectangle; so that there are two cases for the light remaining plane polarized after passing through the mica, for an infinite number in which it will be elliptically polarized. Also the difference of retardation of the two rays may be such as to correspond to a description of these ellipses either right-handedly or the opposite.



Fig. 1.

In particular cases the ellipse may be a circle; then it is obvious that the rectangle must become a square, that the directions of vibration of the two rays in the mica must be equally inclined to that of the original polarized ray, and that one ray must be retarded an odd number of quarter oscillations more than the other. If it be 1, 5, 9, &c., quarter oscillations, the rotation is in one direction; if 3, 7, 11, &c., it is in the opposite. Circularly polarized light cannot be distinguished by the eye, even with the help of a Nicol's prism, from common light; but by the interposition of a thin plate of a double-refractory crystal, phenomena are produced which common light cannot give. Before we leave this part of the subject, it may be remarked that the composition of two equal and opposite circular vibrations produces a plane vibration, whose plane depends upon the simultaneous positions of the revolving bodies in their circular orbits. Hence a plane polarized ray may always be considered as made up of two circularly polarized rays, and if these pass through a medium which retards one more than the other, the plane of polarization of their resultant, when they leave the medium, will in general not be the same as that of the incident ray. In other words, the plane of polarization will have been caused to rotate through a certain angle, which will be proportional to the difference of retardation of its circular components. This is the explanation of what Biot called *Rotatory Polarization* in quartz, turpentine, sugar, &c., and of the rotation of the plane of polarization discovered by Faraday when a polarized ray passes through a transparent body under the action of a magnet.

In the first of these cases the retardation is due to molecular heterogeneity; in the second, it depends upon molecular motions produced by the magnet. The effect is greater in each case the more refrangible the rays; and therefore, when the light which has passed through the medium is examined with an analyzer, the successive colors of the spectrum are cut off each at a different angle, and the observed tint is that compounded of those which remain. The Saccharometer (q. v.), for the determination of sugar in a liquid, is an application of the first case; the second has not as yet been applied to any practical purpose, but it has given most valuable information as to the ultimate nature of magnetism.

When polarized light passes through a slice of any uniaxal double-refracting crystal, nearly in the direction of its axis, it is obvious that the difference of retardation of the two rays into which it is divided will depend only upon (1) their refrangibility and (2) their inclination to the axis of the crystal. Hence, if we suppose the light to be homogeneous, the effects of interference, and subsequent application of the analyzer, must be to produce appearances of bright and dark spaces, symmetrically disposed round the axis; that is, a series of concentric circular rings. The superposition of the separate sets of rings, for each color of the spectrum, produces the appearance actually observed; a series of colored rings, like those known as Newton's Rings, due to Interference (q. v.). Besides these, however, there is a dark or bright cross, consisting of two black or white bands, intersecting each other in the common center of the rings. The dark bands are due to the absolute stoppage by polarizer or analyzer, when placed in positions 90° from symmetry, of all light whose vibrations are executed in the principal planes of the polarizer and analyzer. A similar explanation applies to any other case. The system of colored rings thus produced is one of the most splendid results of

optical combinations yet produced; and may be seen by any one by the help of such simple apparatus as two fragments of window-glass and a piece of clear ice from the surface of a pond. In undisturbed freezing, the axis of the ice crystal is perpendicular to the surface of the water, and the cake of ice is therefore, as it were, cut for our purpose. If light be reflected at an angle of about 54° from the first piece of glass, pass perpendicularly



Fig. 2.—Uniaxal Crystal; Black Cross.



Fig. 3.—Uniaxal Crystal; White Cross.

through the ice, and be again reflected (at 54°) from the second piece of glass, the phenomena above described, and rudely represented in the annexed cuts, will be at once seen, the appearances varying with the relative position of the planes in which the reflections take place from the pieces of glass. If these planes be at right angles to each other, we have the black cross as in the first figure; if parallel, the white cross as in the second.

If, instead of an uniaxal crystal, a biaxal crystal, such as nitre or arragonite, be employed, the system of colored rings and dark brushes is more complex; symmetry now requiring their arrangement about the *two* optic axes. The general appearance of the rings and brushes depends now, not only on the relative position of the polarizer or analyzer, but also on the position of the crystal (which is no longer symmetrical about an axis) with reference to these planes. The two following figures illustrate the nature of the change due to an alteration of the position of the crystal, the polarizer and analyzer being fixed in planes at right angles to each other.



Fig. 4.—Biaxal Crystal; Black Cross.



Fig. 5.—Biaxal Crystal; Black Cross changed to hyperbolas by rotating the crystal.

By employing circularly or elliptically polarized light, these appearances may be still further varied, but we cannot enter into details.

Every doubly-refracting body produces a change upon polarized light which passes through it. Hence the application of the polarizer and analyzer (usually glass mirrors, or Nicol's prisms) to the microscope is often of very great use in detecting crystalline, and other structural peculiarities. Solid bodies, such as glass, which are singly refractive, become doubly refractive when strained either by external forces or by unequal heating. A permanent state of strain is produced in glass when it is cooled quickly. All these phenomena are beautifully exhibited by polarized light. Again, the application of polarized light is sometimes of great importance in qualitative analysis, where only an exceedingly small quantity of a substance is procurable for examination, by enabling the chemist to determine whether a minute crystal is doubly refractive or not.

A practical application of a polarizing prism may be mentioned. In salmon spearing it is often exceedingly difficult to see the fish at the bottom of the stream, on account of the glare of light reflected from the surface. But as this light is always partially, sometimes wholly polarized, a great part of it may be arrested by the analyzer held in a proper azimuth; while the light escaping from the water will suffer little loss.

The light of the sky, being mainly reflected light, is of course partially polarized. The investigation of this subject has been most ably conducted by Brewster (*Trans. R.S.E.*, 1862—1863).

POLA'RITY. The north and south poles of the earth's axis are terms familiar to all; and so are the derived terms of the north and south poles of a Magnet (q. v.). A right-handed and a left-handed corkscrew, or helix, are also perfectly well known. The distinction between the members of any of these pairs leads us to the consideration of polarity, which it is difficult to define except by illustrations. In the case of the helix, it is the difference between right-handed and left-handed; not as in a magnet, the difference between the two ends. If we look closely into the question, we find that it is impossible to define the term 'right-handed rotation' in the abstract. We may define it as being the same as that of the hands of a watch, or that of the apparent motion of the celestial bodies about us *in this northern hemisphere;* but to a person at the equator, or to one who had never seen a watch, such comparisons would be without meaning. In fact, it is impossible to give a definition of even such a simple term as *right, down, east,* &c., independent of reference to the motion or position of some external object. But there is, in many cases, an important scientific reality underlying, and perhaps causing these difficulties. To a spectator looking down upon the north pole of the earth, the axial rotation would appear to be left-handed, or opposite to that of the hands of a watch; while at the south pole the appearance is the reverse. In fact, as motion in a horizontal straight line appears to be from right to left, or from left to right, according to the side on which the spectator stands; so motion in a curve appears to be right-handed or left-handed, according to the side of its plane from which it is looked at. And this is now known to be the cause of the difference of poles in a magnet; the hypothesis of two magnetic fluids is dismissed, and Ampére's explanation, that in a magnet currents of electricity revolve round each particle in planes perpendicular to the direction of magnetization, at once accounts for the dissimilarity of the poles. Such a figure as this gives a clear idea of the subject.

A little electric current, such as that in the figure, in which positive electricity passes in the direction indicated by the arrow-head, acts upon external bodies exactly as a small magnet would whose axis, is, as in the cut, perpendicular to its plane, the arrow-head representing the *north* pole; that is, the pole which turns towards the *south*. Again, an electric current passing in a straight wire would at first sight appear to be altogether independent of polarity; yet it is found that such a current moving in the *straight* line in the cut, in the direction of the arrow-head, tends to make the *north* pole of a magnet rotate round it in the direction indicated by the arrow-head in the circle. Again, there are certain crystals, which when heated, become electric. One end of a prism tourmaline, for instance, takes positive, the other negative electricity. Also certain crystals of quartz cause a ray of Polarized Light, which passes along their axis, to rotate right-handedly; others left-handedly. The difference in these cases is due to molecular arrangement, other effects of which are easily seen in the tourmaline, in the dissymmetry of the two terminals of the prism, and, in quartz, in the position of certain small faces of the crystal, so that a preliminary inspection enables us to predict the direction of the effect to be obtained from any particular specimen. The term has various other applications, amongst the least defensible of which is that to light. See POLARIZATION OF LIGHT.



PO'LDER, a word used in the topography of the Netherlands, is the name given to land below the level of the sea or nearest river, which, originally a morass or lake has been drained and brought under cultivation. An embankment, forming a canal of sufficient height to command a run towards the sea or river, is made, and when carried quite round, as in the case of the Haarlem Lake, it is called the *Ringvaart*. At one or more points on the embankment apparatus for lifting water is placed, and worked by wind or steam-power. If the lake deepens towards the center, several embankments and canals are necessary, the one within the other, formed at different levels as the water-surface becomes lessened, a connection being maintained with the outer canal, which secures a run for the drainage-water. In the Schermer polder, N. Holland, are four canal levels, the land between forming long parallelograms. The water from the inner space is lifted into the first canal; that again, with the drainage of the second section, is thrown into the second, and so on until the outer canal is reached, and a fall obtained. The Netherlands polders are very numerous. The Beemster, a rich district of N. Holland, till 1612 water, is crossed at right angles by fine avenues, and dotted with farm-houses and orchards. In 1865, pop. 3938. The Zype, Schermer, and Purmer are fertile polders, but the most important is the drained Haarlem Lake (q. v.). The land reclaimed amounted to nearly 50,000 acres, and, in 1875, had a pop. of

12,570, with 2867 horses, 5897 head of horned cattle, 7923 sheep, &c. There were in cultivation—colza, 633 acres; madder, 318; flax, 2572; beans, 2353; potatoes, 737; wheat, 4562; rye, 2302; barley, 2145; oats, 12,734; beet, 400; peas, 737; mustard, 95; canary seed, 42; and other crops, 270. In 1874, in the Haarlemmeer were 644 births, 334 deaths, and 95 marriages. In connection with the new canal from the North Sea to Amsterdam, several extensive tracts of land have been reclaimed from the Ij, and formed into valuable polders, some of which are now bearing heavy crops.

POLE, CARDINAL REGINALD, born in Staffordshire in the year 1500, was the son of Sir Richard Pole, Lord Montacute, by Margaret, Countess of Salisbury, daughter of the Duke of Clarence, the brother of Edward IV. His early education was received from the Carthusians at Sheen, whence, being liberally provided for by the king his relative, he passed to Magdalen College, Oxford, and having received deacon's orders, was advanced to several valuable preferments, through the favor of the king, Henry VIII. For the further prosecution of his studies, he went to the university of Paris, and thence to Padua, where he formed the friendship of a distinguished group of scholars and friends, all of whom subsequently took a leading part in public affairs—Contareni, Bembo, Sadoleto, and others. In 1525, he returned to England, where the highest ecclesiastical dignities awaited his acceptance. But it was about this time that Henry had resolved upon the divorce from his queen Catherine, and P. not only withheld his assistance in carrying out the project, but provoked the undying resentment of the king by his well-known treatise, *De Unitate Ecclesiasticâ*. His preferments and pension were withdrawn, and preparations were made for his impeachment. This, and probably still more extreme measures, he evaded by withdrawing from England. The king's resentment fell instead upon his elder brother, and upon his aged mother, the Countess of Salisbury. During the rest of Henry's reign, P. remained in exile. The pope, for the maintenance of whose authority, in the cause of the injured Catherine, P. was regarded as a martyr, treated him with distinguished favor, and elevated him to the cardinalate. He was employed in many affairs of the highest importance, being sent as legate, in 1537, to France and the Low Countries, from both which states Henry VIII. in vain demanded his extradition. He also took an active part in the discussions on the Interim; and when the Council of Trent was opened, he was appointed one of the three legate-presidents who acted in the name of the pope, Paul III. (q. v.).

On this pontiff's death in 1549, P. was all but elected to succeed. For some time after Paul's death, he resided chiefly in a monastery near Verona, in comparative retirement, until the accession of Mary called him back to active life, as the main instrument of the reconciliation of England with the papacy. On November 24, 1554, P. solemnly entered London as legate and plenipotentiary of the Roman see, possessing in an equal degree the confidence of the queen. In the arduous charge thus intrusted to him, he acquitted himself with much prudence, and, considering the circumstances of the time, with singular moderation. In the religious or politico-religious severities which marked the later history of Mary's reign, it is all but certain that P. had no share. He was created Archbishop of Canterbury, and Chancellor of the universities of Oxford and Cambridge. On the difficult and critical question of the disposal of the church property confiscated in the former reign, P., who saw the necessity of moderation, was for a time at issue with the pope; but his representations were successful in producing a more moderate policy, and the work of reunion appeared to proceed with every prospect of a complete permanent issue, when it was interrupted by the death of the queen in 1558. P. died within less than twenty-four hours afterwards. Besides the treatise *De Unitate*, already mentioned, he is also the author of a book *De Concilio*, and of other treatises on the authority of the Roman pontiff and the Reformation of England, and of very many most important letters, full of interest for the history of the time.

POLEAXE, a weapon consisting of an axe-head mounted on a long pole. There were many varieties of this arm, passing from a great hand-axe to an axe-headed spear or halbert, several of the longer sorts bearing but little resemblance to an axe. In the navy, a pole-axe or boarding-hatchet is a hatchet with a handle about fifteen inches long, and a sharp point bending downwards at the back opposite the blade It is used for boarding or resisting boarders.

POLECAT, or FITCHET (*Mustela putorius*, or *Putorius fœtidus*), a quadruped of the Weasel family (*Mustelidæ*), and commonly referred to the same genus with the weasel, stoat or ermine, &c. It is the largest British species of that genus, the length of the head and body being about a foot and a half, the length of the tail more than five inches, the form stouter than that of the weasel or of the ermine. Its color is a deep blackish brown; the head, tail, and feet almost black, the under parts yellowish, the ears edged with white, and a whitish space round the muzzle. The hair is of two kinds—a short woolly fur, which is pale yellow, or somewhat tawny; and long shining hairs of a rich black or brownish-black color, which are most numerous on the darkest parts. The nose is sharp, the ears short and round, the tail pretty equally covered with longish hair. There is a pouch of follicle under the tail, which exudes a yellowish, creamy substance of a very fetid odor; and this odor is particularly strong when the animal is irritated or alarmed. Hence, apparently, its name *Foumart* (*Foul Marten*), which, with various provincial modifications, as *Fulimart*, *Thoumart*, &c., is prevalent in most parts of Britain. The origin of the names P. and Fitchet is much more uncertain.

The P. was much more common in Britain in former times than now, and is almost extirpated in some districts, through the constant war waged against it by gamekeepers and others. It



Polecat (*Mustela putorius*).

eats everything the gamekeeper wishes to preserve. It is extremely destructive in the poultry-yard, the abundance present there inviting it to drink blood and eat brains, which seem to be its favorite luxuries. The rabbit is followed by the P. into its borough, and its ravages among poultry are partly compensated by its destruction of rats.—The taming of the P does not seem to have been attempted. The smell prevents it.—The skin is imported from the north of Europe under the name of *Fitch*, and is used as a kind of fur, similar but inferior to that of the Marten (q. v.). It is imported to some extent from the north of Europe. To artists, the hair of the *fitch* or *fitchet* is well known as that of which the best brushes are made; the hairs used for this purpose being the long hairs already noticed, which grow through the light-colored fur of the animal.—The Ferret (q. v.) is supposed by some to be a variety of the polecat.—A dark-colored kind of ferret is commonly regarded as a cross between the P. and the ferret, and is sometimes called the *Polecat-ferret*. The P. breeds in May or June, making its nest in an old rabbit burrow or similar hole, and producing four, five, or six young.—In North America, the Skunk (q. v.) is called polecat.

POLEMONIA'CEÆ, a natural order of exogenous plants, allied to *Convolvulaceæ*, and containing more than 100 known species, natives of temperate countries, and particularly abundant in the north-western parts of America. They are mostly herbaceous plants, with alternate and often pinnated leaves; regular hermaphrodite flowers; 5-cleft calyx; 5-lobed corolla; 5 stamens, springing from the tube of the corolla; the ovary free, surrounded with a fleshy disc; the style surmounted by a 3-cleft stigma; the fruit a capsule with 3 cells, and 3 valves; the seeds often enveloped in mucus, which contains spiral threads. Some of the species are favorite garden flowers, as *Polemonium cæruleum*, *Cobæa scandens*, and species of *Phlox*, *Ipomopsis*, *Gilia*, &c. None are of value otherwise. *Polemonium cæruleum*, the only British species, and a rare plant in Britain, is well known in gardens by the curious name of *Jacob's Ladder*. It is also called *Greek Valerian*. It is not supposed to be really the *Polemonium* of the ancients, to which great medicinal virtues were ascribed by them. It has a stem from one to two feet high, pinnate leaves, and a panicle of blue (or white) flowers.

POLE'NTA, a preparation of Semolina (q. v.) or of Indian corn or maize meal, which is used as food by all classes in Italy. By the poorer classes, maize is universally used. The material is mixed with milk or water, and boiled until it is just thick enough to pour out into a dish, in which it becomes as firm as a thick jelly. Cheese is grated over it, and other condiments are added according to taste, and it is cut out in slices, and either eaten at once, or sometimes the slices are lightly fried in oil or butter. Semolina being much more expensive, is only used by the wealthier people, and many ingredients are added to suit their tastes.

POLE-STAR, or POLARIS, the nearest conspicuous star to the north pole of the celestial equator. The star which at the present time goes under the name of the 'pole-star' is the star α in the constellation of Ursa Minor. By examining attentively the general movement of the stars throughout a clear winter's night, we

observe that they describe circles which are largest at the equator, and become smaller and smaller as we approach a certain point (the north pole of the celestial equator), close to which is the star above mentioned. This 'pole-star' is, however, a little less than 1½° from the pole, and has a small but sensible motion round it. See POLES. Owing to the motion of the pole of the celestial equator round that of the ecliptic (see PRECESSION OF THE EQUINOXES), this star will in course of time (about 2100 A.D.) approach to within 28′ from the north pole, and will then recede from it. At the time of Hipparchus (156 B.C.), it was 12°, and in 1785, 2° 3′ from the north pole. Its place can easily be found in the heavens, for a line drawn between the stars α and β (called the two *pointers*, from this peculiarity) of the constellation Ursa Major, or the Great-Bear, and produced northwards for about 4½ times its own length, will almost touch the pole-star. Two thousand years ago, the star β of Ursa Major was the pole-star; and about 2300 years before the Christian era, the star α in the constellation of the Dragon was not more than 10′ from the north pole; while 12,000 years after the present time, the bright star Vega in Lyra will be within 5° of it.

The south pole of the celestial equator is not similarly marked by the near neighborhood of a bright star, the only star deserving the name of the south pole-star being of the sixth or least visible magnitude.

POLES (Gr. *polos*, a turning-point), in *Geography*, are the two extremities of the axis round which the earth revolves; they are therefore situated the one on the north, and the other on the south side of the equator, and equidistant from all parts of it, or in lat. 90° N. and lat. 90° S. They are called the north and south poles of the earth.—In *Astronomy*, the poles, which, for distinction's sake, are frequently denominated 'celestial poles,' are those points in the heavens to which the earth's axis is directed, and round which the heavens seem to revolve. The celestial poles are valuable points of reference to astronomers and geographers, so that the determination of their position in the heavens is a matter of the utmost importance. Unfortunately, no stars mark their exact situation (see POLE-STAR)—though there is a minute telescopic star only a few seconds from the north pole, which may be employed instead of it in rough observations—and therefore it is necessary to adopt some means for discovering its precise position. This is effected in the following manner: A bright star (generally the pole-star) is selected, and its position in its upper and its lower *Culminations* (q. v.) is accurately noted; the point midway between these two positions of the star is the pole of the heavens. The observation of the star's two positions must be corrected for refraction, and it is for this reason that the pole-star is selected, since the effect of refraction is much the same in both positions of the star. The term 'poles' has, however, a wider application, as denoting the extremities of a line passing through the center of a great circle perpendicular to its plane; thus, we have the poles of the horizon (viz., the zenith and nadir), the poles of the ecliptic, the poles of a meridian; and in the same sense, the terestial and celestial poles are spoken of as the poles of the equator and equinoctial respectively.—Pole, in *Geometry*, is used in a very indefinite sense; and in *Physics*, it denotes those points of a body at which its attractive or repulsive energy is concentrated. See POLARITY and TERRESTRIAL MAGNETISM.

POLIA'NTHES. See TUBEROSE.

POLI'CE (Lat. *politia*, Gr. *politeia*, civil government; from *polis*, a city), are constables or peace-officers appointed in all parts of town and country for the purpose of watching property and detecting crime, and arresting offenders and maintaining public order. Though the word policeman is now, especially in towns, a household word, the legal denomination is that of constable; but he is a paid constable, to distingush him from unpaid constables and special constables. In each parish in England, the justices of the peace have power to appoint constables to act gratuitously and compulsorily; but the vestry has power to resolve that one or more paid constables shall be appointed, in which case the justices are to make the appointment, and these paid constables supersede the unpaid constables. The salary of these parish constables is paid out of the poor-rates of the parish by the overseers. The justices also appoint a superintendent constable for each petty sessional division, to settle the fees and allowances which are to be paid to the constables for the service of summonses, and for the execution of warrants incidental to the office of justices of the peace. In all boroughs in England, the corporation is empowered, by the Municipal Corporation Acts, to appoint a watch committee, who appoint a sufficient number of men to act as constables. The treasurer of the borough pays their salaries, wages and allowances, as well as extaordinary expenses incurred by them. By an act of parliament applicable to counties, the justices are empowered to establish a sufficient police force for each county, and a chief constable is appointed to govern the whole.

The duties of constables or police-officers are exceedingly multifarious, and they receive printed regulations to guide them in the proper discharge of such duties. They have important duties in reference to the apprehension of offenders, and their powers are necessarily larger than those of private individuals. Wherever a person is seen in the act of committing a felony, it is the duty of every one, not merely of constables, to apprehend him or her without any warrant, for no warrant is needed. Persons found offending in many misdemeanors may also be apprehended by anybody without a warrant; but in other cases, a constable only can make an arrest. In case of a riot, any body may arrest the rioter. Constables are bound to arrest hawkers trading without a license; and vagrants who are offending against the Vagrant Acts, such as telling fortunes, loitering about premises, &c. The powers of constables are much greater than those of individuals with reference to crimes after they are committed. Thus, where the constable has not seen the offence committed, but is merely told of the fact, and he has reason to believe it, he is entitled to arrest the party charged without any warrant; he must, however, in such cases act only on reasonable suspicion. He is not justified, for example, in apprehending a person as a receiver of stolen goods on the mere assertion of the principal felon; nor is a constable justified in taking a person into custody for a mere assault without a warrant, unless he himself was present at the time the assault was committed, or reasonably apprehends a renewal of it. If a constable have a reasonable suspicion that a man has committed a felony, he may apprehend him; and so a private individual may do so. The difference between the authority of the constable and the private person in this respect is, that the latter is justified only in case it turn out that a felony was in fact committed; but the constable may justify the arrest and detention whether a felony was committed or not.

It is the duty of a constable to raise a hue and cry in search of a felon, and all private individuals are bound to join in it, otherwise they may be indicted and fined. An arrest by a constable is usually made by laying hands on the party, and detaining him; but it is enough for the constable to touch him and say: 'I arrest you, in the Queen's name.' If the party arrested be in a house in hiding, the constable may demand admittance, and if he is refused, may then break open the doors; this is so in all cases where the party has committed treason or felony, or has dangerously wounded another. In cases where the constable is not authorized at common law or by some statute to arrest a party without a warrant, then he must produce a warrant signed by a justice of the peace, and show it to the party if it is demanded; and if the constable happens not to have the warrant in his pocket at the time, even though it is not asked for, it is an illegal arrest. When a party is arrested, it is the duty of the constable to take him without any unreasonable delay before a justice of the peace, and meanwhile lodge him in safe custody. The party arrested must not be treated with harshness beyond what is necessary for safe custody, and therefore it has been held that a constable has no right to handcuff a person whom he has apprehended on suspicion of felony, unless such person has attempted to escape, or it be necessary to prevent an escape. Nor has a constable in general a right to search a person apprehended, unless the latter conduct himself violently.

The conduct of constables in reference to public-houses is of some importance. It is an offence in publicans and beer-house keepers, and indeed the keepers of all places of public resort, to refuse to admit the constable into such house or place at any time. Thus, in the case of these places being open on Sundays at the times prohibited by statute, the constable, if he suspect that the act is being violated, may demand admittance, and thus satisfy himself as to the fact. It is owing also to this power of a constable to enter at all times, that he is enabled to detect other offences in public-houses, such as harboring prostitutes and disorderly characters. Constables, when suspecting that a betting-house is kept, must first get a warrant from a justice of the peace, which can be obtained without notice to the parties, and can then break into the house. So as to gaming-houses. While constables have summary power of entering public-houses, still this is not to be abused; and it is a distinct offence in the keepers of all public places where wine, spirits, beer, cider, or any fermented or distilled liquors are sold on the premises, to knowingly harbor, or entertain, or suffer to remain there such constables during the time they are on duty, except when quelling disturbances or restoring order. It is an offence punishable with more than usual severity to assault constables when in the execution of their duty. Though constables are paid in great part by each county and borough, and thus by the public at large, it is often requisite for individuals to require the services of extra constables, in which case such individuals must pay for them at their own expense, as is usual in theaters and large establishments. Of late years, considerable complaint had been made as to constables interfering in the protection of game-preserves and fisheries, it being considered that the owners of those properties ought to bear the extra charge, if required, of the constables' giving more than the ordinary at-

tention to poachers. But by the recent Act, extended powers of detecting poachers of game were given to constables, who are now entitled, whenever they suspect people on the highway of being engaged in poaching, to stop and search them, and then summon the poachers, if necessary, before justices. See POACHING.

In 1880, the total police and constabulary in England and Wales amounted to 31,480 men. These are subdivided into chief constables of counties, 56; head constables of boroughs, 163; superintendents, 521; inspectors, 1311; sergeants, 3008; constables, 25,511; additional constables, 390; detectives, 520. The proportion of policemen to the population is about 1 to 811. In 1879–80, the total expenditure on the police force of England and Wales, including the city of London police, was £3,113,725, of which less than £600,000 was paid by Her Majesty's Treasury and the Superannuation Fund, the major part coming from local sources. The public revenue pays nothing towards the city of London police; it pays all the cost of the dock-yard police; it pays nearly one-fifth of the other branches of the police. In 1881, the metropolitan police numbered 1 chief superintendent, 24 superintendents, 605 inspectors, 941 sergeants, and 9634 constables; the city police comprising 124 officers and 737 constables.

In Ireland, the first regular police force was established in 1814, which was improved in 1836 and 1839. Originally, the expense was defrayed partly out of the Consolidated Fund; but in 1846, the whole expense was borne by the Consolidated Fund, with trifling exceptions. In 1880, the total cost of the constabulary of Ireland amounted to £1,095,121. The number of constables in 1880 was 11,473, besides 1111 Dublin Metropolitan Police. In Ireland the police carry firearms.

In Scotland, the public police force was, in 1880, 3702 (1331 for counties, 2371 for burghs), including 84 detectives; and their cost for the year was £316,413. In addition to this number, the Tweed Commissioners pay for about 30 constables; 12 more are paid by other fishery commissioners, 20 employed by companies or private persons, and 160 by harbor boards.

POLICE, MILITARY, has two significations—1st, the organized body employed within an army to preserve civil order, as distinct from military discipline; and 2d, a civil police with a military organization. The police of an army commonly consists of steady intelligent soldiers, who act under the orders of the provost-marshal, and arrest all persons out of bounds, civilians not authorized to pass the lines, disorderly soldiers, &c.; they also attend to sanitary arrangements. As in all military matters, the police of an army possess summary powers, and a sentence of the provost-marshal is carried out immediately after it is pronounced.

Of civil police with military organization may be instanced, as specimens, the Gendarmerie (q. v.) of France, the Sbirri of Italy, and, in an eminent degree, the Irish constabulary.

PO'LICY (a corruption of the Latin *polyptycha* [analagous to *diptycha*, i. e., two-fold or a pair of tablets] applied in the middle ages to memoranda or registers, written on a set of several tablets), as a Legal term, denotes the contract of insurance (Ital. *polizza d'assecurazione*). The usual contracts are for the insurance of life, or rather against the risk of death, against fire, against loss of a ship; but the same name is given to a similar instrument adapted to meet any other risk. See INSURANCE.

POLIGNAC, an ancient French family which takes its name from a castle said to have been built in the 5th c., on a rock of the Cevennes, near Puy-en-Velay, in the department of Haute-Loire, on the site of a Roman temple dedicated to Apollo, whence —according to rather credulous genealogists—the castle was originally called *Apollianique*, of which Polignac is affirmed to be only a later corruption. The first of the Polignacs who acquired celebrity was MELCHIOR DE P., younger son of ARMAND, 16th MARQUIS DE P., and born at Puy-en-Velay, 11th October, 1661. Destined by his parents for an ecclesiastical career, he received an excellent education at Paris in the colleges of Clermont and Harcourt.

In the negotiations of Cardinal de Bouillon with Pope Alexander VIII. at Rome in 1689, the young, but astute and insinuating abbé took a principal part. In 1695, he was sent to Poland as French ambassador, when John Sobieski was dying; and diplomatized and intrigued so cunningly in favor of Prince de Conti, that the latter was actually elected his successor. Events, however, frustrated this policy, and both Conti and P. had to leave Poland rather precipitately, in consequence of which the latter lost the royal favor. He now retired to his abbey at Bonport, where he spent the next four years, partly occupied in the composition of a Latin poem entitled *Anti-Lucretius*, which was intended as a refutation of the scepticism of Bayle. It appears to be a very respectable and even able performance. In 1702—after a stroke of his usual neat flattery—he was recalled to Versailles, and rose higher into favor than ever. Named *Auditeur de Rote* in 1706, he was sent to Rome, where he devoted himself to the study of canon and civil law, was associated in the negotiations of Cardinal de la Trémouille, and honored with the friendship of Pope Clement XI. In 1712, he was appointed French plenipotentiary at the Congress of Utrecht; and after his return, obtained the abbeys of Corbie and Anchin. When Louis XIV. died, P. was at the top of his reputation and influence. During the regency of the Duke of Orleans, he took part in the conspiracy of Cellamare, and was banished to his abbey of Anchin. In 1720, he was sent to Rome, charged with the conduct of French affairs, and remained here for about ten years, and signalized his mission by healing the quarrel that was dividing the Gallican Church on the subject of the famous bull *Unigenitus*. In 1726, he was raised, in his absence, to the archbishopric of Auch; and on his return to France, spent the remainder of his days in literary repose, and in the high esteem of courtiers, scholars, and the like. He died 3d April 1742. P. succeeded Bossuet at the Académie Française in 1704, and became an honorary member of the *Académie des Sciences* (1715) and of the *Académie des Belles-lettres* (1717). See C. Faucher's *Histoire du Cardinal de Polignac* (2 vols., Paris, 1772), St. Simon's *Memoires*, and D'Argenson's *Memoires*.

The other members of the Polignac family who have an historical name at all are more notorious than noteworthy. In the reign of Louis XVI., TOLANDE-MARTINE, GABRIELLE DE POLASTRON, DUCHESS DE P. (born 1749; died at Vienna, 9th December 1793), and her husband JULES, DUC DE P. (died at St. Petersburg, 1817), were among the worst, but unhappily most favored advisers of Marie Antoinette. They obtained vast sums of the public money from their royal master and mistress, and were largely, if not mainly responsible for the frightful pecuniary extravagance of the court. The discovery of the famous *Libre Rouge* occasioned the exulting cry of Mirabeau: *Mille Ecus à la Famille d'Assas pour avoir sauvé l'Etat; un Million à la Famille Polignac pour l'avoir perdu!* The Polignacs—knowing the deep hatred felt towards them by the French people—were the first of the *noblesse* to emigrate (16th July 1789). From the Empress Catharine of Russia, the duke received an estate in the Ukraine, and did not return to France at the Restoration. He left three sons and a daughter, of whom only one has become historical—AUGUSTE JULES ARMAND MARIE, PRINCE DE P. (born at Versailles, 14th May 1780). On the Restoration, he returned to France; became intimate with the Comte d'Artois, afterwards Charles X.; showed an ardent attachment to the Church of Rome—or at least to its policy—and, in consequence, received from His Holiness, in 1820, the title of Prince; was appointed ambassador at the English court in 1823; and finally, in 1829, became head of the last Bourbon ministry, in which capacity he promulgated the fatal ordonnances that called France to arms, and drove Charles X. from the throne. He then attempted to flee from the country, but was captured at Granville on the 15th of August; was tried, and condemned to imprisonment for life in the castle of Ham, but was set at liberty by the amnesty of 29th November 1836. He took up his residence in England, but died at Paris, 2d March 1847.

POLISH LANGUAGE AND LITERATURE. The Polish language is one of the most widely-spread branches of the Slavic, forming (according to Dobrowsky), along with the Bohemian, the western branch. It surpasses almost all the other Slavonic tongues in euphony and flexibility, and is scarcely excelled by any language in point of brevity. It does not make use of the article, but has a most elaborate declensional system, comprising seven cases. The conjugation of the verb is equally elaborate, and enables a Pole to express transitions and delicate niceties in the conditions of time and gender quite unknown to the French, or German, or English verb. The Polish vocabulary is also uncommonly rich. The number of harsh consonants in the language, it must be admitted, is large, and this fact is a marked distinction between it and its eastern sister, the Russian, but in pronunciation, these are so much softened that its euphony is preserved. It alone of all the Slavic dialects, with exception of the old Slavic Church language, has two nasal sounds; one like the French *on*, the other like the French *in*. The letter *l* has also a peculiarly broad snarling sound. After the introduction of Christianity, Latin, the language of the church, exercised a powerful influence on its structure and development, and subsequent to the 14th c., it adopted into its vocabulary numerous German words. In the 16th c., Polish, as a written language, rapidly attained so high a degree of perfection that it supplanted even Latin itself, until then the language of the state and of the learned. The best Polish grammars are those of Mrongovius (3d ed., Danz. 1837), Bandtke (Breslau, 1824), Muczkowski (Crac. 1845), and Booch-Arkossy (1866); the most comprehensive dictionary is that of Linde, after which rank those of Bandtke (2 vols., Breslau, 1806), Mrongovius (Königsb. 1835), Trojanski (4 vols., Posen, 1835—1846), and Liebkind (1855).

The history of Polish literature is divisible into five clearly marked periods. The *first* extends from a date antecedent to the introduction of Christianity down to the close of the 15th century.

Of pre-Christian Polish literature, nothing has survived but some popular songs and proverbs. Among the very oldest literary monuments is a hymn to the Virgin Mary, ascribed to St. Adalbert. The introduction of Christianity paved the way for a Latin literature more or less ecclesiastico-historical. Casimir III. (q. v.), surnamed the Great, did more than any other early Polish monarch for the encouragement of literature, and, among other things, founded the university of Cracow, which, from the beginning of the 15th c., long continued to be the center of intellectual life and culture in Poland. To the 15th c. belong Jan Dluglosz (Lat. *Longinus*), author of a most interesting and valuable *Historia Poloniæ*, in 13 books, and otherwise worthy of remembrance as an able diplomatist and philanthropist; also Jan Laski, Archbishop of Gnesen (b. 1457, d. 1531), whose collection of the oldest Polish laws, *Commune Inclyti Poloniæ Regni Privilegium*, is of great historical importance. In 1490, the first printing-press in Poland was established at Cracow.

The *second* period of Polish literature embraces the 16th and first quarter of the 17th c., and is marked by the use of the Polish as a written language. The reigns of Sigismund I. and Sigismund II. Augustus, are regarded as the golden era of Polish literature, properly so called. The series of poets begins with Nikol. Rej (b. 1515, d. 1568), commonly called the *Father of Polish Poetry*, a native of Zoravno, in 'Little Russia,' and educated at Lemberg and Cracow. He spent his life at the court of the Sigismunds. His principal works, *Wizerunek Zywota Czlowieka Poczciwego* (Crac. 1560) and *Apophthegmata* (Crac. 1568), are full of sharp wit and strong satire, and though the language is rough and unpolished, it is genuinely poetical.

After Rej, the brothers Jan and Piotr Kochanowski hold the highest rank. Szymonowicz or Simonides (d. 1629) acquired by his Latin odes the name of the 'Latin Pindar;' and his *Sielanki* ('Idylls,' new ed. Leip. 1837), modelled on those of Theocritus, exhibit a charming simplicity of style. Still more original, if scarcely so graceful, are the *Sielanki* (new ed., Leip. 1836) of his friend Zimorowicz (d. 1629). Sebastian Klonowicz, called *Acernus* (d. 1608), is celebrated as a satirist and descriptive poet. The Reformation, which rapidly made way in Poland, being tacitly approved of by the rulers and magnates, gave a powerful stimulus to the intellectual and spiritual activity of the nation—visible in translations of the Bible, hymn-books, and an important pulpit or sermon literature. Among the historians of this period, the most celebrated are the brothers Bielski; Lukas Górnicki (d. 1591), author of a history of the Polish crown (*Dzieje w Koronie Polskiéj*, Crac. 1637, Wars. 1804); Strzikowski (d. 1582), whose *Chronicle of Lithuania* (Königsb. 1582) is an admirable work; and Paprocki (d. 1614).

The *third* period of Polish literature, extending from 1620 to 1750, is coincident with the rule of the Jesuits, who first obtained a footing in Poland about 1566, through the influence of Cardinal Hosius, soon possessed themselves of the schools, and, on the whole, seriously checked the literary and religious growth of the nation. The most conspicuous poet of this retrogressive period is the Jesuit Kazimierz Sarbievski (1595—1640), who wrote only in Latin; others more or less noteworthy are Kochowski (died about 1700); Tvardovski (d. about 1660); Opalinski (d. 1655); Chros'cinski, the translator of Lucan; Morsztyn, the translator of Corneille; and Elz'sbieta Druz'backa (d. 1760). Among the historians of this period, it may suffice to mention Stravovolski (d. 1656), author of *Polonia, sive Status Regni Poloniæ Descriptio* (Wölfenbuttel, 1656), and other works; Kojalowicz, a Jesuit (d. 1677), and Kaspar Niesiecki, a Jesuit (d. 1745), whose *Korona Polska* (4 vols., Lemb. 1728—1743) is the most important work on Polish heraldry.

The *fourth* period, commencing with the middle of the 18th c., and extending into the first quarter of the 19th, owes its characteristics partly to the influence of the French literature of Louis XIV.'s time; partly also to the liberal patronage of literature and science by king Stanislas Augustus, the princess Czartoryski, Jablonovski, and other magnates, and the educational reforms of Stanislas Konarski (b. 1700, d. 1773). The good work begun by Konarski was carried on by Kopczyn'ski (1735—1817), who was the first to thoroughly establish on a scientific basis the grammar of the Polish language in his *Grammatyka Norodova;* by Piramowicz (d. 1801); by Bohomolec, the Jesuit, who translated a multitude of stage-pieces from the French; but above all, by Adam Stanislas Naruszewicz, the accomplished translator of Tacitus; and Ignacy Krasicki (1735—1801), called the 'Polish Voltaire,' the center of the whole Polish literature of his age, whose satires and fables are reckoned the first in his native language. As poets of this Renaissance period, occur the names of Trembecki; Cajetan, Wegierski, Godebski, and Wezik. The most noted dramatist is Boguslavski (d. 1829), who wrote about 80 plays—the majority of which, under the title of *Dziela Dramatzezne*, were published at Warsaw (9 vols., 1820).

The political storms that swept over Europe at the close of the 18th and the first years of the 19th c., did not quite destroy the new literary life that had burst into blossom under Stanislas Augustus.

In 1801, the historian Tadeusz Czacki, Franciszek Dmochowski, and Bishop Jan Albertrandy founded at Warsaw the 'Society of the Friends of Knowledge,' which, especially under the auspices of the state-councillor Staszyc, bore good fruit till it was dissolved in 1832, when its library of 50,000 vols. was carried off to St. Petersburg. At the same time, Jozef Maximilian Ossolinski, Hugo Kolontaj, and Stanislas Potocki, by word and writing exercised a mighty influence on the renovation of the national spirit. The transition of this *newest* or *fifth* period was made by Karpinski (1745—1825), whose Songs and Idylls (4 vols., Warsaw, 1804; new ed., Leip. 1836) live on the lips of the Polish people; by Chancellor Voronicz (1757—1829), a richly imaginative poet and a great orator; by Niemcewicz (1757—1841), a statesman, soldier, and author of celebrity in his own land; and by the poet Kasimierz Brodzinski (1791—1835). At Wilna, which, after 1815, became the center of Polish literary activity, and a rallying-point for all the enthusiastic spirits of the land, several young men united, with Adam Mickiewicz (b. 1798) at their head, in a crusade against the still dominant French style of literature. We can only name some of his numerous and brilliant associates, as Malczevski (1792—1826), whose best production is his epic-lyric narrative of Ukraine life, entitled *Marja;* Goszczynski (b. 1806; Poems, 3d ed., Breslau, 1852); Bohdan Zaleski (b. 1802; *Poezye*, Pos. 1841, and later); Tomasz Padura (*Pienia*, Lemb. 1842); Odyniec (*Poezye*, Pos: 1833); Korsak (*Poezye*, Pos. 1833); Chodzko (*Poezye*, Petersb. 1829); Groza (*Poezye*, Wilna, 1836); Lucyan Siemienski (b. 1809), an excellent novelist and translator; Bielovski (b. 1806), a lyric poet and translator; Gorecki, renowned for his pungently sarcastic fables (*Bajki i Poezje nove*, appeared at Paris in 1833); Garczynski (*Poezye*, Paris, 1833); and Slowacki, the most fertile of all the recent Polish poets.

Most of these writers became either 'banished men,' or men who, while living, were forced to expatriate themselves. They belonged to the 'Polish Emigration,' whose headquarters was Paris. The most many-sided and prolific of all the modern Polish novelists is Jozef Ignacy Kraszevski, who was born at Warsaw in 1812. The new national tendency of Polish literature, which naturaliy first showed itself in poetry, soon became visible in other departments also. Thus, Joachim Lelewel (born in 1786) rose to the first rank as a writer of Polish history, and a study of his works is absolutely indispensable to a knowledge of that subject; next to him (and later) in the same department stand Bandtke, Maciejovski, Count Raczynski, and Count Plater. Narbutt of Wilna wrote a very solid and comprehensive work on Lithuanian History (Wilna, 1837 *et. seq.*), and Lukaszewicz of Posen has furnished numerous important contributions to the history of the Reformation in Poland. A multitude of works more or less weighty have been devoted to a record of the revolution of 1830, chiefly, of course, by Polish emigrants. In philosophy, theology, and physical sciences, Poland has nothing of consequence to show.—The principal works on Polish literature are those of Muczkovski, Bentkovski, Ossolinski, Chodynicki, Lukaszewicz (Posen 1860), and the comprehensive *Historya Literatury Polskiéj* (Crac. 1840, *et seq.*) of Visznievski.

PO'LISHING MATERIALS. See DIAMOND-GRINDING, EMERY, PASTES, and PUTTY-POWDER.

POLISHING OF METALS. This is effected by first removing any tarnish or oxidation by means of some material which will chemically act upon it; for this purpose, sulphuric, hydrochloric, oxalic, and acetic acids are used to different metals, and in various states of dilution. Usually, it is necessary to remove the acid with clean water, and dry rapidly, to prevent re-oxidation; and then either friction with various polishiug materials, or rubbing with a smooth hard surface or burnisher, brings out the lustre of the metal.

POLISHING OF STONE. See STONE-CUTTING.

POLISHING SLATE, a mineral composed chiefly of silica, with a little alumina, lime, oxide of iron, and water; white, yellowish-white, or yellow; and of specific gravity about half that of water. It is found in Bohemia, Saxony, and Auvergne, and is supposed to be a volcanic product. It is used for polishing glass, marble, and metals.

POLISTENA, a town of South Italy, province of Reggio, Calabria. The village which occupied the site of the present town was totally destroyed by an earthquake in 1783. Pop. (1871) 7559.

POLI'TICAL ECONOMY. The word economy is derived from the Greek for house-law or house-regulation. It refers to the material portion of domestic regulation, and does not, for instance, embrace the observance of religion or the communication of instruction. The most important part of it is the adjustment of the expenditure of the household to the income at their command. Hence the word economy is sometimes applied, both in a public and a private sense, to the saving of money. The term

'Political' came to be used along with it as a convenient method of expressing the application to a state of a sound system of management in relation to its affairs. In later times, however, the word, as applied to a community, came to be something totally different from its application to a household. It was thought that one could regulate a people just as a house is regulated, by adjusting the spending and the getting of the national wealth. Hence arose several doctrines now discarced—such, for instance, as 'the balance of trade,' which taught that the trade with any nation is only profitable when you sell more to that nation than you buy from it; the system of bounties upon special trades, as being more profitable to others; and lastly, the system of protection to native industry—the last relic of what may be called the positive school of economists.

Political economy now means, not the art of regulating communities in this respect, but the science of those laws which Providence has established for their regulation. Hence the analogy with domestic economy ceases. Domestic economy is the positive regulation of a household—not the leaving of it to follow its own dictates; and, indeed, that there is a disposition, more or less in the head of every house, to limit its expenditure to its income, is one of the phenomena by which things right themselves, as it were, and make up those laws of nature which constitute political economy. A man knows that if he buys too much, he will become bankrupt; but we do not now order the wholesale merchant not to buy too much from this or that country, so as to place the balance of trade against us—we know that this naturally rights itself, because we must expect our own produce to pay for what we bring in. Even if we should have to pay for it in gold, *that* is a commodity produced by our people. The income and expenditure of the government, as apart from that of the people of the community, are of course under regulation like those of a household; but these form a separate field of operation, called Finance (q. v.). There are a few people who still hold that there is no natural system sufficient in itself to regulate the material affairs of mankind, and that these should be committed to the hands of special managers. Finding the approved doctrines of political economy going further from their direction, such persons, though few in number, have been very absolute in their views, and zealous in pushing them. One class of these are called Socialists; and another, who go further lengths, are called Communists. It has not yet been considered necessary here to go beyond the mere description or definition of the nature of political economy, because the various parts of which it consists are given each under its own head, as BOUNTY, CAPITAL, COLONY, COMMUNISM, COMPETITION, CORN LAWS, DEMAND AND SUPPLY, EXCHANGE, FREE TRADE, LABOR, MONOPOLY, NAVIGATION LAWS, RENT, VALUE, &c.

POLITICAL OFFENCES, crimes considered injurious to the safety of the state, or such crimes as involve a violation of the allegiance due by the subject to the supreme authority of the state.

By the Roman law, in the early times of the republic, every act injurious to the state was comprehended under the name *perduellio*, and visited with death. That term included conspiracy against the government, aiming at kingly power, aiding the enemies of Rome, and losing an army. The word *perduellio* afterwards fell into gradual disuse, and the chief state offences were known by the term *majestas* or *crimen læsæ majestatis*, somewhat akin to the treason of modern times. In the republican period, the crimes to which the epithet *læsa majestas* was most frequently applied, were the betrayal or surrender of an army to the enemy, the excitement of sedition, and such a course of administration as impaired the dignity of the state. In imperial times, acts and words disrespectful to the reigning emperor were included, and an indignity to his statue was visited nearly as severely as an offence against his person. *Læsa majestas* was generally punished with death, confiscation, and infamy. The criminal might even be tried after his death, to the effect of confiscating his property, and rendering his memory infamous—a practice which has been resorted to both in France and Scotland as late as the beginning of the 16th century.

In modern times, the acts brought under the category of political offences have varied much at different periods and in different countries. They have in general been more leniently dealt with under constitutional than under despotic governments. It is, however, a principle which has been generally recognized by the most constitutional of governments, that when the legislature thinks itself endangered by a secret conspiracy against the state, or an understanding with the enemies of the country, it permits the executive, for a limited time, to arrest suspected citizens, without the formalities which are required in ordinary circumstances.

In England, a large number of the graver political crimes are included under the denomination of Treason, and the treason law has sometimes been stretched so as to include offences which, by a fair construction, could hardly come within it, such as the use of violence to reform religion or the laws, or to remove the councillors of the sovereign. Even riotous assemblies with the object of destroying all property of a particular class have been held treason. Political offences also include a number of crimes against government falling short of treason, and passing under the name of Sedition, which, though they have for their ultimate object the violation of the public peace, do not aim at direct and open violence against the laws or the sovereign, but rather the dissemination of a turbulent spirit tending to produce such violence. The British government does not permit the political offenders of other countries to be included in extraditional treaties; and in modern times, generally speaking, extradition does not apply to political offenders; contrary to the doctrine laid down by Grotius. In some countries, conspiracy against the sovereign of any country in league with the state is a special offence; in Great Britain, however, this seems not to be the case. A bill introduced in 1858 to make it felony to conspire to commit a murder without as well as within her Majesty's dominions, was rejected by the House of Commons on the second reading, from the idea that it was dictated by France.

PO'LITICS (Gr. *polis*, city or state), that branch of ethics which has for its subject the proper mode of governing a state, so as to secure its prosperity, peace, and safety, and to attain, as perfectly as possible, the ends of civil society. Among the subjects which political science embraces are the principles on which government is founded, the hands in which the supreme power may be most advantageously placed, the duties and obligation of the governing and governed portions of society, the development and increase of the resources of the state, the protection of the rights and liberties of the citizens, the preservation of their morals, and the defence of the independence of the state against foreign control or conquest. While the philosophy of governing constitutes the *science* of politics, the *art* of politics consists in the application of that science to the individual circumstances of particular states. The ancient Greek writers treated politics with reference to an ideal perfect state, which each propounded according to his own speculative views, pointing out the variation of every existing government from his standard. The politics of a country, in common parlance, implies the course of its government, more especially in its relations with foreign powers.

POLIZIANO, ANGELO, whose name is perhaps better known under the Latin form of POLITIANUS, was the son of a doctor of civil law, and was born at Montepulciano in Tuscany, 14th July 1454. The family name was Ambroginis, but P. took his from his native town—in Latin, *Mons Politianus*. He studied Latin at Florence under Cristoforo Landia, Greek under Andronicus of Thessalonica, the Platonic philosophy under Marsilio Ficino, and the Aristotelian under Argyropulos. He also devoted some attention to Hebrew. P.'s talent for poetry was early developed. When scarcely fifteen years of age, he took the Florentines with surprise by the publication of his famous *Stanze* (a poem of 1400 lines) in honor of Giulio de Medici, who had carried off the palm at a tournament. Lorenzo de Medici took notice of the brilliant lad, and at once placed him in a condition to continue his studies without any pecuniary harassments, by appointing him tutor to his two sons, and subsequently gave him a residence in his charming villa near Fiesole, where P., who was passionately fond of country life, resumed his studies with fresh ardor.

In 1484, he accompanied the Florentine ambassadors to Rome, and was received in a flattering manner by the pope, at whose request he translated into Latin) the Greek historian Herodianus, for which he received 200 golden crowns. He also made Latin versions of the *Enchiridion* of Epictetus, the *Charmides* of Plato, and other works, with such elegance, that Erasmus pronounced him a master in translation. After having filled for some years a chair of Latin literature, he commenced the teaching of Greek. His popularity as a professor was great. Pupils came to study under him from all the great cities of Italy, and even from distant parts of Europe; the principal were Francesco Pucci, Fortiguerra, Maffei de Volaterra, P. Crinitus, Guillaume Grocyn, Thomas Linacre, and Michael Angelo. His copies of Ovid, Statius, Pliny the Younger, Quintilian, &c., and other authors, are still preserved in the different libraries of Italy, and are covered with marginal notes. His copy of the famous *Digest* of Roman law, with an elaborate philological and grammatical commentary, is still preserved in the Laurentian Library at Florence. In 1489 appeared his *Miscellanea*, a collection of critical and other observations on the ancient authors. Towards the close of his life, he entered into orders, and was made canon of the cathedral of Florence. He died 24th September 1494. Among the brilliant scholars of the classical Renaissance, P. occupies a foremost place in virtue of his vigor and originality. His intellect was indeed penetrated by an admiration of the chaste and noble literature of antiquity; but there was nothing servile in his imitations; he reproduced without difficulty—because he was himself a kindred genius—the strength of Tacitus, the elegance of Livy, and the

conciseness of Sallust; his Latin poems, especially his elegies, display the beauty and ardor of his imagination. Among his vernacular pieces may be mentioned his *Canti Carnascialeschi* (Carnival or Merry Ballads), remarkable for their felicity of style, sweetness of pathos, and abundance of imagery. Another proof of his varied poetical power was his *Orfeo*, one of the earliest dramatic compositions produced in Italy. The editions of P.'s separate writings have been numberless. See Seraszi's *Vita di A. Politiano;* N. A. Bonafous *De A. Politiani Vita et Operibus* (Paris, 1845), Tiraboschi's *Storia della Litterat. Italiana;* Greswell's *Memoirs of Politiano*, and Roscoe's *Lives of Lorenzo de Medici and of Leo X.*

POLK, JAMES KNOX, eleventh President of the U. S. of America, was born in Mecklenburg County, North Carolina, November 2, 1795. His ancestors, who bore the name of Pollock, emigrated from the north of Ireland early in the 18th century. Though his father was a farmer in moderate circumstances, he was educated in the university of North Carolina, and studied law with Felix Grundy of Tennessee, an eminent lawyer and statesman. Admitted to the bar in 1820, he was three years after elected a member of the legislature of Tennessee, and soon after, to the Federal Congress, by the Democratic party. In 1836, he was chosen Speaker of the House of Representatives, a position he filled during five sessions with firmness and ability. After serving fourteen years in Congress, he was, in 1839, elected governor of Tennessee; and in 1844, unexpectedly nominated, as a compromise candidate, for the presidency, against Henry Clay, and elected. During his term, the Oregon boundary was settled by a compromise offered by England, though the party cry which helped to elect him was a claim for the entire territory to 54° 40′ N. lat. The annexation of Texas caused, in 1846, a war with Mexico: 50,000 volunteers, added to the small regular force, sufficed to take the capital (September 14, 1847), and enabled the government to dictate terms of peace, by which it acquired California and New Mexico. Having pledged himself to a single term of office, Mr. P. refused a renomination, and retired to his home in Nashville, Tennessee, where he died three months afterwards, June 15, 1849. Mr. P. was a man of respectable abilities, and of a solid, firm, honest, and religious character. He was devoted to the principles of the Democratic party of Jefferson and Jackson to state rights, a revenue tariff, independent treasury, and strict construction of the constitution.

PO′LKA, a species of dance, of Polish or Hungarian origin, the music to which is in $\frac{2}{4}$ time, and has the rhythmical peculiarity of being accented on the third quaver of the measure. It was introduced as a fashionable dance into Western Europe about 1841.

POLL-ACT, a sanguinary act, passed at Trim in Ireland, by the Junto of the Pale, in 1465, under the Earl of Desmond, deputy. It ordained 'that it shall be lawful to all manner of men that find any theeves robbing by day or night, or going or coming to rob or steal, or any persons going or coming, having no faithful man of good name and fame in their company in English apparel, that it shall be lawful to take and kill those, and to cut off their heads, without any impeachment, of our sovereign lord the king. And of any head so cut off in the county of Meath, that the cutter and his ayders there to him cause the saed head so cut off to be brought to the portreffe to put it upon a stake or spear, upon the Castle of Trim, and that the saed portreffe shall testify the bringing of the same to him. And that it shall be lawful for the saed bringer of the saed head to distrain and levy by his hand (as his reward) of every man having one ploughland in the barony, two pence; and of every man having half a ploughland, one penny; and of every man having an house and goods, value forty shillings, one penny; and of every cottier having one house and smoak, one half-penny.' Much slaughter is said to have been committed under this remarkable act.

POLL-TAX. See CAPITATION.

PO′LLACK (*Merlangus pollachius*), a fish of the family *Gadidæ*, of the same genus with the Whiting and Coal-fish. It is common on the coasts of all parts of Britain; and in Scotland and some parts of Ireland, it is called *Lythe*. It is a very playful fish, often gamboling on the surface of the water. It attains about the same size as the coal-fish. It has three dorsal fins; the body is of a longish shape; the lower jaw is much longer than the upper; the tail is slightly forked. The flesh is reckoned superior to that of the coal-fish. Young pollacks are sometimes sold as whitings, to which, however, they are not nearly equal. No fish more readily rises to the artificial fly, and in this way great numbers are caught on the British coasts. The fly is merely a bit of white feather tied to a common bait-hook. Worsted is sometimes used instead of the feather; and flies of different colors are sometimes used together, with great success. No reel is employed, and any stick is good enough for a rod; a few yards of string make a sufficient line.

PO′LLAN (*Coregonus Pollan;* see COREGONUS), a fresh-water fish of the family *Salmonidæ*, a native of lakes in Ireland. It is particularly abundant in Lough Neagh, where it is often seen in large shoals, which issue from the deep waters, and haunt the shore from spring to autumn, when great numbers are taken by nets, and sold in the neighboring country. The P. is from 10 to 12 inches in length; it resembles the Gwyniad, but has not the snout produced like that fish; and there are differences in the size and position of the fins. It is very like *Coregonus sikus*, a species found in the most northern parts of Norway. The spawn of the P. is deposited in November and December on the rocky or stony parts of the bottom of the lake which it inhabits. It is a well-flavored fish. The cry of 'Fresh Pollan' is even more common in Belfast during summer than that of 'Fresh Herring.'

PO′LLARDING (*to poll*, to cut off, or shave the head) is the cutting off of the whole crown of a tree, leaving it to send out new branches from the top of the stem. Trees thus treated are called *pollards*. The new branches are never equal in magnitude to the original branches of the tree, although often more numerous, and when pollarding is often repeated, the scars and stumps form a thick ring at the top of the stem, from which many small branches spring. Pollards are not beautiful; but pollarding is practised with advantage in districts where fuel is scarce, the



Pollard Oak.

branches being cut off in order to be used for fuel, and the operation repeated every third or fourth year. It is much more prevalent in many parts of Europe than in any part of Britain, and in Britain is almost confined to those districts of England which are furthest from coal. Willows, Poplars, Alders, Elms, Oaks, and Limes are the trees most frequently pollarded, and in some parts of Europe the White Mulberry. The trees of most rapid growth are preferred where fuel is the object; and willows, poplars, and alders are planted along water-courses, and in rows in moist meadows and bogs. Oaks are sometimes pollarded chiefly for the sake of the bark of their branches, and the whole treatment very much resembles that of copse-wood. In some parts of Germany, landscapes may be seen of open country with many scattered oak and elm pollards, presenting a very peculiar appearance.

PO′LLEN. See STAMEN and FECUNDATION.

POLLE′NZA, a well-built town in the northern part of the island of Majorca, about 2 miles west of the Bay of Pollenza, and 28 north-west of Palma. It has a Jesuits' college and some manufactures of blank woollen cloth. Pop. about 7500.

PO′LLIO, C. ASINIUS, a politician, soldier, and author of considerable merit, and still more considerable reputation, was born in Rome 76 B.C., but belonged to a family of Marrucinian descent. His first ambition was to be an orator, and in his youth he seized every opportunity of hearing such men as Hortensius and Cicero. When civil war broke out between Cæsar and Pompey, P. sided with the former, was present at the crossing of the Rubicon, and accompanied the great general in his rapid triumphal march through Italy. He joined Cæsar in his expedition to Greece against Pompey, and took part in the decisive battle of Pharsalia, 48 B.C. At the time of Cæsar's assassination (15th March, 44 B.C.), P. was governor of Hispania Ulterior (Further Spain), and carrying on the war against Sextus Pompey. In the subsequent struggles, he sided with the triumvirate (Antony, Lepidus, and Octavian) against the oligarchic senate; and on the triumph of the former, was appointed administrator of Transpadene Gaul, in which capacity he saved the property of the poet Virgil at

Mantua from confiscation. After Antony and Octavian had quarrelled, it was P. who effected their temporary reconciliation at Brundusium, 40 B.C.; next year he conducted a succesful campaign against the Parthini, a people of Illyria, and in consequence, obtained a triumph. After this event, however, he withdrew altogether from political life. He lived 18 years after the Emperor Augustus, dying at his Tusculan villa, 4 A.D., in the 80th year of his age. Besides having a reputation for oratory, P. was celebrated as a historian, poet, and critic; and there seems little reason to doubt that he was an author the loss of whose writings is to be regretted. His literary and political criticism of his contemporaries, in particular, appears to have been valuable. He also claims remembrance as a distinguished patron of men of letters, such as Catullus, Horace, Virgil, and as the founder of the first public library at Rome.

POLLNITZ, KARL LUDWIG VON, noted as a writer of memoirs of his time, was born near Cologne in 1692. He was equally remarkable for his talents and want of principle; and while his father's position as minister of state to the Elector of Brandenburg gave him access to court-circles, his extravagance and eccentricity, coupled with his vagabond habits, often reduced him to the greatest poverty. But after wandering all over Europe, taking service in the church in Austria, and in the army in Spain, he finally attracted the favorable notice of Frederick the Great, who appointed him his reader, and made him director of the theater at Berlin. After having twice changed from Catholicism, to Calvanism, he proclaimed himself a member of the church of Rome shortly before his death, which occurred in 1775. Among the numerous memoirs, either written by or ascribed to him, the following were the most popular in their day, and the most applauded for the powers of observation and the wit which they exhibit: *Lettres et Mém., et la Relation de ses premiers Voyages* (Amst. 1735); *Etat abrégé de Saxe sous Auguste III.* (Frankf. 1734); *Hist. secrète de la Duchesse d'Hanovre, épouse de George I.* (Lond. 1732). After his death, Brunn brought out P.'s *Mémoirs pour servir à l'Histoire des quatre derniers Souverains de la Maison de Brandenbourg* (2 tomes, Berl. 1792).

POLLOCKSHAW'S, a municipal borough in the county of Renfrew, Scotland, is situated on the banks of the White Cart, about 2½ miles south-west of Glasgow. The name is derived from the estate of Nether-Pollock, on which the town stands, and from the Scotch word 'shaw,' which means a 'grove' or 'plantation.' P. is entirely a manufacturing town; cotton-spinning, calico-printing, silk-weaving, bleaching, iron-founding, and fancy dyeing, are extensively carried on. Pop. (1881) 9333.

POLLOK, ROBERT, a Scottish poet, was born in 1799 at Muirhouse, in the parish of Eaglesham, in the county of Renfrew. After receiving the ordinary course of instruction in country schools, he was sent to the university of Glasgow, and on the completion of his curriculum in arts, he entered the Divinity Hall of the Secession Church, where he studied five years. In 1827, he was licensed to preach. By this time he had written the *Course of Time*, and its composition, together with the ardor with which he pursued his studies brought on consumption. The poem was published by Mr. Blackwood in the same year in which the author received license. It was highly praised, but the voice of praise fell on a dying ear. In his critical state, his medical attendants recommended residence for a time in Italy, and in compliance with their advice, he set out, accompanied by his sister. On his arrival in London, his symptoms became suddenly worse, and unable to prosecute his journey, he went to reside at Shirley Common, near Southampton, where he died on the 17th September 1827. He was interred in the churchyard at Millbrook, and over his grave an obelisk has been erected.

The *Course of Time* has run through more than twenty editions, and is extremely popular in Scotland. It is a work of genius, but curiously unequal in merit. It contains eloquent and spirited passages, but considerable portions of it read like a dull sermon turned into blank verse. The writer drew his inspiration from nature, from Milton, and the Shorter Catechism—from the last, perhaps, most of all. His Memoir, written by a brother, was published in 1843. P. also wrote *Tales of the Covenanters*, which were published anonymously.

POLO, MARCO, the celebrated traveler, was born of a noble family of Dalmatian origin, at Venice, about 1250. His father, Nicolo Polo, and his uncle, Matteo Polo, both eminent merchants, had, previous to his birth, set out on a mercantile expedition visiting Constantinople, Soldaya or Sondach (on the Euxine), and Bulgar (on the Volga), the capital of Barkâi, the Khan of Kept-chak. Thence they traveled round the north side of the Caspian Sea to Bokhara, where they remained three years, studying the Mongol language and trading; but in 1261, some ambassadors from the Perso-Mogul khan to Kûblai (q. v.), the Grand Khan of the Mongols, happening to pass through Bokhara, the brothers Polo resolved to accompany them to Kemenfu, the summer residence of the Khagan. They were well received by Kûblai, who was very inquisitive concerning the peoples and mode of government in Europe, and commissioned them to act as his envoys to the pope, bearing a written request for 100 Europeans, well learned in the sciences and arts, to act as instructors to the Mongols. They reached Venice in 1269; but finding it impossible to discharge the mission with which they had been intrusted, they set out on their return in 1271, taking with them young Marco, and arrived again at the court of Kûblai Khan in 1275. Their second reception was still more honorable than the first, and the Khagan took special notice of Marco, from the rapidity with which he learned the customs and language of the Mongols. His wisdom and the nobility of his demeanor also recommended him as a fit envoy to the various neighboring rulers; and during his residence at their several courts, P. was in the habit of closely observing the manners and customs of the country, and delivering on his return a detailed report to the Khagan. These reports were the groundwork of the book which informs us regarding the state of Central and Eastern Asia in the end of the 13th century.

P.'s first mission was to the court of Annam or Tonquin (1277), and during his residence there, he acquired much information, both from his own observation and from report, concerning Tibet, Yunnan, Bengal, Mien (or Pegu), and the south of China; he was next employed to aid in making an inventory of the archives belonging to the court of the Song dynasty; and soon afterwards was appointed governor of the town of Yang-tchow, in the province of Kiang-si, in Eastern China, a post he held for three years. He also accompanied a Mongol army to the attack of the kingdom of Pegu; and closed the list of services rendered to Kûblai by accepting the embassy to Tsiampa, the south part of Cochin-China. Having thus passed 17 years in the service of the Mongol khan, and visited the chief countries and cities of Eastern Asia, traveling through kingdoms (as China) which no European had ever seen before, and acquiring much knowledge of other kingdoms (as Japan, called by P. *Zipangu*), the existence of which was not even suspected, he succeeded in obtaining permission to join the escort of a Mongol princess, who was traveling to the court of Persia. The three Polos accordingly set out in 1291, traveling through China, and thence, by sailing through the Chinese Sea and Indian Ocean, finally arrived at Teheran, where they stayed for some time; but learning that Kûblai Khan was now dead, they continued their journey, and arrived at Venice in 1295, bringing with them much wealth and many precious objects, the fruits of their trading. Marco, in the following year, fought his own galley in the great battle off Curzola, in which the Venetians, under Dandolo, were defeated by the Genoese under Doria, and was taken prisoner and immured in a dungeon at Genoa. Here he dictated, with the aid of the memoranda he had made during his travels, an account of his journey through the East, which was subsequently revised with care.

After his liberation he returned to Venice, where he was appointed member of the Grand Council, and died in 1323, eleven years after his father. His work is variously entitled, but the best edition is *Il Milione di Messer Marco Polo Veneziano*, edited by Count Baldelli (Florence, 4 vols. 4to, 1827), and accompanied with a map, notes, and illustrations. P.'s narrative created an immense sensation among the learned public, and many did not hesitate to affirm that it was a pure fiction; but the Catholic missionaries and subsequent Venetian travelers into these remote regions, verified many of P.'s statements, and then came a reaction of public opinion; P.'s wonderful minuteness, extensive research, and accuracy, being the theme of universal admiration. His work was of inestimable value as a stimulant and guide in geographical research; it encouraged the Portuguese to find the way to Hindustan round the Cape of Good Hope; and it roused the passion for discovery in the breast of Columbus, thus leading to the two greatest of modern geographical discoveries. The first edition of P.'s 'Voyages' was published by Ramusio in his *Raccolta di Navigazioni e Viaggi* (Venice, 1550—1559). English translations have been published in Edinburgh (1844), and in London (1854 and 1871—1875). There is also a German one by Burck, with notes by Neumann (1846).

POLO, an equestrian game recently introduced from India into England, where not a few P. clubs have been founded. The game was first taken up by British cavalry officers when stationed at Lahore in the Punjab; and in England it is still practised chiefly by officers. P. may be familiarly described as hockey on horseback. The ground is three or four hundred yards long, and nearly as wide; the goals are each marked by two posts eight feet apart. Each player, mounted on his pony—for in England ponies are usually employed—holds in his hand a stout stick, having a curved hook at the lower end. The stick is not long enough to touch a ball on the ground without the rider's stooping somewhat; and he must be prepared to stoop to right or left with equal readiness, and to drive the ball backward, forward, or sidewise. The ball is dropped on the ground midway between the goals; then two sets of riders (generally about five on each

side) gallop forward, each endeavoring, by means of repeated strokes, to drive the ball through the enemy's goal. As a safeguard against kicks during the scrimmage, the legs of the ponies are thickly bandaged. P. is admittedly an exciting amusement, and is also splendid training for a horseman.

POLO'TSK, a town of West Russia, in the government of Vitebsk, on the banks of the Düna, where that river is joined by the Polota. It was founded in the 9th c., is the seat of a bishop of the Greek United Church, and has several churches, besides a convent and a school for the nobility. Here, in 1812, the Russian general, Wittgenstein, defeated the French under Oudinot and Sire. Pop. (1867) 11,418.

POLTA'VA, chief town of the government of the same name, is situated on the right bank of the Worskla, a tributary of the Dnieper, about 934 m. S.S.E. of St. Petersburg. Pop. (1867) 31,852. P. has few manufactures, and its trade displays activity only during the annual fairs, of which there are four. The most important is called the Illinsky, which lasts about a month. At these fairs, merchandize is exposed for sale worth £4,000,000. The principal articles of traffic are cloths, woollen tissues, colonial productions, fur, wool, horses, and agricultural produce and implements. P. is famous as the scene of Charles XII.'s defeat by Peter the Great in 1709, and a monument commemorating the victory of the czar stands in the principal square; while three miles from the town a mound surmounted by a cross, still known as the 'Swedish Tomb,' marks the battlefield. P. has a cathedral, numerous churches, and a school for cadets.

POLTAVA, a government of Little Russia, between the governments of Kiev on the west and Kharkov on the east. Area, 19,071 sq. m.; pop. (1870) 2,102,614. The surface is flat, with a gradual slope south-west to the banks of the Dnieper, which forms the southern boundary, and into which the chief rivers—the Sula, Psiol, and Worskla—flow. The government does not abound in wood, but possesses rich and extensive pastures. The soil is for the most part clay and fertile vegetable mould, and the climate is healthy. Agriculture and cattle-breeding are the staple occupations. Many of the peasantry are employed with their oxen in bringing salt from the lakes of the Crimea, and fish from the Don. The manufactures are not numerous nor important. Commerce is chiefly in the hands of Jews, and is mostly transacted at the fairs, the most important of which are those of Poltava and Romny.

PÖLTEN, ST. is a fortified town of Lower Austria, 35 m. W. of Vienna. It is the seat of a cathedral, and has manufactures of cotton, paper, glass, and stoneware goods. Pop. (1869) 7779.

POLYA'NDRY, or POLYANDRIA, that form of polygamy which permits a woman to have several husbands. See MARRIAGE. The hot-bed of polyandry is Tibet. There a wife commonly is the wife of a whole family of brothers—the elder brother being chief husband. In the Himalayan and sub-Himalayan regions adjoining and under the influence of Tibet, it is of frequent occurrence in the same form, as in the valley of Kashmir, in Ladak, among the Koech, among the Telingese. Further south in India, we find polyandry among the Tudas of the Nilgherry Hills, the Coorgs of Mysore, and the Nayars of Malabar. We find it again off the Indian coast in Ceylon; and going eastward, strike on it as an ancient though now almost superseded custom in New Zealand, and in one or two of the Pacific islands. Going northward, we meet it again in the Aleutian Islands; and taking the continent to the west and north of the Aleutians, it is found among the Koryaks, to the north of the Okhotsk Sea. Crossing the Russian empire to the west side, we meet it among the Saporogian Cossacks; and thus have traced it at points half round the globe. This is not all, however. It is found in several parts of Africa; and it occurs again in many parts of America among the red men. We have the authority of Humboldt for its prevalence among the tribes on the Orinoco, and in the same form as in Tibet. 'Among the Avaroes and the Maypures,' he says, 'brothers have often but one wife.' Humboldt also vouches for its former prevalence in Lancerota, one of the Canary Islands.

Thus, polyandry is a phonomenon of human life independent of race and country.—See Latham's *Descriptive Ethnology* (1859), vol. i. pp. 24, 28; vol. ii. pp. 398, 406, and 462; Humboldt's *Personal Narrative*, William's translation, 1819, vol. v. part 2, p. 549; and chap. i. vol. i. p. 84; Hamilton's *New Account of the East Indies* (Edin. 1727), vol. i. pp. 274 and 308; Reade's *Savage Africa*, p. 43; Erman's *Travels in Siberia*, vol. ii. p. 531; *Marriage Ceremonies*, by Seignior Gaya (translation), 2d edition (Lond. 1698) pp. 70 and 96; Emerson Tennent's *Ceylon*, 3d edition (1859), vol. ii. p. 429; Grey's *Polynesian Mythology*, 1855, p. 81; *A Summer Ramble in the Himalayas* (1860); Vigne's *Kashmir; Journal Asi. Soc. Bengal*, vol. ix.; *Asiat. Resch.*, vol. v.; also M'Lennan's *Primitive Marriage* 1865; and Herbert Spencer's *Principles of Sociology* (1876).

From ancient history we learn that the area over which polyandry at one time existed was even more extended; while in certain cantons of Media, according to Strabo (lib. ii. p. 798, and see Goguet, vol. iii. book vi. c. i.) polygynia was authorized by express law, which ordained every inhabitant to maintain at least seven wives; in other cantons, precisely the opposite rule prevailed; a woman was allowed to have many husbands, and they looked with contempt on those who had less than five. Cæsar informs us that in his time polyandry of the Tibetan type prevailed among the Britons (*De Bello Gallico*, lib. v. c. xiv.). We find direct evidence of its existence among the Picts in the Irish Nennius App. li., not to mention the traces of it remaining in the Pictish laws of succession. Indeed, to pass over communities in which something like promiscuity of intercourse between the sexes is said to have prevailed—such as the Massagetæ, Agathyrsi, and the ancient Spartans—we find several among which polyandry, or a modified promiscuity, must have been the rule.

Assuming that the legal obligation laid on younger brothers in their turn to marry the wives of their deceased elder brother, is a relic of polyandry of the Tibetan type, then we must hold that polyandry prevailed at one time throughout India (*Institutes of Menu*, chap. iii. s. 173, and chap. ix. ss. 57, 58), among the ancient Hebrews (Deut. xxv. verses 5—11); in Siam, Burmah, in Syria among the Ostiaks, the But (Bodo), the Kasia, and the Puharies of Gurhwal. Traces of it indeed remained in the time of Tacitus among the Germans (Tac., *Germ.*, xx., Latham's edition, p. 67 and seq.). In short, polyandry may be regarded as one of the transitional forms in the advance from a state of promiscuity, on the assumption that pure promiscuity ever existed. Of the origin of this peculiar institution, our space forbids us to write; but we believe it to be connected with the want of balance between the numbers of the sexes, due to the practice of female infanticide, which is its almost invariable accompaniment. Tribes of warriors, wholly devoted to a military life, find women an incumbrance rather than a solace; and from this cause, and probably from the difficulties of subsistence, formed the practice of killing their female children, sparing them only when they were the first-born. The disparity of the sexes would lead to polyandry, and once instituted, the custom would in many cases continue to exist after the habits and necessities which produced it disappeared. In several places, as in Ladak, where polyandry prevails, the sexes are now either equally balanced, or the female sex predominates. In these cases, polygynia and polyandry are commonly found existing side by side. The subject is one which demands, and as yet has not received full investigation.

POLYA'NTHUS (Gr. many-flowered), a kind of Primrose (q. v.), much prized and cultivated by florists. It is generally believed to be a variety of the Common Primrose (*Primula vulgaris*),



Polyanthus.

produced by cultivation, in which an umbel of numerous flowers is supported on a common *scape* (leafless flower-stem), instead of each flower rising on its own stalk from the crown of the root; a modification to which a tendency often appears in the wild plant itself. Thus, in its habit it somewhat resembles the cowslip and oxlip, whilst in the size of its flowers it is more like the common primrose; but instead of the pale uniformity of the wild plant, it exhibits great variety of delicate and beautiful colors. The subvarieties are innumerable, new ones being continually produced from seed, and of short duration. The seed is sown about midsummer, and flowers may be expected in abundance next year, if the young plants are properly planted out. A rich free soil is most suitable. The P. loves shade and moisture more than its congener, the auricula. It is very hardy, and seldom suffers from from the most severe winters. Fine kinds are preserved for a time by dividing the root. The cultivation of the P. is prosecuted with particular assiduity and success in England.

POLYA'NTHUS NARCI'SSUS. See NARCISSUS.

POLYATO'MIC ALCOHOLS. The term *Alcohol*, originally limited to one substance—viz., spirit of wine, or hydrated oxide of ethyl, has begun to be applied to a considerable number of organic compounds, many of which, in their external characters, bear little resemblance to common alcohol. Most of them are fluid and volatile, some of them are combustible, and all of them are composed of carbon, hydrogen, and oxygen, behave in a precisely similar manner towards the same decomposing agents, and are perfectly neutral to test-paper.

Every alcohol, when acted on by oxidizing agents, loses two equivalents of hydrogen, and is converted into an *Aldehyde;* and by the prolonged action of the oxidizing agent, the aldehyde takes up two equivalents of oxygen, and is converted into a *special acid.* Moreover, all alcohols, by the abstraction of the elements of water, yield ethers. Hence, every alcohol has its own ether, aldehyde, and special acid; the aldehydes of the alcohols termed polyatomic have, however, not been formed

According to the theory of organic radicals, the alcohols are hydrated oxides of an alcohol radical. Thus, common alcohol, or spirit of wine, is the hydrated oxide of the radical ethyl (C_4H_5), and is represented by the formula C_4H_5O,HO; similarly, wood-spirit is the hydrated oxide of the radical methyl (C_2H_3), and is represented by the formula C_2H_3O,HO. According to the theory of chemical types (see TYPES, CHEMICAL), the alcohols are divided into *monatomic* and *polyatomic.* A molecule of water consists of two atoms of that substance, and is therefore represented by the formula H_2O_2, which may be arranged in the form $\left.\begin{matrix}H\\H\end{matrix}\right\}O_2$. If half the hydrogen in this typical formula be replaced by an organic radical, such, for example, as C_nH_{n+1}, C_nH_{n-1}, C_nH_{n-3}, C_nH_{n-7}, or C_nH_{n-9} (*n* being even in all these cases), we obtain what is termed a monatomic alcohol, *one* equivalent of hydrogen being here replaced. Besides the primary water-type represented by one molecule of water, there are derived or secondary and tertiary types, represented by two and by three molecules of water, and expressed in the forms $\left.\begin{matrix}H_2\\H_2\end{matrix}\right\}O_4$ and $\left.\begin{matrix}H_3\\H_3\end{matrix}\right\}O_6$. If half the hydrogen in $\left.\begin{matrix}H_2\\H_2\end{matrix}\right\}O_4$. be replaced by an organic radical, we obtain an alcohol said to be *diatomic,* in consequence of its being formed by the replacement of two equivalents of hydrogen. Similarly, if half the hydrogen in $\left.\begin{matrix}H_3\\H_3\end{matrix}\right\}O_6$ be replaced by an organic radical, we obtain a triatomic alcohol. The term *polyatomic* is applied to all alcohols which are not monatomic.

POLYBA'SIC ACIDS. Most of the inorganic acids combine with bases in such a manner that one atom of the acid is united with one atom of a metallic oxide to form a neutral salt. Nitric acid may be taken as an illustration of the acids possessing this property, and which may therefore be called *monobasic.* In other cases, as, for example, that of pyrophosphoric acid (see PHOSPHORUS), one atom of acid possesses the property of combining with two atoms of base; such acids are termad *bibasic* or *dibasic.* There are strong grounds for believing that sulphuric acid is bibasic, in which case its formula would require to be doubled, and to be written $2HO,S_2O_6$. Common phosphoric and arsenic acids are examples of a third class of acids in which one atom combines with three atoms of base, and which are therefore termed *tribasic.* Whether any polibasic acids beyond tribasic acids exist, is uncertain, but it is probable that silicic acid is a *tetrabasic* acid.

Amongst the organic acids, a similar relation takes place, acetic, succinic, and citric acids affording examples of the monobasic, dibasic, and tribasic class.

The following are the most important general differences shown by acids of different degrees of basicity.

1. Each *monobasic* acid can form but *one* ether, which is neutral. 2. A *Monobasic* acid cannot form a stable, well-defined acid salt, or a salt with two or more metallic bases.

1. Each *dibasic* acid can form *two* ethers, one neutral, and the other acid. 2. *Dibasic* acid can form with each metallic base a neutral salt and an acid salt. They can also form double salts containing two metallic bases.

1. Each *tribasic* acid can form *three* ethers, one neutral, and two acid. 2. *Tribasic* acids can form *three* salts with the same metallic base, two of them acid, and one neutral.

Many attempts have been made to account for the polybasic or monabasic character of an acid, from its composition. According to the Kekulé (*Lehrbuch der organisch. Chemie*, vol. 1, p. 210—219), the basicity depends not, as was formerly supposed, on the molecular constitution of the acid, but upon the amount of oxygen contained in its radical. For further details on this subject, the reader is referred to the article ACIDS in Watt's *Dictionary of Chemistry*, vol. 1, 1863.

POLY'BIUS, the Greek historian, was born about 204 B.C. in Megalopolis, a town of Arcadia. From Lycortas, his father, who was among the leading men of the Achæan League, he received valuable instruction in the science of politics and in the art of war. In 181, he would have visited Egypt in the capacity of ambassador, but the project of sending an embassy to that country was given up. His engaging in public affairs probably dates from this period; and he rapidly gained the confidence of his countrymen. He was one of the 1000 noble and influential Achæans, who, after the conquest of Macedonia in 168, were sent to Rome on the summons of the commissioners from that city to answer the charge of having failed to assist the Romans against King Perseus. On their arrival in Italy in 167, they were not put upon their trial, but were distributed among the towns of Etruria. Owing, perhaps, to his having formed the friendship of Æmilius Paulus, or of his sons Fabius and Scipio, he was more fortunately allocated than others of his countrymen. His residence was fixed at Rome and in the house of Paulus. Scipio, then about 18 years of age, became strongly attached to P., made him his companion in all his military expeditions, and profited greatly by his knowledge and experience. P. in his turn derived much advantage from the protection and friendship of Scipio, who gave him access to public documents, and aided him in the collection of materials for his great historical work. In 151, the surviving Achæan exiles were permitted by the Roman senate to return to Greece, and among them was P., who arrived in Peloponnesus after a residence of 17 years in Italy. He soon, however, rejoined Scipio, followed him in his African campaign, and was present at the destruction of Carthage in 146. But the outbreak of war between the Achæans and Romans summoned him again to Greece, where he arrived soon after the taking of Corinth.

All his influence was now exerted to procure from the conquerors favorable terms for the vanquished, and so grateful were his countrymen for his services in their behalf, that they erected statues in his honor at Megalopolis (his native town), Mantinea, Pallantium, Tegea, and other places. It must have been about this time that P. undertook the writing of his great historical work, the materials of which he had so long been collecting. We cannot now fix with accuracy at what period of his life he visited in foreign countries the places which he had to describe in his history. We know from himself that at one time, probably while accompanying Scipio, he undertook long and laborious journeys into Africa, Spain, Gaul, and even as far as the shores of the Atlantic, in order to add to the scanty knowledge previously existing with regard to these regions. In the latter period of his life, he traveled in Egypt; and about twelve years before his death, he probably accompanied Scipio to Spain, where he witnessed the fall of Numantia. He died about 122 B.C., in his 82d year, in consequence of a fall from his horse.

As a historian, P. occupies a high rank. His work, which began where that of Aratus broke off, includes the period between 220 and 146 B.C., the year when Corinth fell, and, with it, the independence of Greece. Of the two parts into which it was divided, the first embraced a period of 53 years, commencing with the Second Punic War and the Social War in Greece, and concluding with the subjugation of the kingdom of Macedonia in 168. This, the chief portion of his history, was designed to show how, in the short space of 53 years, the greater part of the world had been conquered by the Romans; and in order that his countrymen might have a better knowledge than they possessed of the rise of that people, he gives a sketch of the history of Rome from its capture by the Gauls to the outbreak of the Second Punic War. This occupies the first two books, and may be regarded as an introduction to the work.

The second part embraces the period from the fall of the Macedonian kingdom, in 168, to the taking of Corinth in 146. This part is to be viewed as supplementary to the first, and seems to have brought down the history of the conquest of Greece to its completion in the 39th book, while the 40th and last probably contained a chronological summary of the entire work. The style of P. is not his most striking feature, and he incurred the censure of later Greek critics for his negligence in the choice of words and in the structure of his sentences. His great merits are the care with which he collected his materials, his strong love of truth, and the sound judgment, which was materially assisted by his familiarity with political and military life. His tone is too didactic in general, and although his readers are prepared for this by his calling his work not a *Historia*, but a *Pragmateia*, still the continuity of the narrative is too often interrupted by digressions, sometimes interesting and valuable in themselves, but fatal to artistic effect. Much the greater part of his work has perished. Of the 40 books, we possess only five entire; and of the rest, merely fragments or extracts. Some of these latter, however—such as the account of the Roman army—are of considerable length and value, and four separate collections of them have been added from time to time to the remains of the work. The first of these, discovered soon after the revival of learning, in a

MS. of Corfu, gives us the greater part of the 6th book, and portions of the remaining 11. The second consists of extracts made in the 10th c., entitled *Excerpta de Legationibus*, and published at Antwerp by Ursinus in 1582. The third, entitled *Excerpta de Virtutibus et Vitiis*, was published in 1634 by Valesius. The fourth, entitled *Excerpta de Sententiis*, was discovered by Cardinal Mai in the Vatican, and published by him at Rome in 1827. The history of P. was very closely followed by Livy after the period of the Second Punic War, and by Cicero in his account of the Roman constitution in his treatise *De Republicâ*.—The best annotated edition of P. is Schweighäuser's (Leip. 1789). The best editions of the text, including that of the Vatican fragments, are those of Bekker (Ber. 1844) and L. Dindorf (1866).

PO'LYCARP, Bishop of Smyrna, and one of the most illustrious of the early Christian martyrs, was born in the latter part of the 1st c. A.D., but neither the date nor the place of his birth is known. He was, however (according to a legendary fragment ascribed to an unknown Pionius), brought up at Smyrna, where his pupil, Irenæus, states that P. was taught the doctrines of Christianity by the apostles, particularly by John, with whom he had 'familiar intercourse.' The testimony of Irenæus on this point is of immense value, as it furnishes the chief historical link uniting the apostolic age—that age which is reflected in the later parts of the New Testament—with the rising church of the 2d century. The passage occurs in an expostulatory epistle to a Roman heretic, Florinus, and is preserved by Eusebius (*Hist. Eccl.* chap. xx.). 'I can tell also the very place where the blessed Polycarp was accustomed to sit and discourse; and also his entrances, his walks, the complexion of his life, and the form of his body, and his conversations with the people, and his familiar intercourse with John, as he was accustomed to tell, as also his familiarity with those that had seen the Lord. Also concerning his miracles, his doctrine, all these were told by Polycarp, in consistency with the Holy Scriptures, as he had received them from the eye-witnesses of the doctrine of salvation.' The fragment of Pionius (to which reference has already been made) informs us that P., when only a little child, was adopted by a rich Christian lady named Callisto, who left him heir to all her wealth; in consequence of which he was enabled to gratify his love of works of beneficence and charity. We are, however, utterly without the means of determining what truth (if any) there is in the narratve of Pionius, and can only feel certain that in some way or other he had distinguished himself at a comparatively early period, for before the death of the Apostle John (i. e., at the latest, before 104 A.D.), he was ordained Bishop of Smyrna (according to Tertullian and Jerome) by John himself; according to Irenæus, by 'the apostles;' and according to Pionius by 'the bishops of the neighboring churches'—statements which are quite reconcilable with each other. P. was in the exercise of his episcopal functions when Ignatius of Antioch passed through Smyrna on his road to Rome (107—116 A.D.); and we are told that the two pupils of St. John, who had probably known one another in earlier years, had much delightful Christian converse.

Almost half a century afterwards, P. himself visited Rome, when Anicetus was bishop there (157—168 A.D.), and had a friendly conference with his brother on the subject of the proper time to hold Easter. They could not agree—but they agreed to differ. His martyrdom, which is related at great length and in a touching manner by Eusebius (*Hist. Eccl.* chap. xiv.), took place probably in 166 A.D., during the persecution under the emperors Marcus Aurelius and Lucius Verus. When asked, or rather entreated 'to revile Christ' by the proconsul Statius Quadratus, who, being deeply impressed with the venerable appearance of the aged bishop, wished if possible to save his life, P. replied: 'Eighty-and-six years have I served him, and He never did me wrong; and how can I now blaspheme my King that has saved me.' P. was burned alive. In such profound reverence was he held by his fellow-Christians, for his almost perfect graces of character, that the Jews (who had been conspicuously zealous in collecting 'wood and straw from the shops and baths' to burn him) instigated the proconsul not to give up the corpse of the martyr to his co-religionists, 'lest, abandoning him that was crucified, they should begin to worship this one.' More convincing evidence of a saintly character has never been adduced.

P. wrote several *Epistolæ*, of which only one has been preserved, the *Epistola ad Philippenses*, valuable for its numerous quotations from the New Testament—especially from the writings of Paul and Peter. It is, however, doubtful whether this epistle is really by P. In the most recent edition of the Apostolic Fathers (*Patrum Apostolicorum Opera*, Leipsig, 1877), Prof. Zahn defends its genuiness. There are English versions by Cave, Clementson, and Wake.

PO'LYCHROME PRINTING, the art of printing in one or more colors at the same time. Although several attempts had been previously made to carry out this process, Congreve, in 1820, was the first to do it successfully with metal plates. Sir William Congreve had seen Applegath's poly-chromatic block-printing press, by which very rude-colored pictures were produced, and he conceived the idea of improving upon it, and doing it with metal. His plan is extremely simple, though requiring great nicety in carrying it out. First, the picture is outlined upon a metal-plate; and supposing it intended to have two colors, then the details of only the chief color are completed upon it, and all the parts for the other color are cut out; and into those parts other plates are fitted, like the portions of a child's puzzle-map, but with very great exactness; and upon these the engraving for the parts of the second color are completed. When these are done, a thickness of type-metal is attached to the back of these interior pieces, so that they can be held separately, and pushed forwards or drawn backwards at pleasure. Then they are so adjusted to the machinery of the press, that they are withdrawn when the first color-roller passes over the surface of the main plate, and are pushed forward beyond the face of the main plate, so as to receive the color of the second roller, which then passes over them without touching the first or main plate. Having received their colored ink, the secondary plates are again moved back to a perfect level with the other, so as to form an entire plate, carrying two colors, which are thus, in the ordinary way, imprinted on the paper. Since Sir William Congreve's patent, very many improvements have been made, the principle, however, remaining the same, and it has now a very wide application.

POLYCOTYLE'DONOUS PLANTS, those plants of which the embryo has more than two seed-lobes or cotyledons. See COTYLEDON and DICOTYLEDONOUS PLANTS. In some of the *Coniferæ* in particular, there are numerous cotyledons; the genus *Pinus* has from three to twelve. These cotyledons are placed in a whorl, and have the gemmule of the embryo in the midst of them. Polycotyledonous plants do not form a separate division of the vegetable kingdom, but are ranked with dicotyledonous plants; for plants with two, and plants with more cotyledons, are found not only in the same natural order, but in the same genus.

POLY'CRATÉS, 'tyrant' of Samos, is a well-known name in ancient Greek history. He was born in the first part of the 6th c. B.C., but nothing is known of him until the time when, with the assistance of his brothers Pantagnôtus and Sylosôn, he obtained possession of the island. The three brothers at first ruled conjointly, but after a short time, P. put Pantagnôtus to death, banished Sylosôn, and made himself sole despot. His energetic, unscrupulous, and ambitious character now showed itself more conspicuously than ever. He conquered several islands of the Archipelago, and even some towns on the Asiatic mainland, waged war successfully against the inhabitants of Milêtus, and defeated their allies, the Lesbians, in a great sea-fight. His fleet amounted to 100 ships, and was probably at that time the most powerful in all Greece. P. seems to have aspired to the sovereignty of the Ægean, if not also of the cities of Ionia. His intimate alliance with Amasis, king of Egypt, proves the importance in which this daring island-prince was held even by great monarchs. According to Herodotus, Amasis drew off from his alliance through alarm at the uninterrupted good fortune of Polycratés. He dreaded, we are told, the misfortunes that the envious gods must be preparing for so lucky a mortal, and to which his friends would also be exposed. The particular incident that is said to have finally ruptured the alliance is doubtless mythical, but is so well known that we cannot afford to overlook it.

Amasis is reported to have written a letter to P., earnestly advising him to throw away the possession that he deemed most valuable, and thereby avert the stroke of the spleenful gods. P., in compliance with this friendly advice, cast a signet-ring of marvelously beautiful workmanship into the sea, but next day a fisherman presented the 'tyrant' with an unusually big fish that he had caught, and in its belly was found the identical ring. It was quite clear to Amasis now that P. was a doomed man, and he immediately broke off the alliance. So, at least, Herodotus tells the story, but Grote (*History of Greece*, vol. iv. p. 323) suggests—and the suggestion is far more probable—that P., with characteristic perfidy, abandoned the Egyptian for a Persian alliance, when he found the latter likely to be of more value to him in his ambitious designs. When Cambyses invaded Egypt (525 B.C.), P. sent him a contingent of forty ships, in which he placed all the Samians disaffected towards his 'tyranny,' and told the Persian king privately not to let them come back! However, they escaped in some way or other the fate which P. had designed for them, returned to Samos, and made war against the 'tyrant,' but without success. Hereupon, they went to Sparta, and succeeded in enlisting the sympathies, or, at any rate, in securing the help of both the Spartans and Corinthians. A triple force of Samians, Spartans, and Corinthians embarked for Samos, and attacked the city. After vainly besieging it for forty days, they sailed away, and P. now became more powerful than ever; but Nemesis had her victim after all.

A certain Orœtes, the Persian satrap of Sardis, had, for unknown reasons, conceived a deadly hatred against P., and having enticed the latter to visit him, by appealing to his cupidity, he seized and crucified him. Thus perished ignominiously, in the midst of his power and splendor, one of the most famous *thalassokrats*, or sea-kings, of Greek antiquity. He was a patron of literature and the fine arts, and had many poets and artists about his court. His intimacy with Anacreon, in particular, is quite a celebrated thing, and in his praise that joyous bard wrote many songs. To P. also, in all probability, belongs the construction, or at least the enlargement, of those great buildings which Herodotus saw at Samos.

POLYDI'PSIA (Gr. *great thirst*) is the term now commonly applied to the disease formerly known as *Diabetes insipidus*. It is characterized, as its name implies, by extreme thirst, and by an enormous discharge of pale watery urine. The affection is one of rare occurrence, and the persons most liable to it are dyspeptics who have passed the period of middle life, and whose bodily powers are failing, although (as the case we shall immediately notice, and one recorded by Dr. Watson, show) it may begin in childhood. The two prominent features of this disease usually lead to the suspicion that true diabetes is present; but the low specific gravity of the urine, and the absence of sugar in it in Polydipsia, and the reverse condition in diabetes, seem to make the distinction easy. Dr. Willis, in his work *On Urinary Diseases*, records the case of a man, aged forty-five, who was admitted for an accident into the Hôtel-Dieu at Paris, and who passed, daily, on an average, thirty-four pounds of urine, and drank thirty-three pounds of water, the normal daily excretion of urine being a little less than two pounds. This person reported that he had been affected in a similar manner ever since his fifth year, and that from the age of sixteen upwards, he had daily consumed not less than two bucketfuls of water, and discharged a commensurate quantity of urine.

Little good can be effected by treatment, further then stimulating the action of the skin by the use of Dover's powder, Turkish baths, &c., and by inducing the patient to take as little drink as may be at all consistent with his comfort.

POLYGA'LEÆ, or POLYGALA'CEÆ, a natural order of exogenous plants, herbaceous or shrubby, sometimes twining; the leaves without stipules, and generally simple; the flowers resembling papilionaceous flowers, but the odd petal inferior, and the odd sepal superior; the flower-stalks with three bracts; the calyx of five very irregular sepals; of which the two interior are usually petal-like; the corolla of three, or sometimes five petals, the anterior petal the largest, and often crested; stamens eight, monadelphous or diadelphous, or four and distinct; the ovary superior, generally 2-celled, one ovule in each cell; style and stigma simple; fruit generally a capsule opening by valves, sometimes a drupe. There are about 500 species, diffused throughout all parts of the world.—The genus *Polygala* has a persistent calyx, eight stamens, the lateral sepals large and petal-like, and hairy or wrinkled seeds. The species are very numerous, annual and perennial herbaceous plants, and small shrubs, natives chiefly of warm and temperate climates. One is found plentifully in Britain; the COMMON MILKWORT (*P. vulgaris*), a small perennial plant, growing in dry hilly pastures; with an ascending stem, linear-lanceolate leaves, and a terminal raceme of small but very beautiful flowers, having a finely crested keel. It varies considerably in size, in the size and even shape of the leaves, and in the size and color of the flowers, which are sometimes of a most brilliant blue, sometimes purple, pink, or white.—Several species are natives of the south of Europe.—North America produces a greater number.



Common Milkwort (*Polygala vulgaris*).

The Cape of Good Hope and other subtropical countries produce many beautiful species, some of which have become common ornaments of greenhouses.—*P. Senega* is a North American species, with erect simple tufted stems, about one foot high, and terminal racemes of small white flowers. The root, which is woody, branched, contorted, and about half an inch in diameter, is the SENEGA ROOT, SENEKA ROOT, or SNAKE ROOT of the United States, famous as an imaginary cure for snake-bites, but really possessing important medicinal virtues—stimulating, diuretic, diaphoretic, emmenagogue, and in large doses emetic and purgative—employed in catarrhs, pulmonary affections, rheumatism, low fevers, &c. Its chief active principle is *Polygalic Acid*, $C_{22}H_{18}O_{11}$. The root of *P. Senega* has been employed as a cure for snake-bites by the American Indians from time immemorial, and it is a curious fact, that *P. crotalarioides* is employed in the same way in the Himalaya. *P. vulgaris* is tonic, stimulant, and diaphoretic; and *P. amara*, a very similar European species, possesses the same properties in a higher degree, as does *P. rubella*, a small North American species. The root of *P. poaya*, a Brazilian species, with leathery leaves, is an active emetic, and in a fresh state is employed in bilious fevers. Similar properties seem to pervade the whole genus. Another medicinal plant of the order is *Rattany* (q. v.) *root*. Species of several genera are used as tonics. The bark of the roots of *Monnina polystachia* and *M. salicifolia* is used in Peru as a substitute for soap. *Mundia spinosa*, a South African shrub, produces an eatable fruit.

POLY'GAMOUS (Gr. *polys*, many, *gamé*, marriage), in Botany, a term employed to designate those plants which produce both unisexual and hermaphrodite flowers either on the same or different plants. In the Linnæan sexual system, these plants formed a class, POLYGAMIA, the genera included in which were perhaps more completely disjoined from their natural allies than those of any other class of that system, forming by themselves a very heterogeneous assemblage.

POLYGAMY. See MARRIAGE.

POLYGA'STRICA. See INFUSORIA.

PO'LYGLOT (Gr. *polys*, many; and *glotta*, tongue) means, in general, an assemblage of versions in different languages of the same work, but is almost exclusively applied to manifold versions of the Bible. The Hexapla (q. v.) of Origen contained besides the Hebrew text, several other versions. All these, however, were in the Greek language; and the Hexapla is not commonly reckoned among the polyglots. They are divided into two classes, the greater and the lesser polyglots. To the former belong four works, known as the Complutensian Polyglot; the Antwerp or king of Spain's Polyglot; the Parisian Polyglot; and the London or Walton's Polyglot.—The Complutensian Polyglot derives its title from Complutum, the Latin name of Alcala de Henares, where it was printed in 6 vols., folio 1502—1517. It was published at the cost, and under the direction of the celebrated Cardinal Ximenes, who spared no expense, whether in collecting the most ancient and authentic MSS., or in bringing together the most distinguished scholars of all countries for the carrying out of his design. The Complutensian Polyglot contains, besides the Hebrew text, the Septuagint Greek and the Chaldee (each with a literal Latin version), and the Latin Vulgate—the Antwerp Polyglot, so called from its being there printed (1569—1572), at the celebrated press of Plantin, was published at the cost of Philip II. of Spain, under the direction of the distinguished scholar, Benedict Arias Montanus. It is in eight vols. folio, and contains, in the Old Testament, the Hebrew, the Greek, the Targum of Onkelos, and the other Chaldee paraphrases, and the Latin Vulgate. In the New Testament, besides the Greek and Latin, it contains a Syriac version, printed both in Syriac and in Hebrew characters. Arias Montanus was assisted by many scholars of eminence, chiefly of Spain and the Low Countries.—The Parisian Polyglot was printed at Paris in 1645, at the cost and under the editorship of Guy Michel le Jay. It is in ten splendid volumes, and contains, in addition to the contents of the Antwerp Polyglot, another Syriac version, and an Arabic version, together with the Samaritan version and the Samaritan text of the Pentateuch, each of these being accompanied by a literal Latin translation.

The London Polyglot was edited by Brian Walton, afterwards Bishop of Chester, and it engaged for many years a number of the most eminent linguists of the period. The number of its languages is not the same in all parts of the Bible; but it may be said to contain the Bible, or portions of it, in nine languages—Hebrew, Samaritan, Chaldee, Syriac, Arabic, Ethiopic, Persic, Greek (each of these accompanied by literal Latin version), and Latin. It is in six vols. folio, and was published in 1654—1657;

and was followed, in 1669, by the *Lexicon Heptaglotton* of Edmund Castell, two vols. folio, containing dictionaries of all the languages of the polyglot, except the Greek and Latin. Of the minor polyglots, the chief are (1) the Heidelberg Polyglot (1586), Hebrew, Greek, and Latin; (2) Wolder's Polyglot (Hamburg, 1596), Hebrew, Greek, Latin, and German; (3) Hutter's Polyglot (Nürnberg, 1599), Hebrew, Chaldee, Greek, Latin, German, and French; (4) Reineccius's Polyglot, in Syriac, Greek, Latin, and German (Leipzig, New Testament, 1712; Old Testament, 1750, 1751); (5) Bagster's Polyglot, a very valuable collection of modern versions, folio (London, 1831). It contains eight versions in the Old Testament, viz., Hebrew, Greek, English, Latin, French, Italian, Spanish, and German; and nine in the new, Syriac being added to those already named. (6) A useful 'Hand Polyglot,' containing in the Old Testament, Hebrew, Greek, Latin, Vulgate, and Luther's German version; and in the New, Greek, Latin, Luther's German, and in the fourth column, in which are presented the chief differences between this and other German versions.

Besides the Bible, many other works, or small pieces, have been published in polyglot. Of smaller pieces, the Lord's Prayer has been the favorite, of which many collections, containing a greater or less number of languages, have been published from the 16th c. downwards. Of these, the most comprehensive, and, for philological purposes, by far the most valuable, is the well-known *Mithridates* of Adelung, which contains the Lord's Prayer in nearly 500 languages, with vocabularies and grammatical explanations of most of the specimens.

POLYGNO'TUS, a distinguished Greek painter of antiquity, was born towards the beginning of the 5th c. B.C. He was a native of the isle of Thasos, and belonged to a family of painters, who came to Athens to practice their profession probably after the subjugation of Thasos by Cimon. P. and his brother, Aristophon, were instructed in the principles of art by their father, Aglaophon. We know almost nothing of their lives, except that P. was a friend of the Athenian general above mentioned, and is said to have been attached to his sister, Elpinice. He died about 426 B.C. P. was a contemporary of the great sculptor, Pheidias (q. v.) and flourished during the supremacy both of Cimon and Pericles; but we hear little or nothing of him under the latter ruler; and although the first painter of his day, it does not appear that he was engaged in the decoration of any of those splendid buildings with which that statesman adorned Athens. It is not at all unlikely that Pericles was averse to patronizing a friend of Cimon, and, at all events, P. was absent from Athens for 14 years (449—435 B.C.) of Pericles's rule, painting at Delphi and elsewhere. His principal works (following a chronological arrangement as far as it can be ascertained) were: 1. Paintings in the Temple of Theseus at Athens. 2. In the Stoa Poecile (or Painted Portico) at Athens, representing the Greek princes after the taking of Troy, assembled to judge of the violation of Cassandra by Ajax. 3. In the Anakeion, or Temple of the Dioscuri, a painting of the marriage of the daughters of Leukippos. 4. In the Temple of Athena Areia at Platæa, a picture of Ulysses after having slain the suitors of Penelope. 5. In the Lesché (or 'Conversazione Saloon'), a famous quadrangular court, or peristyle, surrounded by colonnades, built at Delphi by the Cnidians. The walls of this edifice were covered by P. with a series of paintings representing the wars of Troy, and the return of the Greek chiefs, and considered P.'s masterpiece. 6. In the chamber adjoining the Propylæa of the Acropolis. From the criticism of the ancients, it seems quite clear that P. was a great advance on any of his predecessors. He was the first who gave life, character, expression to painting. According to Pliny, he opened the mouth and showed the teeth of his figures; he was the first to paint women with transparent drapery, and with rich head-dresses. Lucian also speaks of his exquisite skill in painting eyebrows and the blush on the cheek; while Aristotle extols the ethical or ideal beauty of his conceptions, saying that P. 'represented men as better than they were,' and finding a parallel for his style in the epic poetry of Homer.

PO'LYGON (Gr. *polys*, many; *gonia*, a corner), a plane figure, bounded by a number of straight lines; the name is conventionally limited to those plane figures whose bounding straight lines are more than *four* in number. Polygons of 5, 6, 7, 8, &c. sides are denominated pentagons, hexagons, heptagons, octagons, &c.; and when the number of sides exceeds twelve, the figure is merely mentioned as a polygon of so many sides. The quindecagon, or figure of 15 sides, is the only common exception to this rule. Polygons have many general properties; such as, that the sum of the angles of a polygon, when increased by four right angles, or 360°, is equal to twice as many right angles as there are sides in the polygon, and that (supposing the number of sides of the polygon to be expressed by n) the number of its diagonals is $\frac{n(n-3)}{2}$; also if a polygon of an even number of sides be circumscribed about a circle, the sums of its even and odd sides are equal; and if a polygon of an even number of sides be inscribed in a circle, the sums of its even and odd angles are equal. A polygon which has all its sides and angles equal is called a *regular* polygon. All polygons of this class are capable of being inscribed in, or circumscribed about, a circle; but though the problem is merely to divide the circumference of a circle into a number of equal parts corresponding to the number of sides in the polygon, geometry was till lately only able to perform it in those cases where the number of sides of the polygon belongs to one or other of the series 2, 4, 8, 16, &c.; 3, 6, 12, 24, &c.; or 5, 10, 20, 40, &c. Gauss (q. v.), however, in the beginning of the present century, showed how it could be done in the case of all polygons the number of whose sides was of the form $2^n + 1$ (provided it be a prime number), or a multiple of this prime number by any power of 2. This discovery supplies us with innumerable series representative of the numbers of the sides of polygons which can be described around or inscribed in a circle, such as 17, 34, 68, &c.; 257, 514, 1028, &c.

POLYGO'NEÆ, or POLYGONA'CEÆ, a natural order of exogenous plants, mostly harbaceous plants, but including a few shrubs, and even trees. The leaves are alternate, sometimes without stipules, but more generally with stipules cohering around the stem. The flowers are not unfrequently unisexual They have an inferior, often colored Perianth, generally in four, five, or six segments; three to nine stamens, inserted into the bottom of the perianth; a one-celled ovary, usually formed of three carpels, but containing only one ovule; styles and stigmas as many as the carpels of the ovary; the fruit generally a nut, often triangular, the seed with farinaceous albumen, which has an economic importance in buckwheat. A few species produce a succulent edible fruit. The order contains nearly 500 known species, natives of almost all parts of the world, but particularly abundant in the temperate regions of the northern hemisphere. Many of the species are common weeds in Britain, as different species of Dock (q. v.) and *Polygonum*. Bistort (q. v.), Buckwheat (q. v.), and Sorrel (q. v.) belong to this order.—The genus *Polygonum* has a colored perianth of five segments, stamens in two rows, styles more or less united at the base, and two or more in number; the fruit invested by the persistent perianth. The species are very numerous. A number are natives of Britain.—KNOT-GRASS (*P. aviculare*), a very common British weed, is one of the plants remarkable for most extensive distribution over the world. It is an annual of very humble growth, but very variable, with much branched trailing stems, small lanceolate leaves, and very small flowers, two or three together, in the axils of the leaves. Thunberg says that in Japan a blue dye is prepared from this plant.

P. amphibium, one of the species often called *Persicaria*, is abundant about margins of ponds and ditches in Britain and throughout Europe, and is remarkable for the difference between the leaves which float on the water, as is often the case, and those on stems growing erect, those of the former being broad and smooth, those of the latter narrow and rough; the spikes of flowers being also of somewhat different form, and the stamens in the flowers of the floating stems shorter than the perianth, in the upright stems about as long as the perianth; differences which might be held to indicate different species, yet both may be found growing from one root. The stems have been used on the continent of Europe as a substitute for sarsaparilla. Some other species are occasionally used for medicinal purposes. *P. hydropiper*, often called WATER PEPPER, a plant common by sides of lakes and ditches in Britain, is acrid enough to be used as a vesicant. Several species are occasionally used for dyeing, as the SPOTTED PERSICARIA (*P. persicaria*), a very common weed on dunghills and in waste places in Britain; but the only species really important on this account is that called DYERS' BUCKWHEAT (*P. tinctorium*), a native of China, biennial, with ovate leaves and slender spikes of reddish flowers, the cultivation of which has been successfully introduced in France and Flanders. It yields a blue dye scarcely inferior to indigo.—*P. orientale* has long been occasionally cultivated in flower-gardens in Britain, and is quite hardy, although a native of the West Indies.—*Fagopyrum cymosum*, a species of buckwheat abundant on the mountains of the north of India, affords an excellent substitute for spinach.—*Mühlenbeckia adpressa* is the Macquarrie Harbor Vine of Tasmania, an evergreen climbing or trailing shrub of most rapid growth, sometimes 60 feet in length. It produces racemes of fruit somewhat resembling grapes or currants, the nut being invested with the large and fleshy segments of the calyx. The fruit is sweetish and subacid, and is used for tarts. *Coccolsba uvifera* is the SEASIDE GRAPE (q. v.) of the West Indies. See also CALLIGONUM.

POLYHY'MNIA, or POLYMNIA ('the Many-hymned One'), one of the nine Muses (q. v.). She was reputed by the ancients to be the inventress of the lyre, and to preside over lyric poetry and eloquence. In works of art, she is usually represented in a

pensive attitude, with the forefinger of the right hand upon the mouth.

POLY'MERISM, a form of ISOMERISM (q. v.).

POLYNE'MUS and POLYNEMIDÆ. See MANGO FISH.

POLYNE'SIA, or the region of many islands (Gr. *polys*, much or many, and *nesos*, an island), is the name usually given, with more or less of limitation, to the numerous groups of islands, and some few single islands, scattered throughout the great Pacific Ocean, between the eastern shores of Asia and the western shores of America. In its widest signification, the term P. might be understood as embracing, besides the groups hereafter to be mentioned, the various islands, large and small, of the Indian Archipelago, in one direction; and the vast island of New Holland or Australia, with its dependency of Van Diemen's Land, in another. Including these, the whole region has sometimes been called Oceania, and sometimes Australasia—generally, however, in modern times, to the exclusion of the islands in the Indian Archipelago, to which certain writers have given the name of Malaysia. In proportion, also, as the area of maritime discovery has become enlarged, it has been thought convenient by some geographers to narrow still further the limits of P., to the exclusion of Australia and Van Diemen's Land; while others, again, exclude Papua or New Guinea, New Ireland, Solomon's Isles, the Louisiade group, the New Hebrides, New Caledonia, and certain other groups and single islands, together with New Zealand, from the area of P., and give to these, in union with Australia, the collective designation of Australasia. To all these, with the exception of New Zealand, French writers have given the name of *Melanesia* or the *Black Islands*; while a similar name, *Kelænonesia*, has been given to them by Prichard and Latham—purely, however, on ethnological grounds, as we shall presently notice.

Thus, we have the three geographical divisions of Malaysia, Australasia, and P., the last mentioned of which embraces all the groups and single islands not included under the other two. Accepting this arrangement, still the limits between Australasia and P. have not been very accurately defined; indeed, scarcely any two geographers appear to be quite agreed upon the subject; neither shall we pretend to decide in the matter. The following list, however, comprises all the principal groups and single islands not previously named as coming under the division of Australasia: viz., 1. North of the equator—The Ladrone or Marian Islands, the Pelew Islands, the Caroline Islands, the Radack and Ralick chains, the Sandwich Islands, Gilbert's or Kingsmill's Archipelago, and the Galapagos. 2. South of the equator—The Ellice group, the Phœnix and Union groups, the Fiji Islands, the Friendly Islands, the Navigator's Islands, Cook's or Harvey Islands, the Society Islands, the Dangerous Archipelago, the Marquesas Islands, Pitcairn Island, and Easter Island.

These islands, which extend from about 20° north of the equator to about 30° south of it, are some of them volcanic in their origin, and some of them coralline. The volcanic islands generally rise to a considerable height above the level of the ocean, and are therefore called the high islands, in contradistinction to the coralline or low islands. They consist of basalt and other igneous formations. Of these, the principal are the Friendly Islands, one of which, Otaheite or Tahiti, has a mountain rising to the height of 10,000 feet; the Marquesas Islands, also very high; the Samoan or Navigator's Islands; and the Sandwich Islands, of which Owyhee or Hawaii possesses several both active and extinct craters, 13,000, 14,000, and even 16,000 feet high. The Galapagos group, nearest of all to South America, are likewise of igneous origin, and have several still active craters. The remaining islands are for the most part of coralline formation.

The coral islands (q. v.) may be distinguished into three classes—namely, atolls or lagoon islands, barrier reefs, and fringing reefs. The atolls are rings of coral reefs, surrounding a basin of sea-water of considerable depth, which is enclosed within this area. Examples of these are found in the Caroline Islands, the Dangerous Archipelago, and several other groups. Barrier reefs differ from the atolls chiefly in the fact of their containing an island in their center, the island being separated from the reef by a body of deep water; while the reef is in some instances entirely converted into land, and in others the sea washes over it, except in certain portions, which project above the level of the ocean. Barrier reefs occur among the Society Islands, the Gambier Islands, and many other groups. Fringing reefs are collections of coralline formation, which are found skirting the coasts of an island in the same manner as the barrier reefs, but without any interior deep water channel. They are found in almost all the groups. From the fact of some of these islands being undoubtedly volcanic, it has been argued that all were originally of the same character; those of coralline formation being based upon the crests of submarine volcanoes, over which the coral insects have for an indefinite series of years been engaged in rearing their limestone structures. In opposition to the volcanic theory, Dr. Darwin has propounded one of his own—namely, the *theory of subsidence*, which, after mature consideration, he believes to be the only one capable of explaining the various phenomena observable in the coral atolls, barrier reefs, and fringing reefs of the Pacific. All these he considers as being the production of saxigenous insects, working upwards from the foundations of what were originally so many islands, erect above the surface of the ocean, but which during long ages have been in a state of gradual subsidence. With respect to the atolls, he states it as his belief, that the lagoon is precisely in the place which the top of a shoal, and, in other cases, the highest part of an island, once occupied.

So soon as these have sunk to a depth of from 120 to 180 feet below the surface, the coral insects (which it is agreed are never found at a lower depth) commence their operations, and these working on in countless myriads, the sunken island, or a portion of it, is in process of time again reared to the level of the surrounding sea. It would take too long to specify all the phenomena upon which Dr. Darwin has based his ingenious theory, especially those connected with what are called the fringing reefs. It must be mentioned, however, that paradoxical as such a theory may seem, it has received the hearty support of no less distinguished a geologist than Sir Charles Lyell, who, in the early editions of his *Principles of Geology*, having held to the volcanic theory, has since abandoned it for that propounded by Dr. Darwin. Nor is this all; for, in the last edition of Sir C. Lyell's work, we find him mentioning with approval Dr. Darwin's 'important generalization that the Pacific and Indian Seas, and some of the lands which border them, might be divided into areas of elevation and areas of subsidence, which occur alternately.'

Of the islands generally, we need only further observe that, although situated within the tropics, the heat of the atmosphere is delightfully tempered by a succession of land and sea breezes. The soil is exceedingly fertile, and besides the vegetable productions found growing when the islands were first discovered by Europeans, it has given a welcome home to the orange, lemon, sugar-cane, guava, cotton, potato, melon, and other fruits and plants introduced by foreign visitants. The only native quadrupeds on any of the islands when first visited were pigs, dogs, and rats; but the ox, the sheep, the goat, and even the horse, have since been successfully introduced into many of the groups. The feathered tribes are numerous, likewise the insects, and the coasts everywhere abound with a vast variety of fish and crustacea, highly important as a matter of food to the inhabitants of those islands in which quadrupeds, whether native or introduced, are found in only a small number.

For a more particular description of the several groups, we refer to the distinct articles of FIJIS, FRIENDLY ISLANDS, SANDWICH ISLANDS, &c.; and shall now proceed to speak of the inhabitants generally under the head

POLYNESIANS.—This race of people, supposed at one time by certain writers to be of American origin, is now almost universally admitted to have a close affinity with the Malays of the peninsular and Indian Archipelago, and hence is classified with them by Dr. Latham under his subdivision of *Oceanic Mongolidæ*. In physical structure and appearance, the Polynesians in general more nearly resemble the Malays than they do any other race, although differing from them in some respects, as, indeed, the natives of several of the groups also do from each other. In stature, they are generally taller than the Malays, and have a greater tendency to corpulence. In color, also, they more nearly approach that of the Europeans. The hair is often waved or curling, instead of long and straight, and the nose is frequently aquiline. These differences, however, which may all have been produced by lapse of time and different conditions of existence, offer no barrier to the strong presumption, that at some long antecedent period these islands were colonized by Malay adventurers. The Malays are known at the present time to be expert and daring sailors, and in the 16th c. were so powerful at sea, that they had frequent naval combats with European fleets in the Indian Archipelago. In 1573, the king of Acheen, with a powerful armament, attacked and destroyed three Portuguese frigates; and in 1582, the same king attacked Malacca with a fleet of 150 sail. At a later period—namely, in 1615, one of his successors attacked the same settlement with a fleet of 500 vessels of various sizes and 60,000 men. If this was their strength and enterprise at a comparatively modern period, may they not have been as enterprising, if not quite so powerful, in far more remote times?

The distance between the more western groups of P. and the eastern islands of the Indian Archipelago is not so great but that it could have been easily overcome by a hardy race of sailors, even although their vessels may have not been so well constructed as in modern times; and the same reasoning holds good with respect to the other groups extending still further east, or still more to the north or south. Each island or group, as it was attained, would only form a convenient point of departure in process of time for some other island or group more remotely situated. It is true that the affinities of language are not great be-

tween the Malays and the Polynesians; still, some affinity has been recognized by philologers; while in their manners and customs a strong resemblance has been shown to exist, as in the institution of caste, the practice of circumcision, the chewing of the betel-nut, and other things. Many other facts might be mentioned in favor of the theory of a Malay settlement, not only of P., but of the islands called Melanesia or Kelænonesia as well; the last mentioned being inhabited by a race almost identical with the Negritos or Pelagian Negroes of the Eastern Archipelago. Dr. Latham, in treating of the Polynesians, divides them into two branches—viz., 1. The Micronesian branch, and 2. The Proper Polynesian branch. His theory as to the probable line of migration is as follows: 'The reason for taking the Micronesian branch before the Proper Polynesian, involves the following question: What was the line of population by which the innumerable islands of the Pacific, from the Pelews to Easter Island, and from the Sandwich Islands to New Zealand, became inhabited by tribes different from, but still allied to, the Protonesian Malays? That line, whichever it be, where the continuity of successive islands is the greatest, and whereon the fewest considerable interspaces of ocean are to be found. This is the general answer *à priori*, subject to modifications from the counterbalancing phenomena of winds or currents unfavorable to the supposed migration. Now, this answer, when applied to the geographical details regarding the distribution of land and sea in the great oceanic area, indicates the following line: New Guinea, New Ireland, the New Hebrides, the Fijis, and the Tonga group, &c.

From hence, the Navigator's Islands, the isles of the Dangerous Archipelago, the Kingsmill and other groups, carry the frequently diverging streams of population over the Caroline Islands, the Ladrones, the Pelews, Easter Island, &c. This view, however, so natural an inference from a mere land and sea survey, is complicated by the ethnological position of the New Guinea, New Ireland, and New Hebrides population. These are *not* Protonesian, and they are not Polynesian. Lastly, they are not intermediate to the two. They *break*, rather than propagate the continuity of the human stream—a continuity which exists geographically but fails ethnographically. The recognition of this conflict between the two probabilities has determined me to consider the Micronesian Archipelago as that part of Polynesia which is most likely to have been first peopled, and hence a reason for taking it first in order.' The islands comprised in the Micronesian branch are the Pelew Islands, the Caroline Islands, the Marian Islands, and the Tarawan or Kingsmill group. In physical appearance, the inhabitants of these groups more nearly resemble the Malays than is the case with the Polynesians Proper. In person, they are not so tall as the latter. Their language has numerous dialects, most of which would perhaps be unintelligible to the groups further south and east. In religion, they are pagans; but their mythology and traditions differ from those of the Polynesians Proper. Neither is the custom of the taboo and the use of kawa so prevalent as they are found to be among the latter. The Proper Polynesians, so called, are found in the Fiji Islands, but not to the same extent as in the following—viz., the Navigator's or Samoan Islands, the Society Islands, and Friendly Islands; also in the Sandwich Islands, the Marquesas, the Dangerous Archipelago, &c. In physical appearance, they are the handsomest and tallest of all the natives of the Pacific Islands, with the exception, perhaps, of the New Zealanders or Maoris.

The aquiline nose is commonly seen among them, and there are many varieties both of hair and complexion. Their face is generally oval, with largish ears and wide nostrils. In the islands nearest to the equator, the skin is said to be the fairest, and it is darker in the coral islands than in the volcanic. Their language is said to bear some affinity to the Tagala, and is split up into numerous dialects, all, however, to a great extent mutually intelligible among the several groups. Paganism, originally prevalent among all the groups, is becoming gradually extirpated through the efforts of the missionaries, principally English and American, as in the Samoan, Sandwich, and Society groups, where but few absolute pagans now remain. The superstition of the taboo, the use of kawa as an intoxicating drink, cannibalism, infanticide, tattooing, and circumcision, which were also formerly prevalent in all the groups, are now fast disappearing, under the influence of Christianity. Unfortunately, however, the contact of these islanders with civilization has not been always productive of unmixed good; the introduction among them of the use of ardent spirits, and of the vices and diseases of Europeans, having thinned the population to a lamentable extent. Further particulars with respect to the natives of P. will be found in some of our articles on the groups regarded as being the most important.

POLYPHE'MUS, in the Homeric mythology, the son of Poseidôn and the nymph Thoosa, the most celebrated of the fabulous Cyclops (q. v.), who inhabited the island of Sicily. He was of immense size and had only one eye. When Ulysses landed on that island, he entered the cave of P. with twelve companions, of which number this tremendous cannibal ate six. The others stood expecting the same fate, but their cunning leader made P. drunk, then burned out his single eye with a blazing torch, and so escaped, leaving the blinded monster to grope about in the darkness.

POLYPHEMUS, a genus of *Branchiopoda* (q. v.), of the order *Cladocera*, remarkable for the extraordinary size of the solitary eye, which occupies almost the whole head. One species, *P. stagnorum*, is common in stagnant pools and ditches in some parts of Britain and of the continent of Europe. It is about the size of a flea, and moves rapidly in the water, executing all kinds of evolutions, employing both its legs and antennæ as organs of swimming. The shell, consisting of two pieces, is so transparent that all the viscera may be seen through it. The abdomen is terminated by a long tail suddenly folded back.

POLYPHO'NIC (Gr. *polys*, many, and *phoné*, voice). When a musical composition consists of two or more parts, each of which has an independent melody of its own, it is said to be polyphonic, in opposition to a homophonic composition, consisting of a principal part with a leading idea, and accessory parts employed to strengthen it. Each part of a polyphonic composition aims at melodic perfection, and while supporting the other, has an equal share in the entire effect, as in the following example:



A fugue (q. v.) is the most perfect example of polyphonic composition. The difference between homophonic and polyphonic compositions is not always so marked as to leave it free of doubt whether a part is subordinate or independent; and many compositions consist of an alternation of homophonic and polyphonic passages. The construction of polyphonic phrases is called Counterpoint.

PO'LYPI, or POLYPES, a class of animals which were, till the last few years, included in the RADIATA of Cuvier, but which, since the Radiata have ceased to be regarded as a sub-kingdom, have found a place in the sub-kingdom CŒLENTERATA. See SUB-KINGDOMS, ANIMAL. The name *Polypi*, or *Polypes*, was given by Reaumur about the middle of the last century to these animals, on account of their external resemblance to the many-armed cuttle-fishes, which were so denominated by Aristotle; and our knowledge of these organisms, as members of the animal kingdom, hardly dates back much more than a century. All polypes are aquatic in their mode of life, and almost all of them are inhabitants of the sea, two genera only (*Hydra and Cordylophora*) of fresh-water polypes being as yet known. Most of them live in societies of considerable extent, supported on a common stock, to which the term *polypidom* (polyp-home) is usually given, and which is sometimes horny and sometimes calcareous. The polypes are either embedded in cavities in the substance of the calcareous polypidom, or enclosed in minute cups or tubes, from which the body can be protruded, and into which it can be retracted at pleasure, in the horny polypidoms. The solitary species often attain a considerable size (as, for instance, many of the Actinias); but the social polypes are always minute, although the combined power of some of the species in modifying the earth's crust is neither slight nor limited in extent. 'They have built up a barrier reef along the shores of New Caledonia for a length of 400 miles; and another, which runs along the north-east coast of Australia, 1000 miles in extent. To take a small example: a single atoll (or coral island) may be 50 miles in length by 20 in breadth; so that if the ledge of coral rock forming the ring were extended in one line, it would be 120 miles in length. Assuming it to be a quarter of a mile in breadth, and 150 feet deep, here is a mound, compared with which the walls of Babylon, the great wall of China, and the pyramids of Egypt are but children's toys; and built, too, amidst the waves of the ocean, and in defiance of the storms.'—Owen, *Lectures on the Invertebrate Animals*, 2d edit., p. 143.

The bodies of these animals are generally soft, and cylindrical or oval in shape; and the mouth, which is the only aperture of the digestive canal, and is quite destitute of any masticating apparatus, lies in the center of the anterior or free extremity of the body, and is surrounded by a fringe or circle of tentacles or arms. The skin in the social polypes is exceedingly soft and delicate; but in the solitary species, it is often of a leathery consistence. It almost always contains peculiar urticating organs, or thread-like cells, which may be regarded as one of the distinctive charac-

ters of the Cœlenterata. Various arrangements of the polypes have been proposed, but it is sufficient for all practical purposes if we admit two orders—namely, the *Hydrozoa* and the *Anthozoa* (or *Actinozoa*), which differ essentially in the following points: in the *Hydrozoa*, the wall of the digestive sac is not separated from that of the somatic (or bodily) cavity, and the reproductive organs are external; while in the *Anthozoa*, the wall of the digestive sac is separated from that of the somatic cavity by an intervening space, subdivided into chambers by a series of vertical partitions, on the faces of which the reproductive organs are developed. The HYDRA (q. v.), or Fresh-water Polype, is the type of the *Hydrozoa*. A few of these polypes are simple animals, as, for example, *Hydra*, *Corymorpha*, *Vorticlava*, and *Myriothela*; but the greater number are compound or composite, exhibiting a numerous colony, connected with one another by a common trunk or *cœnosarc* (from the Gr. *koinos*, common, and *sarx*, flesh), which usually presents an erect tree-like form.

A sufficient idea of the form and structure of the *simple* polypes of the class will be obtained by a reference to the article HYDRA, and by a glance at the accompanying figure of *Corymorpha nutans*, which attains a length of between four and five inches, and was discovered by Forbes and Goodsir when dredging in the north of Scotland. They observe, that when it was placed in a vessel of sea-water, it presented the appearance of a beautiful pink flower, its head gracefully nodding (whence the specific name given to it by Sars, who had previously discovered it on the Norwegian coast), and bending the upper part of the stem; it waved its long white tentacles to and fro at pleasure, but seemed to have no power of contracting them. The *compound* Hydrozoa include, *inter alia*, the orders *Sertularidæ* (embracing the various species of *Sertularia*, *Campanularia*, *Laomedea*, &c.) and *Tubularidæ* (embracing the various species of *Tubularia*, *Eudendrium*, *Bimeria*, &c.). A good idea of the nature of the compound Hydrozoa may be formed from the consideration of the *Campanularia dichotoma*, a common organism on our shores. The compound polype-animal, or association of polypes, resembles a miniature tree. It consists



Fig. 1.– Corymorpha nutans.



Fig. 2.—Campanularia dichotoma, magnified.

essentially of a ramified tube of irritable matter, *f*, defended by an external flexible, and frequently jointed horny skeleton, *a*; and is fed by the activity of the tentacula, *d*, and by the digestive powers of the alimentary sacs (*g*) of a hundred polypi, the common produce of which circulates through the tubular cavities for the benefit of the whole community. The soft integument of the nutrient polyges (*d*, *e*, *g*) contains the thread-cells, to which allusion has previously been made. These are protruded when the skin is irritated, and give the tentacles the appearance of being beset by minute bristles. The digestive sac of each polype is lined by a ciliated epithelium; but there is a perforation at the base communicating with the central tube, *f*. This outlet admits only of the passage of the fluid contents of the stomach, undigested matters being ejected by the mouth.

There is reason to believe that sea-water enters the branches of the tube *f*, and circulates, by means of the ciliated epithelium, through the compound organism; and by this means contributes to the respiratory process. 'At certain points of these ramified polypes,' says Professor Owen, 'which points are constant in and characteristic of each species, there are developed little elegant vase-shaped or pod-shaped sacs, which are called the ovigerous vesicles, or *ovicapsules*. These are sometimes appended to the branches, sometimes to the axillæ, as at *h*, *i*, *k* (in fig. 2). They are at first soft, and have a still softer lining membrane, which is thicker and more condensed at the bottom of the vesicle. It is at this part that the ova or germs are developed, and for some time these are kept in connection with the vital tissue of the polype by a kind of umbilical cord. In all the compound *Hydrozoa*, the ovicapsules are deciduous; and having performed their functions in relation to the development of the new progeny, drop off like the seed-capsules of plants.' On other individuals of the same species, sperm-capsules are developed, which, in form, resemble the ovicapsules, but in place of ova, certain spermatozoa. The act of fertilization in most cases occurs by diffusion of the spermatozoa in the surrounding water. There is much that still requires elucidation in reference to the various modes of reproduction of this class. Many of the Hydrozoa have been shown to be merely larval forms of Medusæ. See GENERATIONS, ALTERNATION OF.

The leading anatomical distinction between the *Anthozoa*, or *Actinozoa*, and the *Hydrozoa*, has been already noticed. The common *Actinia* (q. v.) may be regarded as the type of this class, all of which are marine, and principally inhabit the warmer or tropical seas. Many of the larger tropical polypes of this class combine with the structure similar to that of the Actinia an internal calcareous axis or skeleton, which, penetrating into the interior of the organism, presents the lamellated and radiated structure recognizable in the *Fungiæ*, and in the skeletons of *Caryophyllæ*, *Madreporæ*, &c. Such Anthozoa are termed coralligenous; and every hard structure deposited in or by the tissues of this class, and forming a uniform framework, is recognized by zoologists as a coral. Like the members of the preceding class, many of the Anthozoa multiply freely by gemmation, complex or compound animals or colonies of animals being formed, in

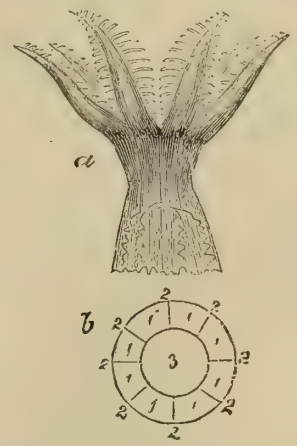


Fig. 3.—Diagram illustrating the Morphology of Anthozoa.
a, polype of *Alcyonium*; *b*, ideal section of the same; 1, 1, 1, &c., the somatic cavity, divided by the mesenteries, 2, 2, 2, &c., into eight chambers; 3, the digestive cavity.

which individual polypes are united by a cœnosarc or polypidom. For a description of the mode in which communication takes place between the common body or mass and the individual polypes, we must refer to the article ALCYONIUM. Various arrangements of this class have been proposed by zoologists. If we exclude the consideration of fossil genera, we may divide the Anthozoa into two orders—the *Alcyonaria* and the *Zoantharia*.

The *Alcyonaria* may be characterized as Anthozoa in which each polype is furnished with eight tentacles, not simple, as in Actinia, but furnished with pinnate margins, with eight somatic chambers, and eight mesenteries. With the exception of one genus, they are all composite in structure; their polypes being connected with one another by a cœnosarc, which is traversed by prolongations of the somatic cavity of each polype, a system of canals being thus formed whose parts freely communicate and are readily distensible. Carus, in the *Handbuch der Zoologie*, 1863, vol. 2 (of which he is joint author with Peters and Gerstaecker), mainly adopting Milne-Edwards's arrangement, divides the Alcyonaria into the three following families: 1. *Alcyonidæ*; 2. *Gorgonidæ*; 3. *Pennatulidæ*. In the *Alcyonidæ*, he includes the beautiful organ-pipe corals, of which Green and others make a separate family. The polypidom constructed by *Tubipora musica* consists of successive stages of cylindrical tubes of a rich crimson color, united at various heights by means of horizontal connecting

plates. The tubes placed upon the upper stage are alone inhabited by living polypes, of a violet or green color, the occu-

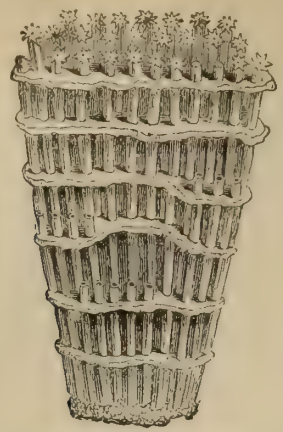


Fig. 4.—Tubipora musica.

pants of those below having successively perished as fresh generations appeared above them. As an example of the *Gorgonidæ*, we may take *Isis hippuris*, in which the skeleton is made up of alternate joints of calcareous and horny matter, with the view

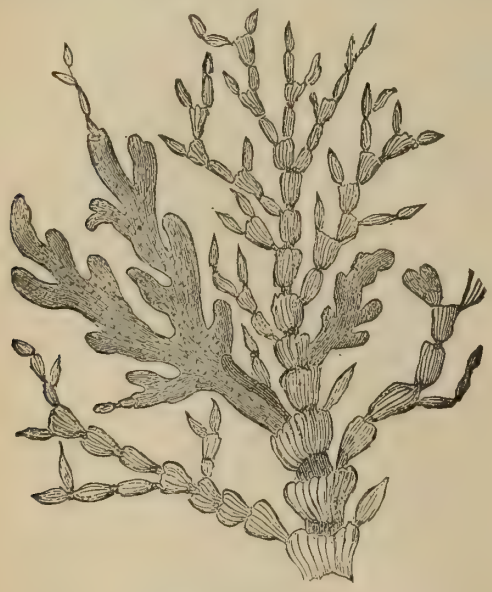


Fig. 5 —Isis hippuris.

of giving the necessary flexibility. In the *Pennatulidæ*, the polypidom is free, and no polypes are attached to its basal portion. The *Sea-pens* (*Pennatulæ*) of our own coast afford a good example of this family. See PENNATULA for description and figure.

The *Zoantharia* may be characterized as Anthozoa in which the tentacles are either simple or branched, in general numerous, and together with the mesenteries, disposed in multiples of five or six. They may be arranged in the three following sub-orders—1. *Z. Malacodermata;* 2. *Z. Sclerobasica* or *Antipatharia* (Milne-Edwards); and 3. *Z. Sclerodermata* or *Madrepores*. The first sub-order has been variously subdivided into families and sub-families, which it is unnecessary to notice. It contains all the sea-anemones and animals allied to them, including the genera *Actinia*, *Anthea*, *Corynactis*, *Capnea*, *Adamsia*, *Ilyanthus*, *Sagartia*, *Bunodes*, *Edwardsia*, *Peachia*, &c.; and the *Zoanthidæ*, which are aggregated polypes arising from a common creeping root-like fleshy band, and of which at least one species, *Zoanthus Couchii*, is an inhabitant of the British seas. All the members of the second sub-order are composite structures. *Antipathes*, the type of the group, presents a stem-like, simple, or branching cœnosarc, which in one species tapers to a length of more than nine feet, with a diameter, at the base, not exceeding three-tenths of an inch. The third sub-order (the *Madrepores*) is a very extensive one. It is divided into the *Madrepora aporosa* and *M. perforata*, according as the coral exhibits a solid or a porous structure. *M. aporosa* may be arranged in the following families—1. *Turbinolidæ* (including the sub-families *Caryophyllinæ* and *Turbinolinæ*); 2. *Oculinidæ;* 3. *Astræidæ;* 4. *Echinoporinæ;* 5. *Merulinaceæ;* 6. *Fungidæ:* while the *M. perforata* are divided into (1) *Madreporidæ* and (2) *Poritidæ*. A few of the commoner forms of Madrepora are delineated in the articles CORAL and MADREPORE. Amongst the most important works on this department of zoology may be mentioned Dana's *Structure and Classification of Zoophytes* (Philadelphia, 1846), and his *Report on Zoophytes*, and *Atlas of Zoophytes* (U. S. exploring Expedition), 1849; Johnston's *British Zoophytes*, in 2 vols., to which we are indebted for many of our illustrations; Milne-Edwards and Haime, *Histoire Naturelle des Coralliaires ou Polypes proprement dits* (3 vols., 1857—1860); and Lacaze-Duthiers, *Histoire Naturelle du Corail, Organization, Reproduction, &c.* (1864).

POLYPO'DIUM, a genus of Ferns, with spore-cases on the back of the frond, distinct, ring-shaped, in roundish *sori*, destitute of *indusium*. Several species, differing very considerably in appearance, are natives of Britain, where no fern is more com-



Polypodium:
1, P. dryopteris; 2, P. vulgare.

mon than *P. vulgare*. It grows on rocks, trees, dry banks, &c., and has fronds 2—18 inches long, deeply pinnatifid, with large sori.—*P. Dryopteris*, with delicate ternate bipinnate fronds, is a fine ornament of many dry stony places in Scotland.—*P. Calaguala*, a native of Peru, is said to possess important medicinal properties—solvent, deobstruent, sudorific, &c.

POLYPO'RUS. See AMADOU and DRY ROT.

POLY'PTERUS, a genus of fishes, ranked by Cuvier among malacopterous fishes and in the family *Clupeidæ*, notwithstanding very important differences of structure; but now constituted by Müller and others into a family, *Polypteridæ*, of the order of Ganoid Fishes. The shape is round and elongated; the head defended by large bony plates, the body covered with large and strong ganoid scales, which are very closely affixed to the skin. These curious fishes, existing remains of a type which was prevalent in former geologic periods, inhabit the rivers of Africa, and lodge in the soft mud. Their flesh is very pleasant. The P. of the Nile, called *Bichir* by the Egyptians, is said to be one of the finest fishes of that river. It is about 18 inches long.

PO'LYPUS, in Surgery, is an antiquated term employed to signify any sort of pedunculated tumor attached to a surface to which it was supposed to adhere like a many-footed animal, as its name indicates. The most common seat of polypus is the mucous membrane, especially that of the nostrils and uterus; but these tumors are also found in the rectum, the larynx, and the external auditory passage of the ear. The only satisfactory mode of treatment consists in their removal, which must be effected in various ways, according to their position, as by the forceps, the ecraseur, the ligature, &c.

PO'LYSTYLE, a term applied to a building with a number of columns, but not the strict number of any of the classic arrangements.

POLYTE'CHNIQUE (ÉCOLE POLYTECHNIQUE), or POLYTECHNIC SCHOOL (Gr. *polys*, many; *techne*, art), was first established in Paris (1794) by the National Convention, under the name of *Ecole des Travaux publics* (School of Public Works). No students were admitted but those who intended to enter the public service; and though the general object of the institution was the supplying of well-educated youths to all branches, it was more particularly devoted to the thorough instruction of recruits for the corps of civil and military engineers. The institution received the name of 'Ecole Polytechnique' in 1795. The pupils were at first 349 in number, and each received, during his stay of two years in the institution, an annual stipend of 1200 francs (£48 nearly); the teachers were in most cases the most eminent savans

of France. In 1799, some modifications were introduced into the working of the school; the number of pupils was at the same time limited to 200, and they were put into uniform. The advantages of an institution of this sort, when ably conducted, soon made themselves evident, and the P., in consequence, rose into high estimation, not only in France, but throughout Europe, so much so, that it became common for foreign nations, when entering into a treaty with France, to stipulate for the admission of a certain number of their subjects into the institution, after passing the prescribed entrance examination. In 1804, the Emperor Napoleon introduced various modifications into its working, and gave it a military organization; it was also removed from the Palais-Bourbon (where it had existed from its first establishment) to the old college of Navarre. The institution became more and more, as the end of the Napoleonic empire drew near, a training-school for young artillerists and engineers; and such was the enthusiasm of the pupils in the emperor's cause, that, after the disasters of 1814, they demanded to be enrolled *en masse* in the ranks of the French army. However, Napoleon was (to use his own words) not inclined 'to kill the hen for the golden eggs;' but he allowed them to form three out of the twelve companies of which the artillery corps of the national guard was composed. These three companies rendered important service in manning the walls of Paris, and behaved heroically in the battle of March 30, 1814.

After the first Restoration, the P., being considered to be evil-disposed to the government, suffered considerable reductions; but was restored to its former importance for the brief period of the 'Hundred Days.' After the second Restoration (July 1815), the staff of Professors was remodelled; Lacroix and some others were dismissed, and replaced by Poisson, Arago, Cauchy, &c. Notwithstanding these changes, the government still had its doubts as to the loyalty of the establishment, and took advantage of an outbreak, April 3, 1816, to break it up. It was reconstituted in September of the same year, under a revised code of regulations, and in 1822 the old severity of military discipline was restored. During the war of 1870—1871, the government of national defence ordered the pupils to meet at Bordeaux, and classes were opened there under distinguished pupils of the school brought from all parts of France. However, the attempt had to be abandoned and the pupils having sought permission to take part in the war, were divided among the different sections of the army in which their services were highly appreciated. The constitution of the school, which has so frequently suffered change, was in the end of 1873 regulated by *décret* of 30th November 1863, and ministerial rules issued on 5th March 1857. 1. No pupil can be admitted unless he has been successful in the public competitive examination which is held each year. 2. The conditions of admission to the competitive examination are, that the candidate shall be a Frenchman; that he shall be more than 16, and less than 20 years of age, on the 1st of January of that year; and that he shall be either a Bachelor of letters or a Bachelor of Sciences of the University of France. If he holds both degrees he is allowed 50 marks in the examination for admission. 3. Regular soldiers are admitted up to the age of 25 years, provided they have been on real and effective service for two years. 4. The charge for board is 1000 francs (£40) per annum, and the cost of outfit (to be also paid by the pupil) about 600 francs. 5. The duration of the course of instruction is two years: the pupils, after finishing their course, must pass a final examination; the successful candidates, if found to be physically qualified, are arranged in order of merit, and choose in order what branch of the public service they wish to enter. 6. The branches of the public service which are recruited from the P. are, the corps of land and naval artillery, military and naval engineers, the imperial marine, the corps of hydrographic engineers, that of engineers of roads, bridges, and mines, the corps of staff-officers, the superintendence of telegraphs and gunpowder and tabacco manufactories; and generally every department which, requiring special scientific knowledge, may be added by *décrets* to these.

The following branches of study were embraced in the curriculum in 1873: Mathematics, physics, chemistry and chemical manipulation, history and literature, German, written exercises, drawing, geodesy, mechanics, architecture, art militaire. Lessons in fencing, music, and dancing, are given out as optional, and must be separately paid for. The number of pupils varies with the requirements of the public service. In 1794, there were 396 pupils; in 1820, only 66. During the first empire, the numbers increased from 110 in 1808, to 227 in 1813; under Louis Philippe the average number was 130. During the second empire, it had risen to 140 and 150. After the war with Germany in 1870–71, the number rose to 260. The numerous and admirably equipped technical schools of Germany (see TECHNICAL EDUCATION), often called *Polytechnica*, have received no military restriction, and are available for all interested in the industrial arts; they are in many cases scientific centers comparable to the universities.

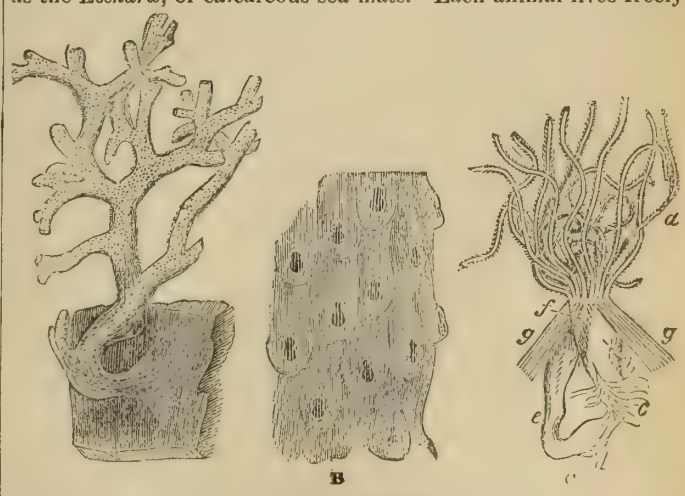
PO'LYTHEISM. See GOD.

POLY'TRICHUM (Gr. many-haired), a genus of mosses, having the capsule supported on a stalk (*seta*) which is terminal, and thus appears as an elongation of the stem; the peristome single, of 32 of 64 short equidistant teeth, which are curved inwards, and their summits united by a horizontal membrane closing the mouth of the capsule. A number of species are found in Britain, of which the most abundant is *P. commune*, sometimes called *Hair-moss, Golden Maidenhair*, and provincially *Goldilocks;* growing in heaths and woods, particularly where the soil is sandy; the stems not at all branched, or only at the base, several inches long; the narrow slender leaves sometimes nearly half an inch long. This beautiful moss is very common in the most northern parts of Europe and Asia.

POLYZO'A, known as a BRYOZOA (from the Greek *bryon*, moss, and *zoon*, an animal; because many of these organisms incrust other animals or bodies like moss), and CILIOBRACHIATA (from the circumstance that their tentacles are ciliated), are so called from many individuals being united into a colony or polyzoary. Although Dr. Grant, in his *Observations on the Structure and Nature of Flustræ*, in 1827, and Milne-Edwards and Audouin, in their *Résumé des Recherches sur les Animaux sans Vertèbres faites aux îles Chaussey* in 1828, indubitably showed that these animals more closely resembled, in the details of their organization, the molluscous than the radiate sub-kingdom, with which they were formerly confounded, some of our most esteemed English writers (including Professor Owen) persist in retaining them among the Polypes, instead of placing them in their true position amongst the *molluscoid animals*.

Most of the P. are microscopic, but as they occur in colonies, they often collectively form sufficiently conspicuous masses, and although there is little diversity in the form or structure of the animals themselves, there is much difference in the form, arrangement, and composition of the cells or chambers in which the individual animals reside. 'In general,' says Mr. Gosse, 'the form of the cell is ovate or oblong; but the general shape is variously modified, being tubular, club-shaped, horn-shaped, cradle-shaped, square, &c.

The arrangement is often shrub-like, or the cells may be arranged in close series, either adhering in irregular patches, as the *Lepraliæ*, or rising into broad, flexible leaves, as the *Flustræ*, or common sea-mats, or in solid strong walls, or coral-like masses, as the *Escharæ*, or calcareous sea-mats. Each animal lives freely



Eschara Cervicornis:

A, portion of its coralline fabric, of the natural size; B, portion of a young branch, enlarged, to show the arrangement of the superficial apertures; C, an individual withdrawn from its cell and highly magnified; *a*, mouth; *b*, pharyngeal cavity; *c*, secreting tubes; *d*, the digestive stomach; *e*, the intestinal canal; *f*, the anus; *g*, retractor muscles.

in its cell, with whose walls it is connected only by means of muscular bands and threads at certain points, and by the covering of the mouth of the cell. The animal may either expand itself to a considerable extent out of the mouth of the cell, or it may be altogether restricted within the latter; their movements being due partly to pressure upon the outer walls, and partly to the muscular bands, which act chiefly as retractors. On examining one of these organisms in the expanded state, the mouth is seen to be surrounded by a crown of tentacles, which are most commonly ten or twelve in number, and are clothed with vibratile cilia, which lash the water towards the mouth, and thus create numberless little whirlpools, by which nutritious matter is conducted into the oral aperture of the polyzoa. These ciliated tentacles, which are seen in C, *a*, in the figure, constitute one of the essential points of difference between these animals and the hydraform polypes, with which they were formerly associated. The mouth leads to a funnel-shaped cavity or pharynx *b*, which is suc-

ceeded by an œsophagus *c*, and a true digestive stomach *d* (between which a muscular gizzard intervenes in certain genera), after which the intestine, *e*, turns back upon itself, and terminates in an anus, *f*, near the mouth. In the separate intestine and anal orifice, we have another characteristic distinguishing these animals from the polypes. At the base of the tentacular circle, just above the anal orifice, is a nervous ganglion, which in all the P. lies on the re-entering angle, between the two extremities of the intestinal canal. No heart has as yet been discovered, the matters, which result from digestion, percolating through the intestinal walls, and becoming mixed with the fluid in which the viscera floats. According to Professor Allman, three distinct modes of reproduction occur in the P., viz., by buds or gemmæ, by true ova, and by free locomotive embryoes. This subject, however, requires further investigation.

Minute appendages, of a very remarkable character, are fixed to the cells of many of the genera. They are termed *Avicularia*, or 'Birds'-head Processes,' and *Vibracula*, or whip-like spines. The *Avicularia* were described by Ellis, who first noticed them (in his *Essay towards a Natural History of the Corallines*, 1758), as resembling 'a bird's head with a crooked beak, opening very wide;' they consist of a fixed and a movable nipper, like a crab's claw, the latter being worked by special muscles. These moving beaks have been often observed to seize minute animals; but as these organs have no power of passing their prey to the mouth, the P. cannot receive nourishment from this source. Mr. Gosse ingeniously suggests that 'the seizure of a passing animal, and the holding of it in the tenacious grasp until it dies, may be a means of attracting the proper prey to the vicinity of the mouth.' The *vibracula* consists of a long, slender movable *seta* or bristle, which, according to Gosse, serves 'to rid the animal of intruding vagrants, and to cleanse away accidental defilement, by sweeping across the orifice of the cell.' Both these kinds of organs are of service in determining genera. Excellent magnified representations of the *Avicularia* and *Vibracula* may be seen on referring to figs. 13 and 11, in Mr. Busk's excellent article, POLYZOA, in *The English Cyclopædia*, to which, as also to that gentleman's *Catalogue of Marine Polyzoa in the British Museum*, and to Professor Allman's 'Report on the Freshwater Polyzoa,' published in the *Reports of the British Association* for 1850, the reader is referred for further information regarding this remarkable class of animals.

POMA'CEÆ, or POMEÆ, according to some botanists, a natural order of plants, but more generally regarded as a suborder of ROSACEÆ (q. v.). The plants of this order are all trees or shrubs, abundant in Europe, and chiefly belong to the temperate and colder regions of the Northern Hemisphere; they are rare in very warm climates, and are not found at all in the southern hemisphere. They have the botanical characters described in the article ROSACEÆ (q. v.), and in addition are distinguished by having the tube of the calyx more or less globose, the ovary fleshy and juicy, lined with a thin disc, its carpels adhering more or less to the sides of the calyx and to each other; the fruit a *Pome* (q. v.), 1—5-celled, in a few instances spuriously 10-celled; the ovules in pairs, collateral. Many of the species are prized for the beauty and fragrance of their flowers, some produce valuable timber; but the order is chiefly remarkable as producing a number of the very finest fruits of temperate climates. See APPLE, PEAR, QUINCE, MEDLAR, LOQUAT, HAWTHORN, CRATÆGUS, AMELANCHIER, ROWAN, SERVICE.—There are about 200 known species.

POMA'DE, or POMATUM, is a preparation used instead of liquid oil for the hair. It consists of a fine inodorous fat, such as lard or suet; but neither of these are quite free from smell, and the most careful perfumers render them so by a peculiar process. They melt them in a steam-bath, and to every ¼ of cwt. add 1 oz. of alum and 2 ozs. of salt, continuing the action of the heat till any scum ceases to rise; the scum is carefully removed, and the fat allowed to cool, after which it is levigated with cold water with great care and patience until every particle has been acted upon, and the salt, alum, and albuminous matters are perfectly washed out, after which it is remelted in the steam-bath, and any remaining water falls to the bottom: when cold, it is fit for use. The perfumer then takes portions of this prepared fat, and remelting each separately, adds a little wax or spermaceti to give it consistency, and perfumes it with some essence. The varieties of pomades are as numerous as the perfumed essences. Anciently, they were made by boiling over-ripe apples in fat, by which the peculiar smell of the fruit was communicated, and this originated the name, which is derived from *pomum*, an apple.

POMBAL, DOM SEBASTIAO JOSE DE CARVALHO, MARQUIS OF, the greatest of all Portuguese statesmen, and one of the ablest men of his time, was born 13th May 1699, at the castle of Soura, near Coimbra. His father, Manuel de Carvalho, was a captain of cavalry, and belonged to the second grade of nobility. After studying law at Coimbra, and serving a short time in the army, P. was banished from Lisbon on accountof his youthful turbulence of disposition, and retired to his birthplace, where he devoted himself for a while to study. Subsequently, he married a rich widow, Donna Teresa da Noronha Almada, and repaired to court. In 1739, he was appointed envoy-extraordinary to the court of London through the influence of his uncle, Paulo Carvalho, a position which he held for six years, after which he was sent to Vienna in a similar capacity. Here P. (whose first wife was now dead) espoused, in 1749, Leonora Ernestina, Countess Daun, niece of the famous Austrian marshal of that name. This marriage had a most felicitous influence on his future career. When P. returned to Portugal, the Portuguese queen, who was an Austrian princess, conceived a great attachment to his wife; and when her son, Joseph I., ascended the throne in 1750, she induced him to appoint P. state secretary for foreign affairs. Immediately, his splendid administrative genius burst forth like a sudden blaze of sunshine. He found his country almost without an army, without a fleet, without commerce or agriculture, and all power in the hands of unscrupulous Jesuits and grasping nobles. Among his first acts was to re-attach to the crown a great number of domains that had been unjustly alienated. Then followed the re-organization of the army, the introduction of fresh colonists into the Portuguese settlements, the establishment of an East Indian Company, and another for Brazil, where he introduced the cultivation of coffee, sugar, cotton, rice, indigo, and cocoa.

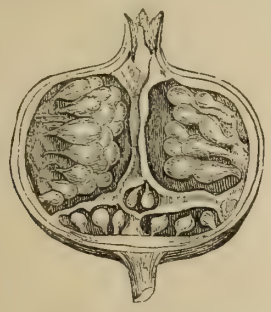
In virtue of a treaty with Spain, signed in 1753, Paraguay became an appanage of the Portuguese crown, and it was in this remote region that P. first came into collision with the Jesuits—the founders of the Paraguay missions. He got his brother, Francisco-Xavier de Mendonça, appointed captain-general of Paraguay, and is said to have given him secret instructions to ruin the Jesuits in his reports to the king. When the great earthquake happened at Lisbon in 1755, P. displayed an almost superhuman courage and energy, in consequence of which the king raised him to the rank of Count of Œyras, and in the following year appointed him prime minister. He crushed a revolt instigated by the great nobles and the Jesuits, the latter of whom he now removed from the person of the sovereign, deprived of the power of the confessional, and in 1757 confined to their colleges. A conspiracy against the life of the king, which broke out 3d September 1758, but failed, placed his enemies completely in his power. The leaders were punished with appalling severity. The Duke of Aveiro and the Marquis of Tavora were broken alive on the wheel, the sons and the son-in-law of the former were strangled, and the wife of the marquis was beheaded. The Jesuits were suspected of complicity in the plot, and P. accused them to the pope; and when the latter would not allow the minister to proceed against them in the civil courts, he daringly caused some to be executed in prison. Father Malagrida, who had prophesied the death of the king, was delivered over to the Inquisition as a heretic, and condemned to be burned alive; and this *auto da fé* actually took place in 1761! But P. was not satisfied. He had made up his mind that the very presence of the Jesuits in Portugal was incompatible with the security of the government and the welfare of the nation, and by a royal decree of 3d September 1759, they were banished from the kingdom as rebels and enemies to the king. When they refused to leave, P. had them violently removed by soldiers, carried on board ships, and transported to the States of the Church.

The pope, Clement XIII., vehemently protested, whereupon P. caused the papal nuncio to be shown across the frontier. Shortly after, Clement XIII. died, and was succeeded in the papal see by Clement XIV.—no friend of the Jesuits, in consequence of which the differences between Portugal and the Vatican were soon made up. All this time P. was laboring energetically to improve the cultivation of the land and the system of education. In 1770, he was created Marquis of P., and from this period to the death of the king in 1777, he was at the very height of his greatness. The accession of Joseph's daughter, Maria I.—an enemy of the minister—was immediately marked by his downfall. He was deprived of his offices; the conspirators whom he kept in prison were released; many of his institutions were abolished; and he himself was only saved from the scaffold because he held in his possession documentary proofs of the former treason of his now triumphant enemies. Maria ordered him to retire to his castle of Pombal, where he died, 8th May 1782. The peasantry always spoke of him as 'The Great Marquis,' and history has stamped the rustic verdict with its approval. When he was turned out of office, he left the queen a public purse containing 78,000,000 cruzados, and a well-ordered and flourishing state.

POME (Lat. *pomum*, an apple), a form of fruit of which examples are found in the apple, pear, and other fruits of the *Pomaceæ;* and in which the *epicarp* and *mesocarp* (see FRUIT) form a thick fleshy mass; whilst the *endocarp* is scaly, horny, or stony, and divided into separate cells, in which the seeds are enclosed.

The fruit is crowned with remains of the calycine segments. Pomes have 1—5 cells, or spuriously 10 cells.

POMEGRA'NATE (*Punica granatum*), a fruit much cultivated in warm countries, and apparently a native of the warmer temperate parts of Asia, perhaps also of the north of Africa. It has been cultivated in Asia from the most ancient times, and is frequently mentioned in the Old Testament. It has long been naturalized in the south of Europe. In a wild state, the plant is a thorny bush, in cultivation it is a low tree, with twiggy branches, flowers at the extremities of the branches, the calyx red, the petals scarlet. It is generally referred to the natural order *Myrtaceæ*. The calyx is leathery, tubular, 5—7-cleft; there are 5—7



Section of a Pomegranate.

crumpled petals; the fruit is as large as a large orange, with a thick leathery rind of a fine golden yellow, with a rosy tinge on one side, not bursting when ripe; the cells filled with numerous seeds, each of which is surrounded with pulp, and separately enclosed in a thin membrane, so that the P. appears to be formed of a great number of reddish berries packed together and compressed into irregular angular forms. The pulp is sweet, sometimes subacid, and of a pleasant delicate flavor, very cooling, and particularly grateful in warm climates. It is often used for the preparation of cooling drinks. A kind of P. without seeds is cultivated and much prized in India and Persia. Pomegranates have long been imported in small quantities into Britain from Portugal and the north of Africa; but have never become an article of general demand and commercial importance like oranges. There is an ornamental variety of the P. with double flowers. The rind of the fruit is very astringent, and a decoction is used as a gargle in relaxed sore throat, and as a medicine in diarrhœa, dysentery, &c. Deriving its astringency from tannin, it is used to tan leather. The finest Morocco leather is said to be tanned with it, and small quantities are imported into Britain from the north of Africa for the preparation of the finest kinds of leather, under the name of *Pomegranate Bark*.—The bark of the roots is used as an anthelmintic, and is often successfully administered in cases of tape-worm. Its value was known to the ancients, and it has long been in use in India.—The P. tree is occasionally cultivated in hothouses or greenhouses in Britain. It bears the winters of the south of England in the open air, and is very ornamental, but the fruit is worthless. In some parts of the south of Europe it is used as a hedge-plant.

POMEL, a boss or ball used as an ornament on the top of pointed roof, turret, &c.

POMERA'NIA (Ger. *Pommern*), a province of Prussia, bounded N. by the Baltic, E. by West Prussia, S. by Brandenburg, and W. by the Mecklenburg duchies. Area, 11,600 square miles. Pop. (at the close of 1880) 1,540,034. P. is divided into the three governmental districts of Stettin, Stralsund and Kösliu.

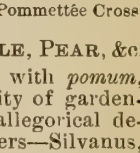
This province, which is one of the lowest and flattest in Germany, and has few hills of even moderate height, is intersected by the Oder (q. v.), which forms numerous lakes and ponds, the largest of which is the Dammer Lake. The waters of this lake and of the Oder are then carried into the Stettiner Haff, from which three outlets—those of the Peene, Swine, and Dievenow—lead into the Baltic. Between these three outlets are the two islands of Usedom and Wollin. After the Oder, the chief rivers of P. are the Ihna, Rega, Persante, Wipper, and Stolpe. The shores in some parts are protected by dikes and sand-banks. The soil is generally sandy, and in many districts even stony, although near Pyritz and Stargard, on the Ploen and Maduc Lakes, and at some points of the sea-coast, it presents a tolerably fruitful character, yielding good crops of wheat, and affording rich pasture. About half of the whole area is cultivated; about a sixth is uncultivated, or under water; and the remainder is in pastures, heath, and wood. The chief vegetable products, most of which are grown in sufficient quantities to be largely exported, are—rye, wheat and other grain, flax, hemp, tobacco, and timber. Among the other exports of P. are horses, cattle, sheep, swine, geese of superior quality, feathers, butter, wool, hams, sausages, smoked poultry, &c. The sturgeon and salmon fisheries are very productive, and P. is noted for its admirable lampreys, eels, and crayfish, which are largely exported in a pickled state. The mineral products, which are inconsiderable, include bog-iron, lime, marl, alum, salt, amber found on the coast near Stolpe, and peat—which latter substance is obtained in enormous quantities, and extensively used for fuel, notwithstanding the abundant supply of wood yielded by the extensive and productive forests.

Linen and wollen fabrics, and leather, rank among the best of the industrial products; but the manufactures of P. are not of much importance. The principal branches of industry are agriculture, and the rearing of horses and cattle, while the active transport-trade between the neighboring Prussian states and the Baltic ports constitutes a very important source of wealth to the province. The main seat of Pomeranian trade is at Stettin (q. v.), which ranks as one of the most important commercial cities of Prussia.

P., like every other part of the Prussian dominions, is well provided with educational institutions, and, besides the university at Greifswald, it has 13 gymnasia, several normal and training schools, and numerous classical and other schools.

P. formed, in the earliest periods of its history, a part of the ancient kingdom of the Wends or Vandals. From the year 1062 it had its own ducal rulers, and from the beginning of the 12th c. it adopted Christianity in consequence of the preaching of Bishop Otto of Bamberg. Bogislaus XIV., who died in 1637, was the last male representative of the Wendish ducal line; and, on his death, the House of Brandenburg laid claim to the whole of the Pomeranian territories, in conformity with a compact which the latter family asserted to have been made between them and the Wendish dukes; but the country having been occupied by the Swedes during the Thirty Years' War, Prussia was obliged to content itself with the possession of Further P., or *Hinterpommern*, which was assigned to it at the Peace of Westphalia, while Sweden retained the remainder of P., with the island of Rugen (q. v.). After the death of Charles XII., and the subsequent decline of the Swedish power, Prussia was able to make good her asserted claims on the territory of P. at the Peace of Stockholm; and in 1720 Sweden was compelled to cede Southern P. and the island of Rugen, retaining only a narrow strip of land between Mecklenburg and the Baltic, which was also incorporated with Prussia in 1815, after having been first transferred by Sweden to Denmark as part indemnification for the separation from the latter kingdom of Norway, and subsequently ceded to Prussia by the Danes in exchange for the duchy of Lauenburg, and on the payment of 2½ million thalers to the latter, and of 3½ million thalers to the Swedish government.

POMMETTÉE, or POMEL CROSS in Heraldry, a cross whose extremities terminate in single knobs or pomels, like the *Bourdon* or pilgrim's staff.



Pommettée Cross.

POMO'LOGY (Lat. *pomum*, a fruit of any kind, an apple), a term much employed in France and Germany, and to a smaller extent in Britain, to designate the study of fruits and of their cultivation, particularly those of the natural order *Pomaceæ* (q. v.). See FRUIT, FRUIT-GARDEN, APPLE, PEAR, &c.

POMO'NA (whose name is obviously connected with *pomum*, 'a fruit') was, among the Latins, the patron divinity of garden-produce. The poets, not, perhaps, without some allegorical design, represent several of the rural gods as her lovers—Silvanus, Picus, Vertumnus, &c. Of Vertumnus, in particular, it is related that after he had vainly tried to approach her under a thousand different forms, he at last succeeded by assuming the figure of an old woman. In this guise, he recounted to her the lamentable histories of women who had despised love, and having touched her heart, suddenly transformed himself into a blooming youth and married her. But Vertumnus (connected with *verto*, 'to turn,' or 'to transform') is probably nothing more than a personification of those changes by which plants advance from blossom to fruit. The worship of P., as was natural among a homely race of farmers and shepherds like the ancient Latins was of considerable importance. Varro tells us that at Rome her services were under the care of a special priest, the *flamen Pomonalis*. In works of art she was generally represented with fruits in her lap, or in a basket, with a garland of fruits in her hair, and a pruning-knife in her right hand.

POMONA, or MAINLAND, much the largest and most populous of the Orkney Islands (q. v.), in which group it occupies a central position. It is open to the Atlantic on the west, and to the German Ocean on the east, while on the north Enhallow and Shapinsha Sounds separate it from the islands of Ronsay and Shapinsha, and on the south, Scapa Flow separates it from Hoy and South Ronaldsha. Area 150 square miles; pop. (1881) 17,165. It is 25 miles in length, and 15 miles in extreme breadth, but is very irregular in shape. At the town of Kirkwall, the breadth of

the island is only about two miles. In the west, the shores are bold and elevated, but there is a general slope towards the east. The surface is diversified with hill and lake, and consists in great part of moor and heath. Good pastures are found, however, and in the valleys there is a fertile, loamy soil. Oats, beans, and bere are produced, and sheep and swine are extensively reared. The chief towns are Kirkwall (q. v.) and Stromness (q. v.).

POMPADOUR (JEANNE ANTOINETTE *Poisson*), MARQUISE DE, a notable mistress of Louis XV., was born in Paris in 1720 or 1722. Her reputed father was a certain François Poisson, who held a humble office in the army-commissariat; but M. le Normand de Tournheim, a rich *fermier-général*, claimed for himself the honors of a dubious paternity, and brought up the little Jeanne as his daughter. She turned out a wonderfully clever child, and M. le Normand spared no pains to give her the best, or, at least, the most stylish education possible. She excelled in such accomplishments as music, elocution, and drawing; but what charmed the brilliant society that frequented the *salons* of the rich financier, was the perfect grace and beauty of her figure, and the exquisite art with which she dressed. A crowd of suitors constantly besieged her, but the one who obtained her hand was her cousin, Le Normay l'Etioles. They were married in 1741. But Madame l'Etioles, who was constantly told by her infamous mother that she was 'a morsel for a king,' was careless of her husband's honor and peace. Though he loved her to distraction—and he was a man with whose love any woman might have been content—she, cold, heartless, and ambitious, was scheming day and night to attract the notice of the monarch. Her efforts were after a time crowned with success, and Madame l'Etioles was installed in the palace of Versailles; she was soon afterwards ennobled by the title of Marquise de P., and long ruled the king, first as mistress, and afterwards as *amie nécessaire*.

One reads with some astonishment of the incessant artifices she had recourse to in order to preserve her influence—the everlasting huntings, concerts, private theatricals, little suppers, and what not—anything to distract the royal mind (surely sufficiently distracted already by nature), and to make it think only of the clever purveyor of gaieties! The private theatricals in particular were a great success, and were 'got up' every winter from 1747 to to 1753—the marquise herself proving a charming actress. The king thought the marquise extremely clever, and, when he ceased to 'love' her, was glad to avail himself of her services as his political adviser. In fact, she became premier of France; the council of ministers assembled in her boudoir, where the most important affairs of state were settled. The choice of ministers, of ambassadors, of generals, depended on the caprice of a female; the Abbé de Bernis, the favorite of a favorite, entered the council. Foreign diplomacy turned the circumstance to account. The Austrian prime-minister induced Maria Theresa, to sacrifice pride to the exigencies of her position, and the empress-queen wrote the courtesan a letter in which she addressed her as *ma cousine*. That word turned the head of the marquise, and changed for a time the foreign policy of France. She died (15th April 1764) with the reins of government in ner hands. During her lifetime, immense sums from the national treasury were paid away to the marquise, and to her brother, created Marquis de Marigny. In the years 1762—1763 alone, they amounted to 3,456,000 livres. She had numerous houses and lands also given her. In 1853, M. le Roi, keeper of the town-library of Versailles, published in the *Journal dé l'Instruction Publique*, a list of the expenses of the Marquise de P. during the years in which she had enjoyed the royal favor, which he had found in MS. in the archives of the department of Seine-et-Oise. They amounted to 36,000,000 livres. She was imperious and vindictive beyond measure, and with relentless cruelty doomed to perpetual imprisonment, in the dungeons of the Bastile and elsewhere, multitudes who had dared to speak about her ill-gotten gains and power. After facts like these it is but a poor apology for the marquise to say that she encouraged savans, poets, and philosophers, patronized and protected the *Encyclopédie*, and aided in the expulsion of the Jesuits. The *Lettres* in her name are mostly spurious. See the *Life* by Goncourt (new ed. 1878).

POMPE'II, a city of Campania, was built at the mouth of the river Sarnus (*Sarno*), looking out on the Bay of Naples. It stood at the base of Mount Vesuvius, between Herculaneum and Stabiæ. Of its early history little is known (legend ascribed its foundation to Hercules); but in more recent times it became a favorite resort for wealthy Romans, many of whom, including Cicero, had villas in the suburbs. It must have been at one time a place of considerable trade, since it was the port-town of Nola and other inland cities which studded the fertile valley of the Sarnus. The city was much damaged by an earthquake which happened on the 5th February 63 A.D., and not many years had revolved when the great and final calamity overtook it. In 79 A.D. occurred that terrific eruption of Vesuvius which, in one day, overwhelmed in irremediable ruin the towns of P., Herculaneum, and Stabiæ. In course of time a small village rose at or near the spot; but by and by the memory of P. was forgotten, and for centuries its very site was unknown. The difficulty of discovering its true position was increased in consequence of the changes produced by this fearful convulsion, which had hurled back the Sarnus from his ancient course, and raised the sea-beach to a considerable height, so that the rediscovered city, to which merchantmen resorted of old, is now a mile from the coast, and a considerable distance from the stream that in ancient times was wont to skirt its walls. For more than sixteen hundred years, P. lay undisturbed beneath heaps of ashes and cinders. At length, in 1689, some ruins were noticed, but it was not till 1755 that any excavations were made. These operations, begun by the Neapolitan government, have been continued till the present time (and recently with increased energy), and have been exceedingly productive of objects which interest the antiquarian and the classical scholar. The remains found are in a remarkably good state of preservation, owing to the fact that the city was destroyed not by lava, but by showers of sand, ashes, and cinders (*lapilli*), forming a light covering, which found its way into every nook, and, as it were, hermetically sealed up the town.

It would appear that in some parts at least the matter was deposited in a state of liquid mud, and so flowed into the remotest cellars of the doomed habitations. This is proved by the discovery of the skeleton of a woman 'enclosed in a mould of volcanic paste, which retained a perfect impression of her form.' It suggested to Signor Fiorelli, the director of the excavations, the idea of filling up the moulds with liquid plaster, and obtaining casts of the forms they contained. Many interesting objects recently discovered have thus been preserved. Among recent excavations are several paintings of classical subjects, one of which, the Laocoön, excavated in 1875, is a most valuable specimen of ancient art. That the superincumbent rubbish, in most places about 15 feet deep, is the accumulation of several eruptions is proved by the facts: that as many as eight or nine different layers have been distinctly counted; and that, while the upper layers are undisturbed, the lower one has evidently been moved. The comparatively few skeletons found, and the almost entire absence of objects of great value, as gold and silver plate, show that most of the inhabitants (estimated at 20,000) escaped and returned to bury their dead, and recover their treasures. In the autumn of 1864, upwards of two hundred skeletons were found in a temple of Juno, the victims having evidently gone thither to seek the protection of the goddess. Only about one-third of the city has as yet been excavated. The plan of P. seems to have been regular, the narrow streets crossing one another at right angles. The houses were plain and seldom more than two stories high, and had all their good apartments on the ground-floor. The walls are about two miles in circumference. It would be impossible in our brief space to attempt even an enumeration of the objects discovered in this now famous city.

Suffice it to say that in all the departments of social life—in the affairs of domestic and public life, of the worship of the gods, and the shows of the arena—in architecture, painting, and sculpture—in fine, in all the appliances of comfort and of luxury in a wealthy community, we have, as it were, a living picture of a city 1800 years ago. The reader who wishes fuller information should consult Mazois' work, *Les Ruines de Pompeii* (Paris, 1812—1838); Breton's *Pompeia* (Paris, 1855); Overbeck's *Pompeji* (3d ed. 1875); Gell's *Pompeiana* (4 vols. 1824—1830); *Something of Italy*, by W. Chambers (1862); and *Pompeii*, by T. H. Dyer (1875). In connection with the celebration of the 18th centenary of the destruction of the city, a volume was issued in 1879 by the directorate of the Museum of Naples, treating of every aspect of the public and private life of the people of Pompeii.

POMPELMOO'SE, or POMELO (*Citrus pompelmoos*), a fruit nearly resembling the Shaddock (q. v.), of which, perhaps, it ought to be esteemed a variety, although it is now distinguished by some botanists as a separate species. It is large and pale yellow. It has long been cultivated in the East Indies, and has recently been introduced into many warm countries. It has become an article of importation into Britain, and is frequently to be seen in fruit-shops. In pleasantness of taste, it resembles the best oranges. It is often preserved with wine and sugar, when it is very agreeable and refreshing in a hot climate. The rind is often candied.

PO'MPEY THE GREAT. Cneius Pompeius Magnus, son of Cn. Pompeius Strabo, was born in 106 B.C. At the early age of 17 he began to learn the military art under his father by service in the field against the Italians in the Social War. Though so young, he gave proof of extraordinary valor, and of remarkable energy of character. On the death of his father in 87 B.C., when he was only 19 years of age, he was left without a protector, and during the temporary triumph of the Marian party, he was for some time in considerable danger.

When Sulla, to whose side he was attached, returned from

Greece to Italy to oppose Marius, P. hastened into Picenum, where he had considerable estates and influence, and there raised an army of three legions, with which he successfully opposed the forces of the Marian party, compelling them to quit the district, and effecting a junction with Sulla. During the rest of the war he behaved with great prudence and valor, and with such remarkable success, that, on the restoration of peace in Italy, the conduct of the war against the remains of the Marian faction in Africa and Sicily was intrusted to him. He speedily performed his commission, and on his return to Rome was honored with the name of MAGNUS (i. e., 'The Great'), and with a triumph, which, for one who had not yet held any public office, and was merely an *eques*, was an unprecedented distinction. His next exploits were the reduction of the followers of Lepidus, whom he drove out of Italy, and the extinction of the Marian party in Spain, led on by the brave Sertorius. This latter work was one of no small difficulty. P. suffered some severe defeats at the hands of Sertorius, and it was only after Sertorius had been assassinated that he was able to put an end to the war. In returning to Italy after an absence of five or six years in Spain, he fell in with and defeated the remnants of the army of Spartacus, and thus claimed the credit of concluding the Servile War. He was now the idol of the people, and though legally ineligible to the consulship, was elected to that important office, for the year 70, the senate relieving him of his disabilities rather than provoke him to extremities. Hitherto P. had belonged to the aristocratic party, but as he had of late years been looked upon with suspicion by some of the leading men, he publicly espoused the people's cause. He carried a law restoring the tribunician power to the people; and aided largely in introducing the bill of Aurelius Cotta (*Lex Aurelia*), that the *judices* should for the future be taken from the *senate*, the *equites*, and the *tribuni aerarii*, instead of from the senate alone.

In 67—66 B.C., P. performed a noble service to the republic in clearing the Mediterranean of the pirates who infested it in immense numbers, and during the next four years, 65—62, he conquered Mithridates, king of Pontus, Tigranes, king of Armenia, and Antiochus, king of Syria. At the same time he subdued the Jewish nation, and captured Jerusalem. On his return to Italy he disbanded his army, and entered Rome in triumph for the third time in 61 B.C. And now his star began to dim. Henceforward we find him distrusted by the aristocracy, and second to Cæsar in popular favor. After his return, he was anxious that his acts in Asia should be ratified by the senate, and certain lands apportioned among his veteran soldiers. But the senate declined to accede to his wish, and he therefore formed a close intimacy with Cæsar, who promised to secure for him the accomplishment of his objects, if he in turn would assist Cæsar in the attainment of *his* aims. Crassus, who possessed enormous wealth, and who in consequence exercised a wide influence at Rome, was induced to forego his grudge to P., and thus these three men formed among themselves that coalition which is commonly called 'the First Triumvirate,' and which for a time frustrated all the efforts of the aristocratic party. This small oligarchy carried all before them; P.'s acts in Asia were ratified; Cæsar's designs were all gained; his agrarian law, distributing land in Campania among the poorer citizens was passed, and thus, too, P.'s promises to his troops were fulfilled. Cæsar's daughter, Julia, was given in marriage to P., and private relationship was thus made to bind tighter the tie of political interest.

And now, for some years following, Cæsar was reaping laurels in Gaul, and rising higher in popular esteem as a warrior and statesman, while P. was idly wasting his time and his energies at Rome. But P. could not bear a rival. Jealousies sprang up; Julia died in 54 B.C., and thus father-in-law and son-in-law were sundered by a yet wider gulf, which no bridge could span. P. now returned to his former friends, the aristocracy, whose great desire was to check Cæsar's views, and strip him of his command. Cæsar was ordered to lay down his office and return to Rome, which he consented to do, provided P., who had an army near Rome, would do the same. The senate insisted on an unconditional resignation, and ordered him to disband his army by a certain day, otherwise he would be declared a public enemy. To this resolution two of the tribunes in vain objected; they therefore left the city and cast themselves on Cæsar for protection. It was on this memorable occasion that he crossed the Rubicon, and thus defied the senate and its armies, which were under P.'s command. The events of the civil war which followed have been recorded in the life of Cæsar (q. v.). It remains only to mention, that after being finally defeated at Pharsalia in 48 B.C., P. escaped to Egypt, where according to the order of the king's ministers, he was treacherously murdered by a former centurion of his own, as he was landing from the boat. His head was cut off, and afterwards presented to Cæsar on his arrival in Egypt. But Cæsar was too magnanimous to delight in such a sight. The murderer of P. was, by his orders, put to death. The body lay on the beach for some time, but was at length buried by a freedman, Philippus, who had accompanied his master to the shore.

POMPEY'S PILLAR. The name of a celebrated column standing in the neighborhood of Alexandria. It stands upon an eminence about 1800 feet south of the walls. It is a monolith of red granite, and of the Corinthian order, and stands upon a pedestal. Its total height is 98 feet 9 inches; shaft, 73 feet; 29 feet 8 inches in circumference. The shaft is well executed. On the summit is a circular depression for the base of a statue, which in some old drawings is represented standing on it. The name popularly applied to it of Pompey's pillar is an erroneous appellation given by ancient travelers, who confess they do not know whence it was derived, and still retained. The inscription, on the base, however, shows that it was erected by Publius, prefect of Egypt, in honor of the Emperor Diocletian, who is styled upon it 'the invincible;' and it is supposed to record the conquest of Alexandria by Diocletian, 296 A.D., and the suppression of the rebellion of the pretender Achilleus. It appears to have been in the vicinity of a circus, forum, or gymnasium. The obelisk stood upon some fragments of Egyptian monuments of remote antiquity, consisting of a piece with the name of a monarch of the 13th Egyptian dynasty, and another with that of Psammitichus I., the former of which is now in the British Museum.—Wilkinson's *Modern Egypt*, I. p. 149 and foll.; White, *Ægyptiaca*, p. 1, and foll.; Champollion-Figeac, *L'Egypte*, p. 472; Norden, I. p. 22.

PONA'NI, or PANIANI, a seaport town of British India, in the district of Malabar, about 600 miles south-east from Bombay. The population is employed in fishing and in trade. Pop. 12,000.

PONCE DE LEON, FRAY LUIS, a celebrated Spanish poet, was born in 1527, probably at Granada. In 1544 he entered the order of St. Augustine at Salamanca, where he studied, took his degree in theology in 1560, and was appointed professor of the same in 1561. The reputation that he acquired as a learned commentator on the Bible induced some persons, who were envious of his success, to accuse him of having disregarded the prohibition of the church, inasmuch as, at the request of a friend, he made a new translation of the Song of Solomon, and brought out prominently, in his arrangement of the verses, the true character of the original—viz., that of a pastoral eclogue. This interpretation was not that adopted by the Catholic Church, and P. was summoned, in 1572, before the formidable tribunal of the Inquisition at Valladolid to answer the charges of Lutheranism, and of translating the sacred writings contrary to the decrees of the Council of Trent. The first accusation he quickly disposed of—for he had in reality no inclination to a foreign Protestantism; but the second was undoubtedly true, and P. was imprisoned. After five years he was released through the intervention of powerful friends, and was even reinstated in his chair at the university with the greatest marks of respect. The numerous auditory that assembled to witness the resumption of his lectures, were electrified when P. began with these simple words: 'As we observed in our last discourse'—thus sublimely ignoring the cause and the duration of his long absence from his lecture-room. In 1580, P. published a Latin commentary on the Song of Solomon, in which he explained the poem directly, symbolically, and mystically; and, therefore, as obscurely, says Mr. Ticknor, 'as the most orthodox could wish.'

P. lived 14 years after his restoration to liberty, but his terror of the Inquisition never quite left him, and he was very cautious in regard to what he gave to the world during his lifetime. He died in 1591. P.'s poetical reputation was wholly posthumous, for though his *De los Nombros de Christo* (on the names of Christ), (Salamanca, 1583—1585), and *La Perfecta Casada* (The Perfect Wife), (Salamanca, 1583), are full of imagery, eloquence, and enthusiasm, yet they are in prose. His poetical remains were first published by Quevedo at Madrid in 1631, under the title, *Obras Proprias, y Traduciones Latinas, Griegas y Italianas: con la Paraphrasi de Algunos Salmos y Capitulos de Job*, and have since been often reprinted. These consist of translations from Virgil's *Eclogues* and the *Georgics;* from the *Odes* of Horace, and other classical authors, and from the Psalms. His original poems are few, but they are considered among the most precious in the author's language, and have given P. a foremost place among the Spanish lyrists. According to Ticknor: 'Luis de Léon had the soul of a Hebrew, and his enthusiasm was almost always kindled by the reading of the Old Testament. Nevertheless, he preserved unaltered the national character. His best compositions are odes composed in the old Castilian versification, with a classic purity and a vigorous finish that Spanish poetry had never till then known, and to which it has with difficulty attained since.' See Nicolas Antonio, *Bibliotheca Hispana Nova;* Ticknor, *History of Spanish Literature;* and Villemain, *Essais sur la Poésie Lyrique.*

PONCHO, an important article of male attire in Chili. It consists of a piece of woollen cloth, 5—7 feet long, 3—4 feet broad, having in the middle a slit through which the wearer passes his

head, so that the poncho rests upon the shoulders and hangs down before and behind. In the fashions of recent times, the poncho has been introduced in Europe.

PONDICHE'RRY, the chief of the French settlements in India, situated in the district of South Arcot, in the Madras Presidency. The other French establishments are Mahé in Malabar, Karikal (q. v.) in Tanjore, Yanaon in Godavari, and Chandernagore (q. v.) in Bengal. The extent of the united territories is given by M. Block at 188 square miles. P. is situated on the Coromandel Coast in 11° 56′ of N. lat., and 79° 54′ of E. long., and is 88 miles from Madras. The territory of P. is divided into three districts—Pondicherry, Vellenore, and Bahour—has an area of 107 square miles, and comprises 92 villages. The total population of the French establishments in India in 1840 was reckoned at 171,217; in 1876, it amounted to 285,022. The population of the town of P. is about 50,000. Its exports (indigo, cotton, skins, nuts, oils, &c.) and imports amount in value to about £600,000 annually. Pop. of district of P. about 90,000. The town stands on a sandy plain, and is divided by a canal into a European and a native town. It has a handsome square, where are the governor-general's house, the Catholic cathedral, and the bazaar. In P. is the high court for the French possessions in Asia, a European college, and an Indian school. The open roadstead is defended by a citadel, and possesses a lighthouse; and from it mail steamers sail for Europe, Madras, &c. The governor of P. is governor-general of the French possessions in India. The spinning of cotton and the fabrication of cotton-thread are the chief manufactures in French establishments.

History.—The first settlement of the French in India was at Surat, in 1668. The chief of the French East India Company at that time was Carou. Subsequently, he took Trincomalee from the Dutch; but they were not long in repossessing themselves of it. Carou then turned to the Coromandel coast. In 1672, he took from the Dutch St. Thomé, a Portuguese town (now a suburb of Madras); but two years later, the Dutch retook this place also. It was then that François Martin collected about 60 Frenchmen and settled them in P., which, in 1674, he had purchased, with the surrounding territory, from Giugee, who had the supervision of all Sivaje's conquests in the country. The Dutch took the town in 1693; but by the treaty of Ryswick it was restored to the French in 1697. Chandernagore was ceded to the French in 1688 by Aurungzebe. In 1727, they obtained the cession of Mahé; in 1739, they purchased Karikal from the king of Tanjore; and in 1752, Yanaon was ceded to them. Dupleix was governor of P. when war broke out between France and England; and in 1746 La Bourdonnais took Madras. In 1748, Admiral Boscawen besieged P., but two months later, was compelled to raise the siege. In the same year occurred the peace of Aix la Chapelle; but it did not put an end to hostilities in India till some time later. In 1757, war recommenced. In 1758, Count de Lally became governor-general, and attacked the English settlement of Fort St. David, which surrendered, and was totally destroyed. In 1761, Eyre Coote took Pondicherry. By the peace of Paris, P. was restored to the French in 1763 with reduced territory, and also Mahé, Karikal, and Chandernagore. P. was again taken by the English under Sir Hector Monro in 1778, and restored in 1783. In 1793, the English again repossessed themselves of it, but the treaty of Amiens in 1802 again restored it, but only till the following year. From this time it was held by the English till, by the treaties of 1814 and 1815, it was for the last time restored to France, reduced to the narrow limits assigned by the treaty of 1783.

Annexed is a statement exhibiting some particulars relative to such of the present French possessions in India subordinate to P. as are not noticed separately in this work.

YANAON, in the Godavari District, in 16° 43′ N. lat., and 83° 11′ 16″ E. long., about 24 miles south of Rajahmundry. The area is about 13 square miles.

MAHE, in the Malabar District, in 11° 42′ N. lat., and 75° 33′ 16″ E. long. The area is only about 2¼ square miles.

PONDWEED (*Potamogeton*), a genus of plants of the natural order *Naiades*, having hermaphrodite flowers, sessile upon a spike or spadix, which issues from a sheathing bract or spathe, a perianth of four scales, four sessile anthers opposite to the scales of the perianth, four pistils, which become four small nuts, and a curved embryo. The species abound chiefly in the rivers, lakes, and ditches of Britain and continental Europe, but they are found also in other parts of the world, and some of them in New Holland. They often present a beautiful appearance in clear streams and ponds, where they protect the spawn of fish and harbor aquatic insects, their seeds also affording food to aquatic birds. The roots are a favorite food of swans. Some of the species have the leaves all submersed, others have some of their leaves floating, and considerably different in form from the submersed leaves.

PO'NGO (*Simia* or *Pithecus Wormbii*), an ape of the same genus with the Orang (q. v.), but of much larger size, six feet or more from the heel to the crown of the head, and covered with black hair, with which dark red hair is mingled. It is a native of Borneo, Sumatra, and probably of other neighboring islands, inhabiting the deepest recesses of the forests, and much more rarely seen by man than its congener the orang, which was at one time supposed by the most eminent naturalists to be the same species in a younger state. It is sometimes called the Black Orang. It has a very prominent muzzle, a large mouth, the face nearly naked, except the lower part, which has a beard. Little is yet known of the habits of the pongo. It is believed to feed chiefly on fruits.

It possesses great strength, and like the orang, is evidently adapted by its conformation for moving chiefly among the boughs of trees.

PONIATOWSKI, a celebrated princely family of Poland, is of Italian origin, being directly descended from the family of the Torelli, whose ancestors were Counts of Guastalla. One of the Torelli family having settled in Poland, assumed the name of P. from his wife's estate of Poniatow in that country. Those of the P. family, who make a figure in history are PRINCE STANISLAS P., who, in the war of succession to the kingdom of Poland, joined Charles XII. of Sweden in supporting Stanislas Lesczynski; his sons, STANISLAS-AUGUSTUS, the last king of Poland (q. v.), and ANDREW, who rose to great distinction in the Austrian service; and Andrew's son, JOSEPH-ANTONY, PRINCE P., the celebrated Polish chief in the army of Napoleon. Joseph-Antony was born at Warsaw, 7th May 1762, and at the age of 16 entered the Austrian army, with which he made the Turkish campaign of 1787, and rose to the rank of colonel of dragoons. In 1789, he returned to Poland, and was named commander-in-chief of the army of the south, having under him Kosciusko, Wielhorski, Lubomirski, and other celebrated leaders. His army, though much inferior in numbers to that of Russia, which, in 1792, invaded the country, gained the brilliant victories of Polonné and Zielencé; but P.'s uncle, King Stanislas, by agreeing to the convention of Targowitz (q. v.), put an end to the contest in 1793. The prince then resigned his command, and went into voluntary exile, but returned in the following year to aid Kosciusko, now dictator, in his fruitless opposition to the third partition of Poland. On the proposal of Napoleon to reconstitute the kingdom of Poland, P. joined the French (1800) at the head of a Polish army, and did good service against the Russians at the battles of Golymin, Danzig, and Friedland; but the French emperor, by the treaty of Tilsit, handed over Poland to its enemies, and only the duchy of Warsaw (nominally subject to the king of Saxony) was left intact.

P. was appointed generalissimo and commander-in-chief for the duchy; and so zealously did he labor for the development of its military resources, that, in 1809, when the war between France and Austria was resumed, he was able to drive the Austrians out of the Polish territory, and overrun a considerable part of Galicia. He continued to administer the military affairs of the duchy till 1812, when he joined the French army, destined to invade Russia, with a Polish army of 100,000 men. But to his intense disgust, the greater part of his army was broken up into detachments, which were incorporated with the various French legions, and P. was left with not more than 30,000 men under his direct command. At the head of this division, which always composed the extreme right of the French army, P. gathered innumerable laurels on the battle-field, and at the storming of the Russian fortresses; but he was so severely injured at Smolensko during the retreat, that he was obliged to return to Warsaw (December 1812). In the following autumn, he resumed his old place in the French army, and on October 16, received from the emperor the dignity of Marshal of France, an honor, in his own estimation, much inferior to that of 'generalissimo of the Poles,' which he already possessed. After the defeat at Leipzig (q. v.), P. was left with the remnant of his Polish division to protect the French retreat, which he accomplished by keeping the Prussians in check for several hours; at last, when his force was reduced to 300 men with 30 horses, and himself severely wounded, he retreated over the Pleisse, swimming his horse through the river; but in attempting similarly to cross the Elster, exhausted nature could no longer bear up, and he sank to rise no more, October 19, 1813. His body was recovered six days after, and was embalmed and carried to Warsaw, whence it was afterwards removed to Cracow, and placed beside the ashes of Sobieski and Kosciusko.

PONT-À-MOUSSON, a town of France, department of Meurthe-et-Moselle, on the railway from Nancy to Metz, 20 m. N.-N.-W. of the former of these towns. The Moselle flows through the town, which is situated in a fruitful valley. There is a fine Gothic church dedicated to St. Martin. P. has large cavalry barracks, and some manufactures of pottery. Pop. (1876) 9904. It was the birthplace of Marshal Duroc, the favorite and friend of Napoleon.

PONTCHARTRAI'N, LAKE, in Louisiana, U. S. America, about 5 miles north of New Orleans, with which it communicates

by a canal, is 40 miles long, and 24 miles in extreme width. It is navigated by small steamers, and communicates on the east with the Gulf of Mexico, and on the south with the Mississippi. Its greatest depth is from 16 to 20 feet.

PONTECO'RVO, a city of southern Italy in the province of Caserta, situated on the river Garigliano, 37 m. north-west of Capua, with 10,020 inhabitants, almost all engaged in agriculture. It has an old castle, many churches, and is a bishopric. It formerly belonged to the pope; but now, since 1860, it forms part of the kingdom of Italy, and is a sub-prefecture. Napoleon I. gave the title of Prince of Pontecorvo to Marshal Bernadotte, afterwards king of Sweden.

PONTÉ DELGA'DA, a town on the south coast of the island of St. Michael, one of the Azores (q. v.), in lat. 37° 40′ N., and long 25° 36′ W. It is defended by the Castle of St. Braz, which can mount 90 pieces of cannon, and by the forts of Sao Pedro and Rosto de Cao. The anchorage in the roadstead is bad and the harbor is shallow, but still the trade (which is largely in the hands of English merchants) is the most considerable of all the towns in the Azores. The chief exports are wheat, maize, and oranges. Pop. at census of 1878, 17,940.

PONTEFRACT (commonly pronounced *Po'mfret*), a market-town and municipal and parliamentary borough, in the county of York, and 24 miles south-south-west of the city of that name, on the Lancashire and Yorkshire Railway. There are two churches, viz., St. Giles and All-Saints, the latter is in the Early English style, and has a handsome tower. There are a grammar, as well as national and other schools, several almshouses, a large workhouse built in 1864, a splendid market hall opened by Lord Palmerston in 1860, &c. In the vicinity are extensive gardens and nurseries. Eight fairs for the sale of cattle take place annually. The trade is chiefly in corn, liquorice, and malt. Two members are returned to the House of Commons for the borough. Pop. of mun. bor. (1871), 6432; (1881) 8798; of parl. bor. (1871), 11,653; (1881) 15,329.

The castle of P., built shortly after the Conquest, was a large and strong edifice, and stood on a commanding height. It was the scene of the imprisonment and death of Richard II., and here also Rivers, Grey, and Vaughan were put to death, at the instigation of Richard III. The remains of the castle to be seen at the present day are very meagre.

PONTEFRACT CAKES are small lozenges of refined liquorice, which have for centuries been made at Pontefract, and are much esteemed. They are impressed with a rude figure of a castle, intended to represent Pontefract Castle.

PONTEVE'DRA, a town of Spain, in Galicia, is situated on a peninsula slope near the mouth of the river Lerez, 35 miles south of Santiago. P. is a clean and pretty place, with high old walls, granite-built houses, broad streets, and pleasant arcades. It takes its name from the bridge (*Pons Vetus*) that spans the river. The Pontevedrans are engaged chiefly in agriculture, though sea-fishing is also carried on, and there are some manufactures. Pop. 4800. The neighborhood, of which charming views are obtained from parts of the town, is covered with villas, farms, and woodlands.

PONTIANA'K, the capital of the kingdom of the same name on the west coast of Borneo, is situated near the junction of the Landak and Kapuas. It is built on both banks of the river, which is 900 feet broad, and thence to the sea is called the Pontianak. The city derives its importance from being the seat of the Netherlands' Resident, who rules directly and indirectly over the whole west coast, from 2° 56′ S.—2° 50′ N. lat., and 108° 45′—112° 50′ E. long.; territories rich in vegetable and mineral wealth. The Residency House is near Fort Du Bus, in 0° 2′ N. lat., and 109° 1′ 30″ E. long.; other principal buildings being the sultan's palace, the mosque, and hospital. Pop. 7000, including 2000 Chinese. Trade is the only pursuit in the town; and the rich alluvial lands are partly cultivated with rice, sugar-canes, cotton, indigo, coffee provisions, and fruits.

Besides a number of small dependencies, the Netherlands' Resident at P. governs the important kingdoms of Landak, Mampawa, and Sambas, with the mining district of Montrado, in the north; Tayang, Simpang, and Matan or Succadana, to the south; and Sangouw, Sekadouw, and Sintang, in the interior. The produce consists of diamonds, gold, coal, tin, iron, wax, edible nests, pepper, gutta-percha, &c. There are many gold mines in Montrado and other districts; rich iron ores in Matan; gold, platina, copper, &c., in Sambas; and in former times, Landak was rich in diamonds, but the produce is now trifling. In this district was found the famed diamond of the Sultan of Matan, which weighed 367 carats. The annual produce of the mines in the Residency of P. is estimated at not less than 425,000 ounces of gold. The population is about 400,000, of whom 250,000 are Dyaks, 90,000 Malays, 25,000 Chinese, and some 150 are Europeans.

The Dutch imports and exports have each a value of something less than £200,000 a year. There are about 70 vessels above 10 tons burden belonging to the west division of Borneo, with a tonnage of about 1700 tons. The other Netherlands possessions in Borneo are called the Residency of the South and East Division, including the lands from Matan, in the south-west, along the south and east coasts to 0° 50′ N. lat. The Resident's house is at Banjermassin, on the island of Tatas, 15 miles from the mouth of the Banjar, in 3° 34′ 40″ S. lat., and 114° 30′ E. long. Pop. 30,000. The exports are—pepper, diamonds, gold-dust, coal, benzoin, wax, rattans, dragon's-blood, camphor, edible nests, iron, fire-arms, &c. Imports—piece-goods, powder, knives, opium, rice, salt, sugar, Chinese porcelain, silk-stuffs, coral, pearls, &c. In one year the coal-mines of Orange-Nassau produced 3650 tons. On the east coast there is also coal, and the Sultan of Kūtei delivers it, according to contract, for the use of the Dutch navy, at £1 per ton. The imports of the South and East Residency have an annual value of £250,000, and the exports of £125,000. The vessels above 10 tons belonging to it are about 30, with a tonnage of 2500 tons. At Nagara (pop. 10,000), in Banjermassin, are important factories of fire-arms and other weapons.

There has been constant war on the south and east coasts since 1859. In 1860, the direct government of Banjermassin was assumed by the Resident, but the interior of the kingdom has always been disturbed, and especially in 1873, through the war with Atcheen (q. v.) inciting the Mohammedan population against the Dutch. In 1873, pop. of the south and east division, 869,763, of whom 403 were Europeans, and 2643 Chinese.—See *Borneos Westerafdeeling, Geographisch, Statisch, Historisch* (P. J. Veth, Amsterdam); the latest Colonial Reports by the Netherlands Secretary of State for the Colonies, &c.

PO'NTIFEX (of doubtful derivation) was the title borne by the members of one of the two great colleges among the ancient Romans, instituted for the purpose of preserving and cultivating religious knowledge; the other was the college of Augurs. See AUGURIES and AUSPICES. It is customary to speak of the college of pontiffs as a 'priesthood;' it was not, however, strictly speaking, such—that is to say, the members were not charged with the worship of any particular divinity, nor did they conduct sacrifices. Their duties embraced the regulation of all the religious rites and ceremonies (both public and private) of a state—e. g., how the gods should be worshiped, how burials should be conducted, how the souls of the dead (manes) should be appeased. To them was entrusted the care of the calendar, the proclamation of festival days, &c. They also saw that every religious and every judicial act took place on the right day. 'As they had thus,' says Dr. Mommsen, 'an especial supervision of all religious observances, it was to them in case of need (as on occasion of marriage, testament, or *arrogatio*) that the preliminary question was addressed, whether the matter proposed did not, in any respect, offend against divine law.' In matters of religion, they were the supreme authorities; from their decisions there was no appeal, and they themselves were responsible neither to the senate nor the people; further, they had power to inflict punishment on such priests as dared to disobey their injunctions, and deviate into schismatical courses. The words of Festus are: *rerum quæ ad sacra et religiones pertinent*, JUDICES ET VINDICES. Their president was termed *pontifex maximus*.

The pontiffs, according to Roman tradition, were instituted by Numa—a mythical person, to whom the origin of nearly all the religious institutions of Rome is ascribed. But as they appear in all the Latin communities, they are regarded by Mommsen as a 'thoroughly national Italian institution,' and probably found a place in the earliest religious organization of the Latin race. Their number was originally four, or, including the *pontifex maximus*, five, all of whom were taken from the patricians. In 300 B.C., the Ogulnian Law raised the number to nine, four of whom were to be plebeians. The first plebeian, however, who attained the dignity of *pontifex maximus* was Tib. Coruncanius, 254 B.C. Sulla, in 81 B.C., again increased the number to 15, and Julius Cæsar to 16. During the empire, the functions of *pontifex maximus* were generally discharged by the emperors themselves; and the name survived even the establishment of Christianity, occurring in inscriptions of Valentinian, Valens, and Gratianus; but at length the emperors dropped it, when it was picked up by the Christian bishops of Rome; and now this title, borrowed from a pagan cult, forms one of the sacred designations of His Holiness the Pope.

PONTI'FICAL (Lat. *pontificale*, belonging to a pontiff or bishop), one of the service-books of the Church of Rome, in which are contained the several services, whether in the administration of sacraments, or the performance of public worship, in which the bishop exclusively, or at least a priest delegated by the bishop, officiates. There were many such collections for the various national churches; but that which is now in universal use throughout the Western Church is the *Pontificale Romanum*, or Roman Pontifical, as published by authority of Clement VIII. in 1596.

and repeatedly republished since that time. The P. contains the services for ordinations, for religious professions and receptions of monks and nuns, consecrations, benedictions, &c., as well as of the solemn administration by a bishop of those sacraments which are ordinarily administered by priests. Besides the prayers to be recited, the P. also lays down the ceremonial to be observed. The rules of this ceremonial are of two kinds—*preceptive*, the literal observance of which is obligatory; and *directive*, which admit of a certain interpretation.

Another of the service-books of bishops is called the 'Ceremoniale;' but it is chiefly confined to a description of the peculiar ceremonial with which bishops are required to celebrate solemnly those offices, as of the mass, vespers, the funeral office, &c., which are common to them with priests. The most prized editions of both these service-books are those published by authority of the learned pope, Benedict XIV.

PO'NTINE MARSHES (Lat. *Pomptinæ Paludes*), a low-lying district, forming the southern part of the Campagna di Roma, and extending in a south-easterly direction from Cisterna to the sea at Terracina. Its greatest length is about 30 miles, and its breadth from 4 to 11 miles. It does not reach the sea-coast on the west, being separated from it by a broad sandy tract covered with forest; but even this barrier partakes to some extent of the character of the marshes themselves, being quite as flat, and largely intermixed with swamp and lagoon. The P. M. have undoubtedly been formed by the stagnation of the streams that take their rise in the Volscian Hills, and by the accumulation of sand along the shore from Astura to the Circeian promontory, but this formation as undoubtedly belongs to pre-historic ages. There is no reason to believe that the P. M. were, in ancient times, essentially different from what they are at present. Pliny, it is true, on the authority of a contemporary, Mucianus, states that at one period they had contained 24 or even 33 cities; but no confirmation of this statement is to be found in any earlier writer, and not a single name of these cities has been preserved. The first attempt to drain the P. M. in ancient times was made in 160 B.C. by the consul, Cornelius Cethegus; but his efforts were only partially successful, for towards the close of the Republic, the region had become as marshy as ever.

Julius Cæsar, among his vast schemes for the improvement of the commonwealth, projected one for the drainage of this pestilential district, but his murder prevented its complete realization. Augustus also appears to have done something; but in the time of Juvenal, it was a mere haunt of robbers. Theodoric, the Goth, likewise tried to reclaim it; but the desolations of succeeding reigns soon reduced it to a hopeless condition, and it continued an uninhabitable region until the close of the middle ages. The first in modern times to resume the labors of the ancients was Pope Boniface VIII., who drained the district about Sezzo and Sermonetta by means of a large canal. In 1417, Martin V. made another canal, called the *Rio Martino*, which was dug to within a mile of the sea; but after his death, the project was given up. Several additional efforts were subsequently made; but nothing was really accomplished till the time of Pope Pius VI., who, in 1778, commenced to drain the marshes, and completed the drainage in ten years. The reclamation of the land, however, has been found possible only in part. Though much is under cultivation and in pasturage, a great portion is hopelessly irreclaimable; and the whole region is so unhealthy, that, in the summer months, the inhabitants are obliged to remove to the neighboring mountains.—The famous Appian Way (q. v.) went through the P. M.; and after being unused for centuries, was re-opened by Pius VI.

PONTOO'N (through the French *ponton*, from the Latin *pons*, a bridge), the name given to buoyant vessels used in military operations for supporting a temporary bridge. Pontoon bridges have been constructed with greater or less skill, from the earliest times. Darius passed the Hellespont and Danube by pontoon bridges, and the former was traversed by Xerxes' immense army on similar temporary bridges, very admirably formed. A pontoon train is a necessity for every army manœuvring in a country where there are rivers, and many campaigns have proved failures from the want of this cumbrous but indispensable apparatus. In most armies, the pontoons are under the charge of the engineers; but in the Austrian army there is a distinct and highly-trained corps, called *Pontonieren*. Marlborough used clumsy wooden pontoons. Napoleon and Wellington had them lighter of tin and copper. They were flat-bottomed, rectangular boats, open at the top. Anchored at stem and stern, beams were laid over from one to another, and transoms with planks crossing these beams completed the roadway of the bridge. These open pontoons were exposed to the disadvantage that they were very liable to be filled with water, and thus ceased to support the bridge. They were, moreover, very heavy, one pontoon, with appurtenances, constituting a wagon-load. As 36 were deemed necessary for the train, a pontoon equipment was a serious item in the *impedimenta* of an army. The open pontoons are, now, however, obsolete, modern science having substituted closed cylindrical vessels of copper (or occasionally of India-rubber), which are far lighter, can in an emergency be rolled along, and can only be submerged if perforated. Against the last contingency, they are divided within into water-tight compartments, so that one perforation may not seriously detract from the total buoyancy of a pontoon. In the British service, two pontoons are used: the larger, with hemispherical ends, being 22 feet 3 inches in length, and 2 feet 8 inches in diameter; the smaller, cigar-shaped, with conical ends, 15 feet in length, and 1 foot 8 inches in diameter. Two of the largest used to form a raft weigh 8 cwt. 7 lbs.; the superstructure 18¼ cwt.

At 24 feet apart from center to center, this raft, will carry infantry four deep, marching at ease; cavalry, two deep, and light field-guns; at 16 feet interval, heavy guns. A raft of three pontoons, at close distances, will support siege-ordnance. The pontoons can be used in very wide rivers as rafts, in their proper sense, or they can be connected, when the width permits, to form a bridge. In the latter case, each is towed into line, anchored above as it drops to its place, and a second time when its exact spot is reached. It is computed that each pontoon requires 1½ minutes to take its position, and that when the pontoons are placed, the roadway can be laid, if properly arranged previously, in 1½ minutes for each interval between two pontoons. A river of 600 feet may thus be bridged in less than 1½ hours. The process of throwing a bridge over in face of an enemy, is fraught with the utmost danger to the engineers employed. Pontoon bridges have to be passed with great care, and every measure should be adopted, as breaking step, &c., which can reduce the peculiarly dangerous vibration.

PO'NTUS, the name given by the ancient Greeks to a country in the north-east of Asia Minor, bordering on the Pontus Euxinus (whence its name), and extending from the river Halys in the west to the frontiers of Colchis and Armenia in the east. Its southern limits were the ranges of Anti-Taurus and Paryadres, so that it corresponded pretty nearly to the modern pashaliks of Trebizond and Siwas. On the east and south, P. is mountainous, but along the coast there are large and fertile plains, which in ancient times produced, and indeed still produce abundance of grain, fruits, and timber. Game, according to Strabo, was also plentiful. The rearing of bees was carefully attended to, and honey and wax were among the chief articles of commerce. Iron was the principal mineral.

Regarding the ancient inhabitants of P., nothing is known ethnologically. Greek colonies, indeed, flourished on the coast from the 7th c. B.C., and doubtless spread some knowledge of civilization among the inland barbarians; but how far the latter were influenced thereby, we cannot tell. They first appear as divided into numerous tribes, virtually independent, but owning a nominal allegiance to the Persian kings, whose authority was represented by a hereditary satrap belonging to the royal family of Persia. It was one of these satraps, Ariobarzanes, who, by subjugating some of the Pontian tribes, in the year 363 B.C., during the reign of Artaxerxes II., laid the foundation of an independent sovereignty. Ariobarzanes was succeeded in 337 B.C. by Mithridates II., who took advantage of the civil confusions that followed the death of Alexander the Great, to enlarge his dominions; but the greatest of these Pontine sultans, and one of the most formidable enemies that Rome ever encountered in the east, was Mithridates VI. (q. v.). On the overthrow of this potentate by Pompey (65 B.C.), the western part of P. was annexed to Bithynia, and the rest parcelled out among the neighboring princes. Subsequently, a grandson of Mithridates, Polemon, was installed monarch of the central part of P.; but in the reign of Nero, it was voluntarily ceded to the Roman emperor, became a Roman province, and was called *Pontus Polemoniacus*. In the reign of Constantine, it underwent a new division. The principal towns of ancient P. were Amisus, Polemonium, Pharnacia, Cerasus, Trapezus, Apsarus, Cabira, and Neocæsareia.

PONTYPOOL, a small market-town of Monmouthshire, 20 miles west-south-west of Monmouth, and 10 miles north of Newport, with both of which it is connected by railway. Japan wares were long made here, but this branch of manufacture has declined. Articles in polished iron are made, and the iron forges and coal and iron mines which surround the town employ many of the inhabitants. Pop. (1871) 4834.

PONY, the common name of many small active breeds of Horse (q. v.), belonging to different countries, from India and Africa to Iceland; but in the warmer parts of the world, chiefly found in mountainous or sterile regions. They are in general the property of man, and not truly wild, although, in very many cases, they live almost in a wild state, and receive no care or attention except when they are wanted for use. They are in general very hardy, and their strength is great in proportion to their size. They are often vicious, or at least playfully tricky to a much

greater degree than is usual with larger horses. Ponies are very often covered with rough hair, and have large shaggy manes and forelocks. The *Shetland P.* is a very good example of these small races of horse. The *Iceland P.* is scarcely different from it and is hardy enough to endure the winter of Iceland without shelter. The *Galloway, Welsh, Dartmoor, Exmoor,* and *New Forest* breeds, are British races of P., larger than the Shetland. The progress of enclosure and cultivation in their native regions has so changed the circumstances in which they long subsisted, and in which, perhaps, they originated, that scarcely any of them is now to be seen of pure and unmixed race. Sardinia and Corsica have small races of P., which have subsisted unchanged from ancient times. In the Morea, there is a race of ponies, driven in herds to Attica for sale, exceedingly wild and vicious, but capable of being rendered very serviceable. But it is unnecessary to mention the many races both of Europe and Asia. They differ considerably in size, some, like the Shetland P., suggesting a comparison with a large dog, some much larger. They also differ much in color; a dun or tan color, with a black stripe along the back, is prevalent in many of them. Ponies are seldom employed in agricultural labors; but they are of inestimable value in many wild and mountainous regions, from their hardiness and surefootedness; and are often used as saddle-horses, the largest kinds being even employed as horses for light cavalry.

POO'DLE (Germ. *Pudel*), a kind of dog, originally German, but extensively diffused throughout Europe during the wars of the French Revolution, and abundantly introduced into Britain by the soldiers who served in Spain and the Netherlands. It is very closely allied, however, to the coarser crisp-haired *Water-dog*, long well known in England, and particularly to water-fowl shooters and the fishermen of the north-eastern coasts. The *Barbet* of the French is a diminutive variety, much in request as a lady's pet. The P. is of a stout form, and has a short muzzle standing out abruptly from the face; the ears are of moderate length, and pendent; the tail rather short; it is everywhere covered with long curled hair, which in many of the little barbets hangs to the very ground. No kind of dog exhibits greater intellegence or greater affection; and as to both, many interesting stories are on record.

POOLE (so called from the inlet or *pool* on which it stands), is the chief seaport of Dorsetshire, and is situated on a wide but shallow inlet in the east coast of the county. It is built of red brick, is intricate and confused in plan, but is pierced by the High Street, a mile in length. Along the shore are capacious quays, well lined with shipping. The town is more noted for its trade than for its architecture. Sail-cloth and cordage are manufactured, and, together with potters' and pipe clay, provisions, and articles of clothing, form the principal articles of export. Ship, and especially yacht building is carried on. The harbor, into which fall the rivers Trent and Frome, is a beautiful estuary, and is a fine feature in the charming scenery of the vicinity. Its depth of water is 13 to 14 feet, and its navigable channels, being unobstructed by rocks or sands, are perfectly safe at all times. Brownsea Island, in the middle of the pool, is 6 miles in circumference. On its extreme point stands the castle of the same name. In 1880, 1014 vessels, of 75,987 tons, entered the port. Pop. (1871) 10,079; (1881) 12,303. P. returns one member to parliament.

POOLE, MATTHEW, a learned English divine of the Puritan age, was born at York about the year 1624, and educated at Emmanuel College, Cambridge. Very little is known regarding his life. In 1662, he figures as preacher in the church of St. Michael le Querne, in London; but was one of the 2000 ministers whom the Act of Uniformity compelled to leave the Church of England. Subsequently, he retired to Holland, and died at Amsterdam in 1679. His principal work, *Synopsis Criticorum Biblicorum* (5 vols. fol. 1669—1676), is an attempt to bring together in a condensed form the opinion of 150 biblical critics of all times and countries previous to his own. It is a work showing great (professional) learning, and very respectable talent; but later criticism and research have done much to render it obsolete. Other productions of P.'s are *Annotations on Scripture,* and *The Nullity of the Roman Faith.*

POO'NA, or PUNA, the capital of a district of British India, of the same name, in the presidency of Bombay, is situated on the small river Moota, near its confluence with the Moola, in a treeless plain about 74 miles south-east of Bombay. Its present population is estimated (1872) at 90,436; but in its palmy days, when it was the capital of the Mahratta power, it contained more than twice that number. A large proportion of the population consists of Brahmans. The city is divided into seven quarters, named after the days of the week, and the principal building is a palatial structure, formerly the residence of the Peishwah. Its climate is salubrious and pleasant, and it is the headquarters of the Bombay army. The cantonment for the infantry and horse-artillery is from one to two miles west of the city. The cantonment for the cavalry is at the village of Kirkee, about two miles to the north-east of the city. In 1821, soon after P. came into the possession of the British, a college was established for the study of Sanscrit literature, in the hope that the disaffected Brahmans (who had been all-powerful under the Peishwah) might be thus conciliated.

As the modes of instruction originally adopted were entirely native, and far from efficient, the college has gradually been transformed. At present, it possesses a staff of European professors with native assistants, and is a highly respectable seminary for the study of English, Marathi, and Sanscrit. Only Brahmans were admissible into the college as first established; now it is open to the public generally. P. is very much resorted to, particularly in the rainy season (from June till October) on account of its pleasant and salubrious climate. The fall of rain averages from 22 to 25 inches annually; whereas at Bombay it is about four times as great. The range of the Ghauts (properly called the Sahyadree range) which rises up as a precipitous barrier 2000 feet high, with peaks considerably higher, receives the full burst of the monsoon; so that Khandalla on the top of the Ghauts is drenched with almost perpetual rain for four months. Then the clouds pass on, relieved of their watery burden, and the rainfall eastward of the Ghauts is much less. From the Ghauts, the whole country gradually slopes towards the Bay of Bengal. P. is about 1800 feet above the sea-level. One of the most interesting objects in the neighborhood of P. is a large *bund,* or embankment, solidly built of hewn stone over the Mootamoola river for the purpose of providing a supply of water for the cantonment, and especially the bazaar or native town connected with it. It was built by the late Sir Jamsetjee Jeejeebhoy, whose charities were very great. Two forts celebrated in Maratha history are close to Poona—Singhur, about 12 miles to the south-east, and Poorundur, about 18 miles to the south. These are favorite sanatoria during the hot season (from the end of February to June). At Poorundur there is a sanatorium of considerable size for sick soldiers. P. was formerly a great mart for jewelry and precious stones, but the trade in these things has quite ceased. The native manufactures have also been supplanted by the introduction of European piece-goods, and the only business that prospers is that of dealers in grain and other agricultural produce. The railway has rendered P. almost a suburb of Bombay. The works by which the railway climbs up the great mountain-barrier of the Ghauts from the low lands of the Konkan to the high table-lands of the Deccan are among the boldest that have as yet been undertaken. The line up the Ghauts was opened in April 1863.

Of late years, great alterations have taken place around Poona. The native city has not greatly altered, except that the streets have been widened and cleaned; but the cantonment has changed rapidly. The great fire of 1879 has left its mark on P. Among the most striking of the many new buildings recently reared is the Government College—a Gothic building, recently finished, which was erected mainly at the expense of Sir Jamsetjee Jeejeebhoy. While speaking of education in Poona, it is but fair to the Scottish mission to say that it commenced English education in P. soon after the mission was established (in 1831), and has all along carried it on. The schools of the mission, both male and female, both for English and the vernacular (Marathi), are largely attended, even by the highest castes. The female pupils are upwards of 300 in number; and one school consists of Musulman girls. The Musulmans in India generally are far behind both Hindoos and Parsees in their desire to educate the females; in fact, a Musulman female school is as yet exceedingly rare.

POONA-WOOD is the timber of the poon trees of India (*Calophyllum inophyllum* and *C. augustifolium*). It is very commonly used in the East Indies, particularly in ship-building, for planks and spars; these latter are usually called *Poon,* and are in general use for masts in that country. The trees are natives of Penang, and of the countries eastward of the Bay of Bengal.

POOP, in large vessels, is a sort of supplemental deck raised over the after-part of the upper deck. The best cabins are situated beneath it. In old ships, a second and even a third poop were raised above the hinder part of the poop proper, giving the vessels that immense height at the stern which is shown in old drawings. The poop is gradually disappearing from ships built either for speed or war, as offering undue resistance to the wind in one case, and an undesirable mark to an enemy in the other.

POOR AND POOR-LAWS. Charity, like Christianity, had its origin, or earliest development, in the East. Among the primitive nations of the world, almsgiving was inculcated as a religious observance, and is prescribed as such in their sacred records. Among the European nations of antiquity, we find a provision for the poor adopted as a matter of state policy. In earlier times, Athens could boast of having no citizens in want; 'nor did any disgrace the nation by begging.' But war, at length, brought poverty in its train, and the Athenian people decreed the maintenance of those who were mutilated in battle; and, at a later period, of the children of those who fell. Plutarch mentions

Peisistratos as the originator of the first decree, though others derive it from Solon. By the latter decree, the state provided for the orphans of its soldiers up to their eighteenth year, and then sent them into the world with a new suit of armor. The bounty given to the disabled is mentioned by Lysias, Harpocratian, Aristotle, Isocrates, and others; and is variously stated at one, two, and three oboli a day, and it seems to have been increased with the increased cost of subsistence. There were also societies for the relief of distress among the democratic states of Greece, called Eranos—a sort of friendly society, in which the members relieved were expected to pay back the money advanced to them, when they had raised themselves to better circumstances. But it must be remembered that these so-called democratic states were in reality slave-holding aristocracies.

Among the Romans, the Agrarian and Licinian laws (years of Rome 268 and 338) were framed in order to prevent the extremes of riches and poverty in the state. They limited the extent of property in public land to be held by each citizen, and the latter directed that all such land, above the allotted portion, should be taken away from the holders, and given to those who had none. The distribution of grain at reduced prices, which at length became gratuitous, was introduced by Caius Gracchus, and lasted till the fall of the Roman empire. Augustus in vain tried to suppress it. In his time, 200,000 citizens were thus fed. Cicero makes mention of this provision as in great favor with the Roman people, because it furnished them with an abundant subsistence without labor; other Roman writers describe its results as disastrous both to agriculture and manners, creating a nation of mendicants, and causing the land to fall out of cultivation.

In the middle ages, the great body of the laboring classes were in a state of bondage and looked to their feudal lords for maintenance. The obligation to provide for their slaves, or serfs, seems to have been fully recognized, so that many encountering, in a state of freedom, the miseries of want, went back to bondage as a refuge from destitution. The villeins in Saxon England were attached to the soil, and received from their lord a portion of land for the support of themselves and their families. But the church of Rome constituted herself the great receiver and dispenser of alms. The rich monasteries and abbeys distributed doles to the poor.

In most states of continental Europe, the church remains to a larger or smaller extent the public almoner, the state only stepping in to supplement the offerings of the church and voluntary charity, when they become deficient. The disseverance from the church is hardly anywhere so complete as in England. The laws of different countries vary as to the degree of want entitling a pauper to relief, the extent to which the right to relief is a matter of positive right, the conditions which give rise to a claim of relief, and the incidence of taxation. In the Netherlands, a title to relief is acquired by birth, or by having inhabited the same place uninterruptedly for six years. In Sweden, such title as the law allows is conferred by inhabitancy in the parish or town, if the applicant, being above 45 years of age, has been entered on the list of tax-payers. In Norway, the right is acquired by a residence of two years; in Denmark, of five years. By the Prussian poor-law of 1842, the duty of relief falls on the commune of which the person applying was expressly admitted a member, in which he has acquired a regular abode, which he has occupied for a year, or in which he has been living for three years after attaining full age. In Slesvig-Holstein, the right to relief in a commune is acquired by birth; also by 15 years' residence after the age of 18: the latter mode of acquiring it being competent to foreigners. In Saxony, a settlement is acquired by birth, express gift, or purchase of a house and 5 years' residence.

In Spain, the state supports several asylums for lunatics, the blind, and deaf and dumb. It also distributes a large sum annually among the provinces for the relief of the poor—each province being bound to raise double the amount received from the state. The state also steps in for the relief of great calamities, and devotes a certain sum annually for the assistance of unfortunate Spaniards abroad. A general directory of the charitable and sanitary services superintends the parochial bodies charged with the distribution of assistance to the poor.

In Austria, each commune is charged with the relief of its poor. All who have legal domicile, or being unable to prove their domicile, are resident in the commune, are entitled to relief out of the general assessment. There is no special rate, and the administration is strictly municipal. In many provinces, private charity is associated with public assistance, administered by the curé, a few chosen inhabitants, who are called 'Fathers of the Poor,' and an officer accountable to the commune. This system is called the 'Poor's Institutes;' and their funds are principally derived from private sources; but they receive a third part of the property of ecclesiastics who die intestate, and certain fines, &c. Applicants are subjected to minute inquiry as to the cause of poverty, and a weekly allowance is made on a scale according to age and necessity. The infirm poor, who have no relatives to reside with, are taken into hospitals established in almost every commune, where they receive, besides lodging, fire and light, clothing, medical care, and a small allowance in money to provide for their food and other wants. Children are either provided for in the homes of their parents, put into asylums, or boarded with people of probity, who receive a monthly payment, as in Scotland. The welfare of these children is superintended by the curés, the maires, and the sanitary officers of the commune. Foundlings, lunatics, the blind, deaf, and dumb, are provided for by the state. Vagrancy is punished, and parents permitting children under fourteen to beg are liable to three months' imprisonment. Able-bodied vagrants are sent to houses of correction, and kept to work. Pawnbroking is a charitable institution in Austria, under government control; and many pawnbroking establishments rest on endowments, and lend without interest. The trade is forbidden to private persons.

In France, the relief of the poor is not compulsory, in as far as its distributors may, after making inquiry, refuse relief, except in the case of foundlings and lunatics. The Minister of the Interior has a general superintendence of the machinery of relief, as well as the immediate administration of many large hospitals and refuges. He also assists a great number of private charities. The other ministers of state give assistance on the occurrence of great calamities. The departmental funds are called upon for the compulsory relief, but the commune is the main source of public assistance. Its duty is to see that no real suffering remains unrelieved, and that the nature of the relief is such as can most easily be discontinued when the necessity ceases. The commune encourages and stimulates voluntary charities, and receives gifts for the benefit of the poor's funds. Except in Paris, the administration of the hospitals, and of the relief given at the homes of the poor, are under different management, the communes only interfering to supplement the funds of the hospitals, when these are insufficient. The maire is president both of the administration and the hospitals and of the body for giving out-door relief (the *bureau de bienfaisance*). During industrial calamities, the poor are sometimes employed in workshops supported by the public, and in public works. In Paris, since 1849, there has been a responsible director set over all the charities of the city. He manages the out-door relief through the medium of the Committees of Assistance, formerly called *bureaux de bienfaisance*, in each arrondissement. He is under the inspection of a council, composed as follows: The Prefect of the Seine (president), the Prefect of Police, two members of the Municipal Council, two maires or deputy-maires, two members of the Committees of Assistance, one councillor of state or a Master of Requests, one physician and one surgeon practising at the hospitals, one professor of medicine, one member of the Chamber of Commerce, one member of the Council of Prud'hommes, and five members taken from other classes than those above mentioned. Begging is forbidden, and punished, wherever there are establishments for the relief of the poor.

In the Hanse Towns, there was introduced, in 1788, a system of voluntary contributions aided by fixed subsidies from the government. This at length resulted in government supplying all deficiencies, which in the last few years have been 80 per cent. of the cost of the general poor relief. In Holland, pauper colonies have been supported by government for the last forty years. Vagrants, after a short imprisonment, are sent to one of these, under a system of discipline quite as rigorous as an Irish intermediate prison. Paupers of good character are sent to maintain themselves and their families, by agricultural labor, in free colonies. The working of the system is pronounced costly and unsatisfactory.

In America, the system is very similar to our own. Every man is entitled by law to relief from the town of his settlement, the rate being assessed on whole towns, and not on parishes. The States have their own poor-laws, but paupers are removable from one state to another. Any American becoming a pauper loses his state rights. The acts concerning Workhouses and Paupers in the Revised Code of Massachusetts may be taken to represent generally the state of the law throughout the Union. The former provides 'that any town may erect or provide a workhouse for the employment and support of all poor and indigent persons that are maintained by, or receive alms from the town; all persons who being able to work, and not having means to maintain themselves, refuse or neglect to work; all persons who live a dissolute vagrant life, and exercise no ordinary calling or lawful business; and all such persons as spend their time and property in public-houses, to the neglect of their proper business, or by otherwise mis-spending what they earn, to the impoverishment of themselves and their families, *are likely to become chargeable to the town or the commonwealth.*' The idle and the vagrant may be committed to the workhouse, and kept to labor as in a house of correction. There are no provisions for enforcing the claims of kindred, and for the immediate relief of strangers. The administration is in the hands of overseers, whohave discretion as to the mode of relief.

The annals of the poor in England are neither short nor simple. Severe enactments for the repression of vagabondage and mendicity date from an early period. In ancient Saxon times the householder was bound to provide for the laborer, and men who had no master were, by the Folkmote, assigned to some householder; but when freedom began to prevail, this state of things ceased. No master was bound to provide for the freeman, and when he failed to provide for himself by honest labor, he generally took to vagrant begging, often to violence. The statute of Winchester (13th Ed. I., 1285) shows the poor utterly uncared for, and the roads infested by vagrant robbers. Up to the reign of Richard II., the idea of English rulers was to treat pauperism as a crime, and repress it by punishment, and by the most unjust and absurd restrictions on the freedom of labor. The 23d Ed. III. forbids giving alms to vagrants, on pain of imprisonment; then also the laws of settlement had their origin in the attempt to chain the free laborer to the land. See SETTLEMENT. The 12th Richard II. (1388), c. 7, is the first statute that makes provision for the impotent poor. The statutes of Henry VII. endeavor to carry out, by the severest measures, the system of repression. The 27th Henry VIII. c. 25 (1535), introduced the principle of compulsory assistance. Each parish was ordered to receive and provide for the impotent, and set the able-bodied to work. Alms were to be collected into a general fund, and indiscriminate almsgiving was forbidden. The sturdy beggar was treated without mercy, was to be whipped when first caught, next to have his ear cropped, and for a third offence, to suffer death, as a felon and enemy to the commonwealth. This is repealed by 1st Ed. VI., c. 3 (1547), because, 'through foolish pity, it is rendered of non-effect.' Not much milder, to modern ideas, seem the substituted penalties—viz., branding, on first conviction, with a V on the shoulder, and being adjudged a slave for two years, to be claimed by any one, fed on bread and water, and caused to work by beating, &c.

Running away from this tender treatment was punishable with S branded on the face, and slavery for life to the town or parish, on the roads of which the incorrigible vagrant was to work in chains, at the penalty of the town or parish. Other two acts of Edward's reign return to earlier and considerably milder measures of restraint. A little urging was now found necessary to obtain funds for the maintenance of the poor. The collectors were gently to ask every man and woman at church what they would give; but if one could not be persuaded, the bishop was to send for the recusant, and use 'charitable ways and means.' At length, the 5th Elizabeth, c. 3 (1563), provided that he who obstinately refused to give should be handed over to the more persuasive arguments of the justices, who were empowered to tax him at their discretion, and send him to jail for default. Ten years later, the power of compulsory assessment is given to the justices, and abiding places are ordered to be provided for the aged and infirm. These statutes culminated in the 43d Elizabeth, c. 2 (1601), which has formed the basis of the poor-law system of England up to the present time. It taxed every inhabitant of every parish for the relief of the poor. It directed the justices in every county to appoint three or four substantial householders in each parish to be overseers of the poor, along with the churchwardens. It ordered the relief of the impotent, and the apprenticing of children, and the providing of work for the able, by means of 'a convenient stock of flax, hemp, wool, thread, iron, and other necessary ware and stuff.' The great act of Elizabeth came but slowly into operation. Up to the reign of Charles I., there were many parishes in which no rate was assessed, and which turned away their poor; but the great evils had been remedied, and there is little legislation on the subject for the next hundred years.

The 3d William and Mary, c. 2. (1691), an act relating chiefly to settlement, provides that the persons to be relieved be registered and examined by the vestry, because evils had arisen out of the unlimited power of the churchwardens and overseers giving relief for their own private ends,' by which the charge on the parish was greatly increased, contrary to the true intent of the statute of Elizabeth. This act also gave power to the justices to order relief in cases of emergency, a provision which afterwards became a fruitful source of difficulty. The evils henceforth complained of were, that many had thrown themselves on the rates who ought to have been supporting themselves independently of such aid; that pauper labor was found interfering with and displacing industrial labor; that the overseers were acting with unchecked dishonesty; and justices, with unrestrained liberality, ordering the money of the industrious and prudent to be spent upon the idle and improvident. Efforts were made to remedy these abuses throughout the reigns of the first three Georges, by making the justices act with the overseers, by rendering the overseers accountable to the parishioners by means of returns and the power of inspection, and by the offer of the workhouse to all applicants for relief. This last provision, made in the reign of George I. (9th Geo. I., c. 7, 1723), substituted what is called in-door relief, for the allowance made to the poor at their own homes, and introduced the workhouse system. All who refused to be lodged in the house, were to be struck off the poor's-roll, and refused relief. A great increase in the number of workhouses took place; guardians were appointed to guard the pauper children from neglect and improper conduct, and other attempts to improve their administration made; Work-house Unions were also introduced by an act called Gilbert's Act (1782), and a succession of acts passed for the protection of parish apprentices.

Towards the close of the 18th c. a great relaxation took place in the treatment of the poor. The 36th Geo. III., c. 10 and 23 (1796), increased the amount, and extended the application of relief. It repealed the act forbidding relief to those who refused the workhouse, and allowed relief to be given in aid of wages. Henceforth, out-door relief became the rule under a variety of systems, of which the complaint was justly made, that they turned the poor-laws into a mode of paying wages. In 1801, the amount of the rates was reckoned at £4,000,000. In 1820, it had risen to £7,330,254. In 1817, a commission of the House of Commons stated their opinion, that unless checked, the assessment would swallow up the profits of the land. Though the two Vestry Acts, which resulted from the commission appointed in 1817, seem to have done something to remedy the evils complained of, a new commission to inquire into the operation of the poor-laws was found necessary, and appointed in February 1832. The evidence brought before this commission revealed a disastrous state of things. The independence, integrity, industry, and domestic virtue of the lower classes were in some places nearly extinct. The great source of the evil was shown to be the relief afforded to the able-bodied on their own account, and that of their families, in aid of wages. This aid at first reduced the expenditure in wages, and found favor with farmers and magistrates, who framed scales of relief in accordance with the wants of the people, so that they began to be paid for their necessities, and not for their industry, and fell into the temptation of increasing the former, and neglecting the latter. Five modes of out-door relief were found in operation: 1. Relief without labor; 2. Allowance given, in aid of wages, according to the number of the laborer's family; 3. The Roundsmen system, the laborers being let out, by the parish, among the employers round; 4. Parish work, generally on the roads; 5. The labor-rate, the ratepayers preferring to divide among them the pauper labor, and to pay for it, however valueless, instead of raising a rate. Diminished industry ate away the very root of capital. Farmers turned off their men, or refused to employ them at fair wages, thereby causing a surplus of unemployed labor fraudulently, they then took them back from the parish at reduced wages, paid out of the rates.

Under the system of allowance, there were parishes in which every laborer was a pauper, paid more for idleness than he could get for labor, paid more if he took a pauper wife, and still more for every pauper child. Paupers married at 17 and 18 years of age, and claimed the allowance the day after their marriage; and from parish after parish came the reply to the queries of the commissioners: 'All our able-bodied laborers receive allowance.' No poor man in such parishes could save; if industrious and thrifty, and it was known that he had a fund of savings, 'he would be refused work till the savings were gone,' and he had come down to the pauper level. This had gone on, till in many places pauperism swallowed up three-fourths of the rent. Nor was the maladministration confined to the rural districts; the evidence showed that it extended all over the country, and into the manufacturing towns, where the out-door relief was a source of constant imposture. The administration of in-door relief was also full of abuses, from want of classification, discipline, and employment. Better food and lodging was provided for idle paupers than working-people could procure—better, even, than could be afforded by many of the ratepayers. In 1834, the commissioners reported that they found the administration 'opposed to the letter and spirit of the law, and destructive of the welfare of the community.' The commissioners strongly laid down the principle, that the condition of the pauper ought to be below the lowest condition of the independent laborer, because every penny bestowed in rendering the condition of the former more eligible than that of the latter, is a bounty on indolence and vice, and recommended: 1. The cessation of out-door relief; 2. A central authority to control the administration; 3. Unions for the better management of workhouses, and the classification of their inmates; and 4. A complete and clear system of accounts. The bill embodying these recommendations was brought in, March 17, 1834, passed its second reading in the House of Commons with only twenty dissenting votes, and became law on the 14th August as the 4th and 5th Will. IV. c. 76. This act was not a change of law, but of administration.

The orders of the new board restricted overseers, on the formation of a union, to the collection of rates; appointed paid relieving-officers to dispense relief under the directions of the unpaid Boards of Guardians; required the gradual withdrawal of out-door relief; and enforced classification and discipline in the workhouses. A rapid formation of unions took place under the

new board. In the first eight months, 112 were formed out of 2066 parishes. The pauperized districts experienced a great and immediate relief, numbers of paupers going off when they found that relief involved adequate work, or the strictly-disciplined workhouse; wages rose, and the expenditure was reduced, on an average, 20 per cent. At the accession of George I. in 1714, the poor-rates amounted, as nearly as can be estimated, to £950,000, equal to 3*s.* 3¾*d.* per head on the population of 5,750,000. At the accession of George III, in 1760, the population had increased to 7,000,000, the poor-rates to £1,250,000—an average of 3*s.* 6¾*d.*; while in 1834, the population, estimated from the last census, was 14,372,000, and the money expended in relief, £6,317,255—equal to 8*s.*9½*d.* per head. In three years, the operation of the Amendment Act had reduced the expenditure one-third, viz., to £4,044,-741. In 1848, the commissioners were exchanged for a public board, which is one of the government departments, with a president, in whom has been vested the power of the commissioners, and who holds office as one of the ministers of the crown. There are 631 unions. In 1860—1861, the number of poor receiving relief in England was about 850,000, about 4½ per cent. on the population: of these, about 140,000 were relieved in workhouses. The commissioners were unable to withdraw out-door relief, which continues to be in England the most important item. With the aged, the sick, and orphans, the guardians deal at their discretion; but stringent rules for the relief of the able-bodied are in operation under the board, whose orders have the force of laws.

In the rural districts, guardians are prohibited from giving relief to the able-bodied out of the house, unless under a supplemental order, in emergency. For other places, the general rule forbids relief to be given in aid of wages, and requires work to be supplied. Exceptions are made by the board on the application of the unions when necessity arises, as in the recent case of the cotton districts. The expenditure is strictly guarded and examined by public auditors, of whom there are fifty-four for England. A district medical officer, of whom one or more are appointed for each union, attends to all cases of sickness among the poor.

Scotland and Ireland have been legislated for separately. Their poor-laws are similar to the English in principle and practice; both are administered by a Central Board, which supervises the local bodies charged with relief, and in both the rate is levied on the annual value of real property. The present system in Scotland was instituted by the 8th and 9th Vict. c. 83 (1845). Scotland is divided into 883 parishes, some of them combined for poorhouse accommodation. The relief is administered by a parochial board, appointed by the ratepayers, the burgh magistrates, and the kirk-session. They appoint inspectors of the poor, who act as relieving-officers. The Scotch law differs from the English and Irish in allowing no relief to able-bodied adults. Claimants must be aged, infirm, or disabled. Out-door relief is the rule. As regards the working of the Scottish poor-law, its great and acknowledged defect is the constant and costly contest respecting settlements, or right to fix claims on particular parishes. Scotland had, in 1874, 64 poorhouses for 406 parishes, having a population of 2,407,441. Ireland had no poor-laws until the year 1838, when they were introduced by the 1st and 2d Vict. c. 56. For the purpose of relief, Ireland is divided into 163 unions of townlands or parishes. Each union has a workhouse managed by a Board of Guardians, elected by the ratepayers. Every destitute person has an absolute right to relief, which is administered almost entirely in the workhouse.

The average yearly population of the United Kingdom during the ten years ending 1870, was 29,694,138; average paupers in each year, 1,140,185, or 3·9 per cent. They were apportioned as follows:

	Population.	Paupers.	Percentage.
England	20,998,332	973,860	4·6
Scotland	3,044,919	100,927	3·3
Ireland	5,650,897	65,398	1·2

The total expenditure in the United Kingdom during the ten years was £80,901,456, or an annual charge of 5*s.* 5½*d.* per head on the average population of the period, apportioned as under:

	Amount of Assessment.	Per head per annum.	
	£	*s.*	*d.*
England and Wales	67,286,674	6	4¾
Scotland	6,191,066	4	0¾
Ireland	7,423,716	2	7½

To look back ten years, the rate which, at the end of the financial year 1861, was 5*s.* 9*d.* a head on the population, was 6*s.* 4½*d.* two years after—a fact due to the cotton famine. Applying similar calculations to the five years 1871—1875 gives the following results: estimated annual average population of the United Kingdom, 32,129,865; annual average of paupers, 1,109,608, or 3·4 per cent, distributed thus:

	Population.	Paupers.	Percentage.
England and Wales	23,355,535	920,030	3·9
Scotland	3,430,930	112,132	3·25
Ireland	5,343,400	77,446	1·4

The total expenditure for the same period was £47,532,756, or an annual average charge of 5*s.* 0¾*d.* per head of population—in England and Wales, 6*s.* 7¾*d.*; Scotland, 5*s.* 1½*d.*; Ireland, 3*s.* 5*d.* At the beginning of 1880, there were 837,940 paupers in England and Wales; at the beginning of 1881, 803,126. In Scotland there were 34,412 paupers in 1881; and in Ireland, 549,874.

There is no poor-law in our Australian colonies, but benevolent asylums for the infirm and destitute have become general, and hospitals are numerous in all the rising towns in the gold-fields.—Compare Böckh's *Public Economy of Athens*, translated by Sir G. C. Lewis; Sir George Nichol's *History of the Poor-laws;* Emningham's *Poor Relief in different parts of Europe*, revised by E. B. Eastwick (1873); *Report of the Poor-law Commissioners* (1835); *Reports of the Poor-law Commission and Poor-law Board from* 1835 *to* 1875.

POOR, General Laws as to. The fundamental rule as to the relief of the poor was, that each parish in England and Wales is bound to maintain its own poor. For the purpose of providing the requisite machinery, overseers are required to be appointed in each parish every year on the 25th March, or within a fortnight following; and these, along with the churchwardens, who are *ex officio* overseers, have the duty of providing the requisite funds. See Overseers. This is done by means of a poor-rate, which the churchwardens and overseers may levy on all the occupiers of land in the parish, after such rate has been confirmed by the justices. The rate specifies a certain sum in the pound which is to be levied, and the annual value of the various lands is then specified, and the amount is thus easily computed. The rate is thus a local tax on the occupier of the land, and not on the owner, unless he himself is also occupier. In all cases, the duty of raising the funds attaches to the overseers; but the actual distribution and application of them are not always in their immediate control. Owing to the mischiefs arising from the officials of each parish distributing the funds at their discretion, without uniformity of plan, a central controlling power was created in 1834, in the shape of the Poor-law Board; and authority was given to combine various parishes into one poor-law union, for the purpose of greater uniformity as well as economy. When a union is formed, the control of the expenditure is chiefly vested in the guardians of this union, who are elected by each parish, and who supervise the management of the union workhouse. They order the overseers of each parish to raise their due proportion of funds, by a contribution order issued to such overseers, who are thereon bound to levy the amount by including it in the next poor-rate. The guardians are bound to contract for the provisions, clothing, fuel, &c., supplied to the workhouse, by means of sealed tenders, unless the quantity is less than a stated amount. All the controlling powers formerly vested in the Poor-law Board are now transferred to the Local Government Board.

The principle on which relief is administered to the poor is, that the condition of the pauper should not be so comfortable as that of the lowest independent laborer; otherwise, idleness and imposture would be encouraged to an indefinite extent. The guardians profess only to relieve destitution already existing, and not to enable persons to keep off impending destitution. Hence they only supply the bare necessaries of life. They cannot, for example, advance or lend money to set up a poor person in trade. Minute regulations are contained in the consolidated poor-law orders of the Board as to the classification of paupers in the workhouse, mode of admission, diet, discipline, and out-door relief. With regard to out-door relief and able-bodied paupers, it is provided, that every able-bodied person requiring relief from any parish, shall be relieved wholly in the workhouse, together with his wife and family, if any, and if not otherwise employed. But the relief may be given out of doors in cases of sudden and urgent necessity, of sickness, accident and a few other cases. In general, relief is confined to persons actually residing in some place within the union, except in case of casual destitution, or sickness and accident. Whenever out-door relief is given to an able-bodied person, half of it is to be in the form of articles of food or fuel. Relief is given only weekly, where the pauper is not required to be received into the workhouse. No relief is to be given to able-bodied persons while they are employed for wages or hire by any person; and every able-bodied male person, if relieved out of the workhouse, shall be set to work by the guardians, and kept so employed while he continues to receive such relief. The law with regard to the relief of the poor is so far qualified, that wherever a person applies for parochial relief, if he or she has a father or grandfather, mother or grandmother, or child, who is able to maintain such pauper, then the parish officers can obtain an order from justices to compel such relative to contribute a sum towards such maintenance. So husbands or

fathers of paupers are bound to contribute to such maintenance. In all cases, the pauper is relieved either in the workhouse or out of the workhouse, according to the regulations of the poor-law orders.

In some cases, the guardians or overseers may employ the poor in public works; but this is seldom done, except on occasions like the Lancashire distress. The law as to the settlement of the poor is somewhat intricate, and gives rise to much ligitation. There are various grounds on which this settlement is acquired. Thus every person has, *primâ facie*, a settlement in the parish where he was born, until, some other is proved; and there are so many other qualifications, that it is seldom a birth-settlement is resorted to. By marriage, a woman immediately acquires the settlement of her husband, if he has one, whether the husband be an Englishman or a foreigner. If the husband has no settlement, then the wife is thrown back on her maiden settlement. Formerly, a person acquired a settlement in a parish by hiring and service, and by residence for forty days under such hiring; but since 1834, no such settlement can be acquired. If any person shall be bound an apprentice by indenture, and reside forty days under such apprenticeship, he or she acquires a settlement thereby. So whoever shall rent a tenement in a parish, and actually occupy the same, and be rated to the poor for one whole year, the rent being not less than £10, and paid by the person so actually occupying the tenement, shall acquire a settlement. So a person acquires a settlement by acquiring an estate in land, however, small in value, and residing forty days in the parish. So, if a person buy an estate, and the consideration amount to £30 at least, he shall thereby acquire a settlement. Formerly, a settlement was acquired by serving a public annual office, such as that of constable, overseer, &c.; but no settlement is now acquired on that ground. Unless a pauper has acquired a settlement on one or other of the grounds before mentioned in the parish or union where he receives relief, he is liable to be removed compulsorily to the parish where he last acquired a settlement. Certain persons, however, cannot be removed, and these are called irremovable paupers. Such are those paupers who have resided for one whole year in the parish or union in which they became destitute.

The mode of computing this one year is, however, somewhat difficult in certain cases. The expense of maintaining the poor generally is paid out of the common fund, and not by each parish in the union. When a pauper is sought to be removed, it is necessary to take him before two justices of the peace for examination; and on proper evidence of his settlement, the justices will make the order of removal, which is an authority to the overseers to take or send the pauper to the overseers of the parish of settlement. If, however, the pauper is too ill at the time to admit of removal without danger, the justices may suspend the order of removal till he is recovered. Whenever a pauper is to be removed the removing union is bound to give notice to the union of settlement; and it is on these occasions that so many obstinate and costly litigations take place as to which is the union of settlement. Much litigation was avoided by substituting a union for a parish as the test. The union also may appeal to the Court of Quarter-sessions against the removal order; and the Quarter-sessions may state a case for the opinion of the Court of Queen's Bench, if any nice point of law should arise, as frequently happens.

In Scotland, there was no systematic provision for the relief of the poor until 1845, when the statute of 8th and 9th Vict. c. 83 was passed. By this statute, a central board (called the Board of Supervision) was established, which controls the parochial board of each parish or union of parishes in a manner similar to the Poor-law Board in England. A settlement can be acquired in Scotland by residence of five years. Children follow the settlement of their parents, and wives that of their husbands; and if no other settlement be proved, then the settlement of birth is liable. In Scotland, the mode of assessment differs from that in England, where only the annual value of lands and tenements can be rated in the hands of the occupier.

The parochial board had the option of three modes of assessment: 1. One half to be paid by owners, and one half by the occupiers; 2. One half to be paid by owners of lands, and the other half to be paid by all the inhabitants, according to means and substance other than lands; 3. Assessing owners of lands and other inhabitants rateably according to their means and substance. But by a later act of 24th and 25th Vict. 37, the mode of assessing means and substance is abolished. It will thus be seen that in Scotland the poor-rate can never be imposed wholly on the occupier as it always is in England.

In Ireland, a Poor-law Act was also, in 1838, passed, and numerous amending statutes have followed, the code of laws being substantially founded on the English acts.

There are special acts of parliament regulating the conditions on which paupers are removable between England, Scotland, and Ireland respectively.

POOR-RATE. See Poor; Overseers.

POOR'S-ROLL, in the practice of the law of Scotland, means the list of poor persons who are litigants, but unable to pay the fees of court, and therefore are allowed to sue *in formâ pauperis*. As this is considered a privilege, and enables the person to secure the services of counsel and agents gratuitously, it is only granted on production of a certificate by the minister of the parish and two elders, setting forth his circumstances to their own knowledge and his general poverty. Notice is given of this to the adverse party, who is allowed time to inquire and oppose the application. When the court is satisfied of the poverty, the next thing is for the court to remit the matter to the counsel for the poor, of whom there are always two annually appointed by the Faculty of Advocates, generally young counsel, for the purpose: one of these counsel reports whether there is a *probabilis causa*, i. e., a good cause of action. If this report is made, it is considered conclusive, and the party is put on the poor's-roll. This warrant remains in force for two years, and during that time, the pauper is exempt from all fees of court, and has the gratuitous services of counsel and agents. This provision for enabling paupers to carry on litigation, which is so complete in Scotland, is unknown in England or Ireland; for though a party may also be allowed there to sue *in formâ pauperis*, no provision is made by the court for giving him the gratuitous services of counsel and attorney; nevertheless, these sometimes volunteer to act gratuitously. See In Forma Pauperis.

POPAYAN, a city of the United States of Colombia (New Granada), South America, stands in a fertile plain, 6000 feet above sea-level, on the Cauca, in lat. 2° 27′ N. It contains a cathedral and a number of conventual edifices. It was founded in 1537, and was the first city built by Europeans in this region. Under the Spaniards, it rose to considerable importance; but an earthquake in 1834, and the continued unsettled state of the country, have done much to reduce it. It is still of some consequence as a mart for agricultural produce. A great commercial road, about 1000 miles in length, leads from P. to Truxillo, in Peru. Pop. 20,000.

POPE (Gr. *papas;* Lat. *papa*, father), the title of the Bishop of Rome, and Supreme Pontiff of the Roman Catholic Church; applied also to all priests of the Greek and Russo-Greek Church. Under very many heads, occasions have arisen requiring reference more or less detailed to the authority and the privileges ascribed to the Bishop of Rome by the church of which he is the head. We propose in the present article to explain briefly the titles of the pope, the manner of his election, the nature and functions of his office, and the authority ascribed to him by the different schools of Catholics; and finally the chronological succession of the bishops of Rome from the earliest ages to our own day.

1. The name 'Papa' (q. v.)—the Latin equivalent of pope—was originally used of all bishops. The first known writer who applies it to the Roman bishop as his specific title, is Ennodius of Pavia, in the latter part of the 5th c., who thus addresses Pope Symmachus. It is used also by Cassiodorus; and from his time gradually came to be reserved to this application, but it did not lose entirely its old and general use for many centuries later. In the modern ecclesiastical vocabulary, the pope is called the 'Sovereign Pontiff,' the 'Vicar of Christ,' the 'Head of the Church,' the 'Holy Father,' &c. He subscribes himself, since St. Gregory the Great, *Servus Servorum Dei* (Servant of the Servants of God); and he is addressed as Your Holiness, Your Beatitude, &c.

2. The office of pope is elective. The electoral body, according to the present usage, is the College of Cardinals. Primitively, the pope, as the other bishops, was elected by the clergy and people, although the rights of both were not the same. Some elections having been attended with violence, the electoral body was by degrees limited. At length, by a decree of Pope Nicholas II. in 1059, the right of election was vested in the cardinals. Provision was thus made for a representation of all the ancient electoral bodies; the cardinal bishops representing the bishops of the Roman synod; the cardinal priests the parish clergy, and the cardinal deacons, the heads of the popular electoral districts (*regiones*) of the city. Preparatory to an election, the cardinals are shut up in what is called 'the conclave,' all communication with the outer world being interrupted until the election shall have been made. A simple majority of voices does not suffice—two-thirds of the cardinals must vote for the same candidate. There are four modes of election—'scrutiny,' 'access,' 'compromise,' and 'inspiration.' Twice a day during the conclave, each cardinal deposits, in a chalice placed on the altar, the name of his candidate. If the requisite number of votes are not found for any one, the papers are at once burned; and the smoke of the burning votes is a signal to the expectant crowd outside that no election has taken place. This is called the 'scrutiny.' If votes be added to those already given for one candidate, so as to make the required two-thirds, it is called 'access.' If the cardinals of two parties unite, it is called 'compromise.' If by a public movement,

a particular candidate be carried as if by acclamation, the election is said to be by 'inspiration.'

Pope Pius IX., was elected in this way. The greater Catholic powers—France, Austria, and Spain—were formerly understood to have the privilege of placing a veto upon the election of *one* candidate; but this right was vague and undefined, and had no formal foundation in law. It is required by long usage, as a condition of election, that the candidate shall be an Italian. After election, the pope is enthroned, enters upon possession of his see, and finally, is solemnly crowned. The ceremonial of consecration is very splendid and deeply impressive. One of the ceremonies—that of burning a bunch of flax before him, with the words: 'Holy Father, thus passeth away the glory of the world!'—has often been cited for its highly symbolical character, as well as for its dramatic effect. Cardinals, in order to vote, must be present at the conclave—no voting by proxy is permitted. Some of these conditions are practically set aside by the cessation of the status of the pope as an Italian temporal sovereign; and it is not unlikely that the forms of election may be modified by special legislation. It has even been alleged that Pope Pius IX., prepared a special bull regulating the time, place, and order of the election of his successor.

3. The general nature of the office of the pope may be inferred from his reputed character as successor of St. Peter, and vicegerent of Christ on earth, whence follow all the powers necessary for the practical government of the church. Hence he is held (1) to possess over the entire church, and each of its parts, a supreme authority, not indeed arbitrary, but regulated by the law of God and by the canons. He has power (2) to examine and decide authoritatively all controversies; (3) to convoke councils; (4) to revise and confirm their decrees; (5) to issue general decrees, whether upon discipline and morals, or upon doctrine; (6) he is the center of communion, separation from which involves the forfeiture of the communion of the whole church; (7) he has *ultimate* authority to appoint bishops in all parts of the church, and however this right may be exercised in the first instance, as by the sovereign, by the clergy, or by a synod of bishops, it rests with him to confirm episcopal elections, no matter how made, and to grant 'canonical institution;' (8) he can also deprive bishops, and set others in their place; and can even, in cases of great emergency, suppress bishoprics, and change their limits according to existing requirements; (9) he has authority to judge of the doctrine taught in particular books, or by particular individuals, and to pronounce authoritatively as to its conformity with the Catholic faith, or the contrary. This privilege formed the subject of the great controversy with the Jansenists as to what are called Dogmatic Facts.'

4. All Catholics are agreed that the pope, as primate, possesses, by divine law and in virtue of his office, full governing authority over the entire church. Of the exercise of such power, they find traces in history from the earliest times. Roman Catholic historians trace the history of the pope's primacy in St. Clement's Letters to the Church of Corinth, in the action taken by Victor in the Paschal controversy, and by Stephen and Cornelius in the controversy on re-baptizing heretics; in the deposition of Marcian, Bishop of Arles, at the instance of Cyprian, by Pope Stephen; in the leading part taken by the popes in the condemnation of Donatus and of the Pelagian heresy; and perhaps more than all, in the appeals made from various parts of the church by persons excommunicated by their own bishops, and the rehearing at Rome of such causes, and the confirmation or reversal of the sentence according to the result of the trial. These several facts, however, although to Catholics they appear evidences of the papal supremacy, are explained by Protestant writers in a sense which does not suppose any permanent supremacy on the part of the Roman See, and which they hold to be reconcilable with the full independence of national churches; and it is admitted by Catholics themselves, while they contend that the instances to which they appeal imply a real exercise of primacy from the beginning, that the details of that primacy have undergone a gradual and extensive development in the progress of the church. Up to the date of the late Vatican Council, great differences of opinion existed between the Gallican and the Ultramontane schools as to the extent and nature of the papal authority, whether in decrees of doctrine or in the government of the church.

As to the former, all agreed that the judgment of the pope, in concert with the body of bishops, was infallible; but they differed as to papal decrees on doctrine issued by the pope alone, *ex cathedrâ*, and addressed to the whole church, although both agreed as to the duty of respectful obedience on the part of all, until the general sense of the church should have been ascertained; and should no reclamation on the part of the church take place, the decree of the pope was held to be, in the opinion of both the contending schools, as infallible; and the doctrine propounded therein was allowed to be recognized as a question of faith, which had been sanctioned with the ultimatum of infallibility. See GALLICANISM. But the Ultramontanes held that a doctrinal decree issued *ex cathedrâ*, is infallible *ipso facto*, and independently of any reference to the church dispersed. As to the government of the church, the Ultramontanes held the pope to be supreme, and thus to be superior to general councils, and independent of their decrees. The Gallicans, on the contrary, held that a general council is superior to the pope, and has power to bind him by its decrees. Further the Ultramontanes held that the pope is the source of all jurisdiction in the church, and that the bishops derive their powers *through him* from Christ. The Gallicans regarded the episcopal power as received directly from Christ by virtue of the episcopal office. This difference of opinion leads to many controversies of detail as to the respective rights and powers of the pope and the bishop in the several dioceses, regarding which it is only necessary to indicate the general ground of difference of opinion. With regard to all, it may be said that both on the question of infallibility and on all its practical consequences, the Ultramontane view, although not in its most extreme form, has received the sanction of the late Vatican Council.

5. The chronology of the papacy in the 1st c. is very obscure. The enumerations in the ancient writers are imperfect, and they differ as to the exact order of succession. The two most ancient catalogues, those of Irenæus and Augustine, differ in more than one particular. The chief difficulty regards Linus and Cletus. The former is believed to have been the vicegerent of Peter during the interval between his first coming to Rome and his final residence there. He would therefore have been at once the contemporary of Peter and his successor (though but for a very brief period). The difficulty as to Cletus arises from the doubt whether he be the same person with Anacletus. We subjoin a catalogue drawn up after the most careful modern authorities, and arranged according to centuries:

FIRST CENTURY.	A. D.
St. Peter	41—67
Linus	68
Cletus, or Anacletus	uncertain date
Clement I.	uncertain date
SECOND CENTURY.	
Evaristus	about 100
Alexander I.	about 109
Sixtus I., Roman	119
Telesphorus, Greek	127
Hyginus, Athenian	138
Pius I., native of Aquileia	142
Anicetus, Syrian	151
Soter, Greek	161
Eleutherus, Greek	170
Victor I., African	185
Zephyrinus	197
THIRD CENTURY.	
Callixtus I., Roman	217
Urban I., Roman	222
Pontianus, Roman	230
Antherus, Greek	235
Fabianus, probably Roman	236
Cornelius, Roman	252
(Novatianus, first antipope.)	
Lucius I., Roman	253
Stephen I., Roman	253
Sixtus II., Roman	257
Dionysius, Greek	259
Felix I., Roman	270
Eutychianus, uncertain	275
Caius, Roman	283
Marcellinus, Roman	296
FOURTH CENTURY.	
Marcellus I., Roman	308
(Marcellinus having died in 304 or 305.)	
Eusebius, Greek	310
Melchiades, African	310
Sylvester I., Roman	314
Marcus, Roman	336
Julius I., Roman	337
Liberius, Roman	352
(Felix II., antipope.)	
Damasus I., Spaniard	366
(Ursicinus, antipope.)	
Siricius, Roman	384
Anastasius, Roman	398
FIFTH CENTURY.	
Innocent I., native of Albano	401
Zosimus, Greek	417

	A.D.
Boniface I., Roman	418
Celestinus I., Roman	422
Sixtus III., Roman	432
Leo I., Roman, called 'the Great'	440
Hilarius, native of Sardinia	461
Simplicius, native of Tibur	467
Felix III., Roman	483
Gelasius I., Roman	492
Anastasius II., Roman	496
Symmachus, native of Sardinia	498
SIXTH CENTURY.	
Hormisdas, native of Frusino	514
John I., Tuscan	523
Felix IV., native of Beneventum	526
Boniface II., Roman	530
John II., Roman	532
Agapetus I., Roman	535
Sylverius, native of Campania	536
Vigilius, Roman	540
Pelagius I., Roman	555
John III., Roman	560
Benedict I., Roman	574
Pelagius II., Roman	578
Gregory I., Roman, styled 'the Great,'	590
SEVENTH CENTURY.	
Sabinianus, native of Tuscany	604
Boniface III., Roman	607
Boniface IV., native of Abruzzi	608
Deusdedit or Deodatus I., Roman	615
Boniface V., Neapolitan	619
Honorius I., native of Capua	625
Severinus, Roman	638
John IV., native of Dalmatia	640
Theodorus I., Greek	641
Martin I., native of Tudertum	649
Eugenius I., Roman	654
Vitalianus, native of Signia	657
Deusdedit II., Roman	672
Domnus I., Roman	676
Agathon, Sicilian	678
Leo II., Sicilian	682
Benedict II., Roman	684
John V., native of Syria	685
Conon, native of Thrace	686
Sergius I., native of Palermo	687
EIGHTH CENTURY.	
John VI., native of Greece	701
John VII., native of Greece	705
Sisinius, native of Syria	708
Constantine, Syrian	708
Gregory II., Roman	715
Gregory III., Syrian	731
Zacharias, Greek	741
Stephen II.	753
Stephen III., Roman	753
Paul I., Roman	757
Stephen IV., Sicilian	763
Adrian I., Roman	772
Leo III., Roman	795
NINTH CENTURY.	
Stephen V., Roman	816
Paschal I., Roman	817
Eugenius II., Roman	824
Valentinus, Roman	827
Gregory IV., Roman	827
Sergius II., Roman	843
Leo IV., Roman	847
In this interval is placed the fabulous pope Joan (q. v.).	
Benedict III., Roman	855
Nicholas I., Roman	853
Adrian II., Roman	867
John VIII., Roman	872
Martin II. (called also Marinus I.)	882
Adrian III., Roman	884
Stephen VI., Roman	885
Formosus, Bishop of Porto	891
(Sergius and Boniface VI., antipopes.)	
Stephen VII., Roman	896
Romanus, Tuscan	897
Theodorus II., Roman	897
John IX., native of Tibur	897
TENTH CENTURY.	
Benedict IV., Roman	900
Leo V., native of Ardea	903
(Christopher, antipope.)	
Sergius III.	904
Anastasius III., Roman	911
Lando, native of Sabina	913
John X., Roman	914
Leo VI., Roman	928
Stephen VIII., Roman	929
John XI.	931
Leo VII., Roman	936
Stephen IX., Roman	939
Martin III., (called by some Marinus II.)	943
Agapetus II	946
John XII., Ottaviano Conti	956
He was the first who changed his name on his elevation.	
(Leo VIII., antipope)	963
Benedict V., Roman	964
John XIII., Roman	965
Benedict VI.	972
Domnus II., Roman	973
Benedict VII. (Conti), Roman	974
John XIV	983
(Boniface VII., Franco, antipope.)	
John XV., Roman	985
John XVI., Roman	986
Gregory V., German	996
Sylvester II., Gerbert, native of Auvergne	999
ELEVENTH CENTURY.	
John XVII., (May—October)	1003
John XVIII., Roman	1003
Sergius IV., Roman	1009
Benedict VIII., native of Tusculum	1012
John XIX., Roman (in some catalogues reckoned XX.; the diversity arising from a disputed election)	1024
Benedict IX.	1033
(Sylvester, antipope.)	
Gregory VI., Roman	1044
Clement II., native of Saxony	1047
Damasus II. (Poppo)	1048
Leo IX., Bishop of Toul	1049
Victor II., Bishop of Eichstadt	1055
Stephen X., Frederick, Abbot of Monte Casino	1057
Benedict X., by some styled antipope, abdicated	1058
Nicholas II., native of Burgundy	1059
Alexander II., native of Milan	1061
Gregory VII., Hildebrand, native of Tuscany	1073
(Guibert, antipope, assumed the name of Clement III.)	
Victor III., native of Beneventum	1086
Urban II., native of France	1088
Paschal II., native of Tuscany	1099
(Albert and Theodoric, antipopes.)	
TWELFTH CENTURY.	
Gelasius II., native of Caieta	1118
Callixtus II., native of Burgundy	1119
Honorius II., Cardinal Lamberto, Bishop of Ostia	1124
Innocent II., Roman	1130
(Anacletus, antipope.)	
Celestinus II., Tuscan	1143
Lucius II., native of Bologna	1144
Eugenius III., native of Pisa	1145
Anastasius IV., Roman	1153
Adrian IV., Nicholas Breakspeare, Englishman	1154
Alexander III., Cardinal Orlando Bandinelli, native of Siena	1159
(Victor, Paschal, and Callixtus, antipopes.)	
Lucius III., Cardinal Ubaldo of Lucca	1181
Urban III., Uberto Crivelli, Archbishop of Milan	1185
Gregory VIII., native of Beneventum	1187
Clement III., Paul, Bishop of Prænestе	1188
Celestinus III., Cardinal Hyacinthus, Roman	1191
Innocent III., Cardinal Lotharius, native of Signia	1198
THIRTEENTH CENTURY.	
Honorius III., Cardinal Savelli, native of Rome	1216
Gregory IX., Cardinal Hugo, native of Anagni	1227
Celestinus IV., native of Milan	1241
Innocent IV., Cardinal Sinibaldo Fieschi, native of Genoa	1242
Alexander IV., Cardinal Rinaldo Conti, native of Anaqui	1254
Urban IV., James, Patriarch of Jerusalem, Frenchman	1261
Clement IV., Guy, native of St. Gilles, in Languedoc	1265
Gregory X., Tebaldo Visconti, native of Piacenza	1272
Innocent V., Cardinal Peter, native of Tarentaise	1276

	A.D.
Adrian V., Ottobono Fieschi, native of Genoa	1276
John XXI, native of Lisbon	1276
Nicholas III., Cardinal Orsini, native of Rome	1277
Martin IV., Cardinal Simon de Brie, Frenchman	1281
Honorius IV., Cardinal James Savelli, native of Rome	1285
Nicholas IV., Cardinal Jerome, native of Ascoli	1288
Celestinus V., Pietro, da Morrone of Abruzzi	1294
Boniface VIII., Cardinal Benedetto Gaetani, native of Anagni	1295
FOURTEENTH CENTURY.	
Benedict XI., Cardinal Nicholas, native of Treviso	1303
Clement V., Bertrand of Bordeaux, removed the papal see to Avignon	1305
John XXII., James, native of Cahors, in France	1316
(Nicholas, antipope.)	
Benedict XII., James Fournier, Frenchman	1334
Clement VI., Peter Roger, native of Limoges, in France	1342
Innocent VI., Stephen Aubert, native of Limoges	1352
Urban V., William Grimoard, Frenchman	1362
Gregory XI., Peter Roger, Frenchman, restored the papal see to Rome	1370
Urban VI., Bartolomeo Prignano, Neapolitan	1378
(From 1378 to 1410 occurs the great Western Schism, during which, in conflict with the line of popes inserted in the catalogue, is found a rival line residing at Avignon—Clement VII., 1378—1394; Benedict XIII., 1394—1410. The Council of Pisa, 1410, deposed both rival popes; but Benedict XIII. remained in schism till his death in 1424.)	
Boniface IX. Peter Tomacelli of Naples	1389
FIFTEENTH CENTURY.	
Innocent VII., Cosmo Migliorati, native of Sulmona	1404
Gregory XII., Angelo Corrari, native of Venice	1406
Alexander V., Peter Philargius, native of Candia	1409
John XXIII., Cardinal Cossa, deposed by the council of Constance	1410
Martin V., Otho Colonna, Roman	1417
Eugenius IV., Gabriel Condulmero, Venetian	1431
(Felix, antipope.)	
Nicholas V., Cardinal Thomas, native of Sarzana	1447
Callixtus III., Alfonso Borgia, Spaniard	1455
Pius II., Æneas Sylvius Piccolomini, native of Siena	1458
Paul II., Peter Barbo, native of Venice	1464
Sixtus IV., Francis della Rovere, Genoese	1471
Innocent VIII., Gian Battista Cibo, Genoese	1485
Alexander VI., Rodrigo Lenzoli Borgia, Spaniard	1492
SIXTEENTH CENTURY.	
Pius III., Francis Todeschini Piccolomini	1503
Julius II., Julian della Rovere, Genoese	1503
Leo X., Giovanni de' Medici, son of Lorenzo the Magnificent	1513
Adrian VI., native of Utrecht	1522
Clement VII., Giulio de' Medici, nephew of Lorenzo	1523
Paul III., Alessandro Farnese, native of Rome	1534
Julius III., Giovan Maria Giocci, native of Rome	1550
Marcellus II., Cardinal Cervini, native of Montepulciano	1555
Paul IV., Gianpietro Caraffa, Neapolitan	1555
Pius IV., Giovanni Angelo Medichini, native of Milan	1559
Pius V., Michele Ghislieri, native of Alessandria	1566
Gregory XIII., Hugo Buoncompagni, native of Bologna	1572
Sixtus V., Felice Peretti of Montalto, native of the March of Ancona	1585
Urban VII., Gian Battista Castagna, Genoese	1590
Gregory XIV., Nicola Sfrondati, native of Milan	1590
Innocent IX., Gian Antonio Fecchinetti, native of Bologna	1591
Clement VIII., Ippolito Aldobrandini, native of Fano	1592
SEVENTEENTH CENTURY.	
Leo XI., Alessandro de' Medici, native of Florence	1605
Paul V., Camillo Borghese, native of Rome	1605
Gregory XV., Alessandro Ludovici, native of Bologna	1621
Urban VIII., Maffeo Barberini, Florentine	1623
Innocent X., Gian Battista Pamfili, native of Rome	1644
Alexander VII., Fabio Chigi, native of Siena	1655
Clement IX., Giulio Rospigliosi, native of Pistoia	1667
Clement X., Emilio Altieri, native of Rome	1670
Innocent XI., Benedetto Odescalchi, native of Como	1676
Alexander VIII., Pietro Ottoboni, native of Venice	1689
Innocent XII., Antonio Pignatelli, native of Naples	1691
EIGHTEENTH CENTURY.	
Clement XI., Gian Francesco Albani, native of Urbino	1700
Innocent XIII., Michael Angelo Conti, native of Rome	1721
Benedict XIII., Vincenzo Maria Orsini, native of Rome	1724
Clement XII., Lorenzo Corsini, native of Florence	1730
Benedict XIV., Prospero Lambertini, native of Bologna	1740
Clement XIII., Carlo Rezzonico, native of Venice	1758
Clement XIV., Gian Vincenzo Ganganelli, born near Rimini	1769
Pius VI., Angelo Braschi, native of Cesena	1775
NINETEENTH CENTURY.	
Pius VII., Gregorio Barnaba Chiaramonti, native of Cesena	1800
Leo XII., Annibale della Genga, native of Romagna	1823
Pius VIII., Cardinal Castiglioni, native of Cingoli	1829
Gregory XVI., Mauro Cappellari, native of Belluno	1831
Pius IX., Giovanni Maria Mastai-Ferretti, nat. of Sinigaglia	1846
Leo XIII., Gioacchino Pecci, native of Carpineto	1878

Protestants generally object to the list of popes given by Roman Catholics, that there is no absolutely conclusive evidence of the apostle Peter's ever having been at Rome; although most of them admit the probability that he was there, and suffered martyrdom there. But they deny that there is any evidence whatever of his having exercised the office of bishop either there or anywhere else. They call in question many other of the names and dates in the earlier part of the list, not so much disputing the existence of the persons named, as their exercise of the office of bishop in Rome, and still more their right to be considered bishops *of* Rome. According to Protestants in general, the papacy grew by a gradual assumption of power out of an ordinary bishopric, through the advantage of metropolitan position and influence, and was afterwards supported by the fable—as they deem it—of the see of St. Peter.

POPE. See RUFFE.

POPE, ALEXANDER, an eminent English poet, was born in London, May 21, 1688. His parents were Roman Catholics, and to this faith the poet also nominally adhered, thus debarring himself from public office and employment. His father, a linen-merchant, saved a moderate competency, and received some accession of fortune by his marriage with Edith Turner, his second wife, and the poet's mother, a lady of a good Yorkshire family. He then withdrew from business, and settled on a small estate he had purchased at Binfield in Windsor Forest. He died at Chiswick, in 1717. His son shortly afterwards took a long lease of a house and five acres of land at Twickenham, on the banks of the Thames, whither he retired with his widowed mother, to whom he was tenderly attached, and where he resided till his death, cultivating his little domain with exquisite taste and skill, and embellishing it with a grotto, temple, wilderness, and other adjuncts poetical and picturesque. In this famous villa, P. was visited by Frederick, Prince of Wales, and by the most celebrated wits, statesmen, and beauties of the day, himself being the most popular and successful poet of his age.

P.'s early years were spent at Binfield, within the range of the Royal Forest. He received some education at little Catholic schools, but was his own instructor after his twelfth year. He never was a profound or accurate scholar, but he read the Latin poets with ease and delight, and acquired some Greek, French, and Italian. He was a poet almost from infancy; he 'lisped in numbers,' and when a mere youth, surpassed all his contemporaries in metrical harmony and correctness. His pastorals and some translations appeared in Tonson's *Miscellany*, in 1709; but were written three or four years earlier. These were followed by the *Essay on Criticism*, 1711; *Rape of the Lock* (when completed, the most graceful, airy, and imaginative of his works), 1712—1714; *Windsor Forest*, 1713; *Temple of Fame*, 1715. In a collection of his works printed in 1717, he included the *Epistle of Eloisa*, and *Elegy on an Unfortunate Lady*, two poems inimitable for pathetic beauty and finished melodious versification. From 1715 till 1726, P. was chiefly engaged on his translations of the *Iliad* and *Odyssey*, which, though wanting in true Homeric simplicity, naturalness, and grandeur, are splendid poems. They realized to the fortunate and fashionable translator a sum of about £8000. He next edited an edition of Shakspeare, which proved unworthy of his reputation. In 1728—1729, he published his greatest satire—the *Dunciad*, an attack on all poetasters and pretended wits, and on all other persons against whom the sensitive poet had conceived any enmity. In 1737, he gave to the world a volume of his *Literary Correspondence*, containing some pleasant gossip and observations, with choice passages of description; but it appears that the correspondence was manufactured for publication, not composed of actual letters addressed to the parties whose names are given, and the collection was introduced to the public by means of an elaborate stratagem on the part of the scheming poet.

Between the years 1731 and 1739, he issued a series of poetical essays, moral and philosophical, with satires and imitations of Horace, all admirable for sense, wit, spirit, and brilliance. Of these delightful productions, the most celebrated is the *Essay on Man*, to which Bolingbroke is believed to have contributed the spurious philosophy and false sentiment; but its merit consists in

detached passages, descriptions, and pictures. A fourth book to the *Dunciad*, containing many beautiful and striking lines, and a general revision of his works, closed the poet's literary cares and toils: he died on the 30th of May 1744, and was buried in the church at Twickenham. P. was of very diminutive stature, and deformed from his birth. His physical infirmity, susceptible temperament, and incessant study, rendered his life 'one long disease.' He was, as his friend, Lord Chesterfield, said, 'the most irritable of all the *genus irritabile vatum*, offended with trifles, and never forgetting or forgiving them.' His literary stratagems, disguises, assertions, denials, and (we must add) misrepresentations, would fill volumes. Yet P., when no disturbing jealousy, vanity, or rivalry intervened, was generous and affectionate, and he had a manly, independent spirit. As a poet, he was deficient in originality and creative power, and thus was inferior to his prototype, Dryden; but as a literary artist, and brilliant declaimer, satirist, and moralizer in verse, he is still unrivalled. He is the English Horace. Of the many lives, that by Carruthers is one of the best (1857); see also that by Leslie Stephen (1880).

POPERINGHE, an old commercial town of Belgium, in the province of West Flanders, four miles from the French frontier. The town has manufactures of lace, linens, and woollen cloths. Pop. 11,000.

PO'PERY literally means attachment to the religion or to the party of the pope; and in this sense the word is synonymous with the profession of the Roman Catholic religion. In its use, however, it has come to involve the idea of contempt or disparagement. It may therefore be said, that the word is either intended to designate what are regarded by Protestants as the most exaggerated and superstitious among the doctrines and practices which they ascribe to Catholics, in contradistinction to the belief of the more moderate members of that church, or is designedly employed as an expression of contempt and depreciation.

POPISH PLOT, the name given to an imaginary plot, on the part of the Roman Catholics in England during the reign of Charles II., the object of which was believed to be a general massacre of the Protestants. See OATES, TITUS.

PO'PLAR (*Populus*), a genus of trees, forming, along with willows, the whole of the natural order *Salicaceæ* or *Salicineæ* (by some regarded as a sub-order of *Amentaceæ*), and having dicœcious flowers arranged in catkins, both male and female flowers with an oblique cup-shaped perianth. The seeds have silky hairs, as in willows, and are readily wafted about by the wind. The species are numerous, chiefly natives of the temperate and cold regions of the northern hemisphere. They are large trees of rapid growth, with soft wood; and broad, heart-shaped, ovate, triangular, or lozenge-shaped, deciduous leaves, on rather long stalks. Many of them are very beautiful trees. The catkins appear long before the leaves, and proceed from distinct lateral buds. Few of the poplars are of much value for their timber, which is generally white, soft, and light; but from their rapid growth, they are useful as yielding firewood, where the scarcity of other fuel renders it necessary to plant trees for this purpose, and they are often planted as ornamental trees, producing an immediate effect of embellishment in a bare situation more readily than almost any other kind of tree. Besides the species known by the name Aspen (q. v.), or Tremulous Poplar, the following seem the most worthy of notice.

The WHITE P., or ABELE (*P. alba*), a native of the southern parts of Europe, and reckoned among British trees, but probably not indigenous in Britain, is a tree of 80 feet or upwards; with a fine spreading head; and roundish, heart-shaped, lobed, and toothed leaves, which are smooth, shining, and dark-green above, downy and silvery-white beneath. The wood is used by cabinet-makers, turners, and toy-makers. It is little liable to swell or shrink, which adapts it for various purposes. The tree loves low situations and clay soils. This tree has of late years suffered in Britain from some unknown cause, like the potato, dying where it previously flourished; whilst other poplars, the most nearly allied, continue to flourish in the same localities.—The GRAY P. (*P. canescens*) is very similar to the White P., but of more vigorous growth, a large spreading tree; the leaves similar to those of the White P., but not so dark-green above or so white beneath. It is not of so rapid growth as the White P.; and its wood is harder and better, makes good flooring, and is preferable to pine-deal for the neighborhood of fireplaces, being less apt to take fire; it is also used for coarse doors, carts, barrows, &c., and not being liable to warp, is esteemed by wood-carvers. The tree generally begins to rot in the heart when forty or fifty years old. Like most of the other poplars, it fills the ground around it with suckers. Like the White P., it is a very doubtful native of Britain, and belongs to the center and south of Europe.—The BLACK P. (*P. nigra*), a native of most parts of Europe, and perhaps of England, is a tree of 50—80 feet high, with an ample spreading head, viscous leafbuds, and deltoid or unequally quadrangular, perfectly smooth leaves.

The wood is used for the same purposes as that of the White and Gray Poplars. The 'cotton' from the seeds has been used in France and Germany for making cloth hats and paper, but



Black Poplar (*P. nigra*).

these uses of it were not found profitable.—The LOMBARDY P. (*P. fastigiata* or *dilatata*) is perhaps a mere variety of the Black P., with erect instead of spreading branches. It appears to have been introduced into Europe from the East. It is very common in the Punjab and in Persia, and now also in Lombardy and other parts of Italy. It attains a height of 100, or even 150 feet, and is remarkable for its erect form, contracted head, and very rapid growth. It is often planted as an ornamental tree, although not so generally as in the end of last century, when it was thought preferable for ornamental purposes to every other tree. It is common in the streets and squares of towns in all parts of Britain; and is paticularly adapted to situations where a long horizontal line of any kind fatigues the eye, or as seen starting up from a mass of lower wood or shrubbery, but has a besom-like appear-



Lombardy Poplar (*P. fastigiata*).

ance when planted in unsuitable situations. The wood is of almost no value. It is generally propagated by layers.—The species commonly known as BLACK ITALIAN P. (*P. monilifera* or *acladesca*), although it is really a native not of Italy, but of North America, and is sometimes more correctly called CANADIAN P., the female catkins of which resemble a string of pearls, is frequently planted both as an ornamental tree and for the sake of its timber, which is useful for flooring, &c. The leaves are deltoid. It is of very rapid growth, and attains a height of 100—120 feet.

The BALSAM P., or TACAMAHAC (*P. balsamifera*), a very common ornamental tree in Britain, is a native both of North America and of Siberia, and has whitish ovate-oblong leaves, which in spring are of a delicate yellow tint, and have an agreeable fragrance. The leaf-buds are viscid. The erect, fastigiate manner of growth approaches that of the Lombardy Poplar. The resinous exudation of the buds (*Tacamahac*) is said to be diuretic and anti-spasmodic; and an ointment made from the buds is used for tumors, wounds, and burns. The resinous exudation of the buds of other species, as the Black P., possesses similar properties.—The COTTON-WOOD (*P. Canadensis*) of North America, particularly abundant on the upper parts of the Mississippi and Missouri, is valued as a timber tree, and has been pretty extensively planted

in Britain; as has also the ONTARIO P. (*P. candicans*), a species with the same balsamic character as *P. balsamifera*, and chiefly distinguished from it by its larger leaves. In size of leaf, no other species equals *P. heterophylla*, a native of the Southern States of North America, the leaves of which are often six inches long.

PO'PLIN (Fr. *papeline*). In the 15th c., a fabric was woven in Avignon called *papeline*, which was made of silk, and was much esteemed. An attempt to imitate it was introduced into England, and the name was corrupted to *poplin*, which has been adopted abroad as well as at home. In 1775, the manufacture was introduced to Ireland by French Protestant refugees, and from that time to the present, Irish poplins have been famous. What the exact nature of the original *papelines* was, is not certainly known; but the best modern poplins consist of a warp of silk and a weft of worsted, which gives substance, combined with great softness and elasticity, to the material. Cotton, and even flax yarns are substituted for silk, wholly or partially, in making cheap goods, but they are very far inferior in beauty to the true poplins.

POPOCATEPE'TL (Aztec, *popoca*, to smoke, and *tepetl*, a mountain), or in Spanish, *Volcan Grande de Mexico*, Grand Volcano of Mexico, a mountain about 10 miles south-west of the city of Mexico. It rises in the form of a cone to a height of 17,720 feet above the sea-level, and is composed chiefly of porphyritic obsidian. Forests girdle its lower parts; but at an elevation of 13,000 feet, all vegetation ceases. About the period of the Spanish conquest, it was very active, but no eruption has been recorded since 1540. It still smokes, however. Cortes, the conqueror of Mexico, attempted to reach its summit, but was unable to do so, on account of the masses of snow that covered it. This feat was first achieved by Francisco Mantãno, one of Cortes's followers, who not only climbed to the top of the mountain, but had himself let down its crater, by means of ropes, to a depth of about 450 feet. In 1827, it was again scaled by the brothers Glennie, who determined its altitude barometrically, and since then this laborious exploit has been several times performed, and even by ladies.

PO'PPINJAY, a name of the Green Woodpecker (*Picus viridis*), a bird common in most of the wooded districts of England and Scotland. See WOODPECKER.

PO'PPY (*Papaver*), a genus of plants of the natural order *Papaveraceæ*, having a calyx of two (or rarely three) sepals, which very soon fall off; a corolla of four (rarely six) petals; numerous stamens seated on a receptacle; the stigma crowning the germen, without a style, and in the form of 4—20 rays; the capsule opening by pores under the persistent stigma, imperfectly divided into cells by partitions as numerous as the rays of the stigma, but which do not reach the center, the seeds extremely numerous. There are numerous species of P., mostly natives of Europe and Asia, some of them found even in very northern regions, but most of them in the warmer temperate parts. They are rather large herbaceous plants, annual or perennial, mostly sprinkled with bristly hairs. They have a white milky juice; a disagreeable narcotic smell, particularly when bruised; pinnatifid or bipinnatifid leaves, more rarely jagged or toothed leaves; and large showy flowers, which readily become double by cultivation. The capsules are curious from the manner in which they fling out their seeds when the plant is shaken by the wind; each capsule being somewhat like a round or oval pepper-box, with holes, however, not in the top, where rain might get in by them, but under the rim. By far the most important species is that known as the OPIUM P. (*P. somniferum*), also called the WHITE P., and the OIL POPPY. See OPIUM. But the same species is important on account of the bland fixed oil of the seeds, and is much cultivated as an oil-plant. *P. oil* is as sweet as olive oil, and is used for similar purposes. It is imported into Britain in considerable quantities from India. The P. is also extensively cultivated for it in France, Belgium, and Germany.

The use and manufacture of this oil were for a long time, during last century, strictly prohibited in France, from a mistaken notion that it must partake of the narcotic properties of the milky juice of the plant. The seed, however, contains no opium or any narcotic principle, and was well known to the ancients as a pleasant article of food, fit to be eaten by itself or with bread. The oil expressed from it is perfectly wholesome, and is much used in France and elsewhere as an article of food. Fully one-half of the oil used for cooking and otherwise for alimentary purposes in France, is of this kind. The seeds yield about 40 per cent. of oil, and the oil-cake is useful for manure or for feeding cattle. The oil is sometimes used by painters and by soap-boilers; but it is not good for burning. In the cultivation of the P. for oil, the seed is often sown in autumn, where the severity of winter-frosts is not to be feared; in more northern parts, it is sown in the spring, and sometimes the seed is scattered on the top of the snow with which the ground is covered. Being very small, it needs little or no harrowing. Early sowing is favorable to the size of the plant, and the abundance of produce. Hoeing and thinning are advantageous. An open but rich soil is best for the P.; and a sheltered situation is necessary, as in exposed situations, much of the seed is scattered by the wind. The P. does not exhaust the land so much as colza, rape, and some other oil-plants. Harvesting ought to begin when one-fourth of the capsules of each plant are open. It is accomplished by pulling the plants in such a manner as not to shake the seed out of the capsules, and tying them in sheafs, which are placed together in an erect or slightly sloping position, till the ripening of the capsules is completed, when the seed is taken out by shaking the capsules into a tub or on a cloth, great care being used to prevent any earth from the roots from getting mixed with them. Some farmers in Flanders sow P. in alternate rows with carrots.

The variety of P. chiefly cultivated as an oil-plant has flowers of a dull reddish color, large oblong capsules, and brownish seeds; but the white-flowered variety, with globular capsules and white seeds, is also used.—The ORIENTAL P. (*P. orientale*), a native of Armenia and the Caucasus, a perennial species, is often planted in gardens on account of its very large, fiery-red flowers. Its unripe capsules have an acrid, almost burning taste; but are eaten by the Turks, and opium is extracted from them.—Several species are British, all of them local, rare in some places, and troublesome weeds in cornfields in other places apparently quite similar in climate. Among them is the CORN P. or COMMON RED P. (*P. rhoeas*), with bright red flowers, and deeply pinnatifid leaves. The petals are mucilaginous and slightly bitter; they have a slight narcotic smell; and a syrup made of them is sometimes used as an anodyne in catarrhs and children's complaints; but they are more valued for the rich red color which they yield. A variety with double flowers is cultivated in flower-gardens, under the name of *Carnation Poppy*. Among the ancients, the P. was sacred to Ceres.

POPPY-HEAD, a carved ornament, used as a finial on top of bench-ends, &c. In early examples, it is a simple fleur-de-lis, but in late Gothic, this and other wood-work becomes very elaborately carved.

POPULATION, as a study, comprehends those general laws that govern the increase or decrease of the human race, and the checks which modify them. The practical object of the investigation is to regulate the operation of the laws so as to promote the welfare of society. Malthus was the first to formulate the great law of the dependence of the increase of population on the means of its subsistence (see MALTHUS). The varying rate of increase in different countries makes it a subject which requires to be investigated under different heads. For those laws affecting it through the relations of births, deaths, and marriages, see VITAL STATISTICS.

PO'RCELAIN. See POTTERY.

PORCH, a building forming an enclosure or protection for a doorway. Every one knows how much this beautiful feature is now used, and how efficient it is as a protection from the wind



Porch of Aldham, Essex (1350).
(From Parker's *Glossary of Architecture.*)

and weather. In Elizabethan and medieval architecture, the porch was also very common in domestic architecture. In churches, it was almost universal in this country. In France, many splendid porches or portals remain; they are amongst the most beautiful specimens of medieval art. In England, wooden porches, of picturesque structure, are very common in the parish churches of the middle ages.

PO'RCUPINE (*Hystrix*), a genus of mammalia, of the order *Rodentia*, and family *Hystricidæ*. This family is remarkably characterized by an armature of spines, which, like those of the

hedgehogs, are, as to their structure, merely thick and strong hairs. The *Hystricidæ* are plantigrade; the fore-feet have four toes and a rudimentary thumb, the hind-feet have five toes. Their general aspect is heavy and pig-like, and they have a grunting voice. The muzzle is broad and blunt; the ears short and rounded; the incisors smooth and large, two above, and two below; the molars eight above, and eight below. The name porcupine is derived from the French words *porc*, a hog, and *epin*, a spine.—The COMMON P. (*H. cristata*) is a native of the south of Europe, of many parts of Asia, and of most parts of Africa. It is one of the largest of rodents, being from two to three feet in length, besides the tail, which is about six inches long. The hinder part of the head and the neck are furnished with a crest of long bristles, capable of being elevated or depressed at pleasure. The muzzle and limbs are covered with very short hair; the back



Porcupine (*Hystrix cristata*).

and sides with spines, which are longest on the middle of the back, where they are almost of the thickness of a goose-quill, and more than a foot long. The spines are supported by a slender pedicle, and they terminate in a sharp point; they are longitudinally striated, and are ringed with black and white, which gives a general gray color to the animal. Their ordinary position is flat, with the points directed backwards; but when the animal is excited, they are erected, and it rolls itself up like the hedgehog, with spines pointing in every direction.

The tail spines or quills are of very singular structure, being open thin-sided tubes, about two inches long, supported upon slender flexible pedicles; and they make a sound by rattling together when the tail is shaken. The P. is said to rattle also the spines of its body when irritated, but this is doubtful. The statement has been often made, that it throws off its spines or quills by a voluntary act, launching them at its adversaries; but it has no such power, although it is possible that quills ready to come off may be detached in moments of excitement, and fly to a small distance with sufficient force to be annoying to a pursuer. The P.'s armor, however, is strictly defensive, and it seeks to turn its back, and thus the points of its spines to an enemy. It is a solitary and nocturnal animal. It burrows in the ground, and in winter it becomes torpid. It feeds on roots, bark, fruit, and other vegetable substances, sometimes committing great depradations in gardens. The spines or quills of the P. are used for various purposes, and have a certain commercial value. It is chiefly sought on account of them; although its flesh is eaten, and was brought to the market of ancient Rome.—A larger species of P. (*H. leucurus*), with the quills of the tail quite white, is found in India, and other species inhabit different parts of the East. The ATHERURE, or TUFTED-TAILED P. (*Atherura fasciculata*, a native of India and Malacca, differs from the true porcupines in the head and muzzle not being convex, in having the quills flattened like blades of grass, and those of the tail gathered into a tuft at the end of it. The Canada P., or Urson (q. v.), is still more different from the true porcupines; and the Coendus (*Synetheres*) of the warm parts of America—which are covered with short quills, and, like the urson, live among the branches of trees—are remarkably distinguished by their long prehensible tail.

PORDENONÉ, a town of Italy, in the province of Udine, 40 miles N.N.E. of Venice, on a plain near the base of the Alps. Pop. 5000.

POR'IFERA (Lat. *pore-bearing*) is the term employed by Dr. Grant to designate the class *Spongiæ*, or *Sponges*, in consequence of the appearance which the members of this class present when a section is made through their tissue. The term *Spongiæ* is used in preference by many naturalists.

PO'RISM, a kind of geometric proposition in high favor among ancient Greek mathematicians, but of which the notices that have come down to us are so few and meagre, that, till lately, mathematicians were not agreed about what a porism really was. The ancient works in which porisms are mentioned are the *Collectiones Mathematicæ* of Pappus, and the *Commentarii* of Proclus. Dr. Robert Simson (q. v.) was the first to restore the probably original form of porisms. As defined by Playfair, 'a porism is a proposition affirming the possibility of finding such conditions as will render a certain problem indeterminate, or capable of innumerable solutions.' Good examples of porisms are given in Simson's *Opera Reliqua;* Playfair's 'Origin and Investigation of Porisms' (*Trans. of Roy. Soc. of Edin.*, vol. iii.); Wallace's paper, 'Some Geometrical Porisms, &c.' (*Edin. Trans.*, vol. iii. &c.)

PORK (Fr. *porc*, a hog, from Lat. *porcus*). The flesh of swine forms a very large portion of the animal food of most nations, although it is not the most nutritive, as will be seen by the following comparison of the four principal kinds of flesh-food:

	Mineral Matter.	Gelatine.	Fibrine and Albumen.	Fat.	Water.
Veal	4·5	7·5	9·0	16·5	62·5
Beef	5·0	7·0	8·0	30·0	50·0
Mutton...	3·5	7·0	5·5	40·0	44·0
Pork	1·5	5·5	4·5	50·0	38·0

It has qualities, however, which especially fit it for man's use; its fatness makes it a very heat-giving food for cold and temperate climates; whilst it surpasses all other kinds of animal food in the ease with which it may be preserved by salting and drying. Hence the trade in pork is considerable in all countries where it is used, but especially so in Great Britain and America, where vast quantities are cured for the supply of ships and the army, and for home use.

The quantity of pork imported into Britain (of which the greater part comes from the United States) is prodigious; in 1875, the value of the bacon and hams imported amounted to £6,955.200, besides pork to the value of £594,386. Millions of hogs are raised in the state of Ohio, and the curing of swine's flesh is the staple business of Cincinnati and other towns. A more vivid idea of the extent of this vast trade cannot be given than a recent statement of the *Louisville Gazette*, that 'there were between five and six acres of barrelled pork piled up three tiers high, in open lots, and not less than six acres unpiled, which would cover eighteen acres if closely laid in a single tier on the ground; besides all which, six acres of pens were filled with hogs waiting to be killed.' America has long furnished the chief supply of mess and common pork not only for the British army, navy, and mercantile marine, but also for those of most European nations. Next to America, Ireland, and especially the neighborhood of Cork, furnishes the largest supply of cured pork; and London and Wiltshire, and other parts of England, also furnish vast quantities of bacon and hams for general consumption.

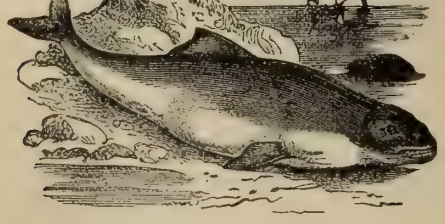
PORO'SITY. By this term we express the experimental fact, that no kind of matter completely fills the space it occupies; in other words, that all bodies are full of minute cavities or interstices, such as are illustrated on a large scale by a sponge. On the atomic theory, it is obvious that this must be the case if the atoms of matter are spherical, or, indeed, if they have any form save one or two special ones, such as cubes or rhombic dodecahedrons. It is commonly asserted that all bodies must be porous, because they are compressible; but this is a great mistake, since we have no reason to believe that matter is not *per se* compressible, independently of the existence of interstices. The Florentine Academicians, in their attempts to compress water, proved the porosity of silver, by flattening a sphere of that metal, filled with water, and soldered. The water escaped through the pores of the silver, and stood in fine drops on its surface. The porosity of liquids is easily shown by mixing alcohol and water. The bulk of the mixture is considerably less than the sum of the bulks of the components, showing that these must in part have entered each other's pores. This property of matter is of great importance in natural phenomena, as it brings the molecular forces of capillarity into play: raising the sap in vegetables, allowing rain to sink into the ground, &c.

PORPHY'RIUS, one of that series of ancient philosophers to whom is due the reformation of the Greek philosophy known as Neo-Platonism, was probably born at Batanea in Syria (the Bashan of Scripture) in the year 233 A.D. His original name was Malchus, the Greek form of the Syro-Phœnician *Melech*, or king. The name by which he is known in history, *Porphyrius*, 'one clad in purple,' is but a Greek epithet intended as a sort of paraphrase of his name. He is said by Socrates, the historian, and by St. Augustine, to have been originally a Christian; but this seems improbable, although it is certain that in his youth he was a hearer of Origen, or at least held some intercourse with him at Cæsarea in Palestine. What is more certain is, that he passed at a later time to Athens, where he studied rhetoric under Longinus, the well-known author of the treatise *On the Sublime*. It was at

Rome, however, whither he repaired soon after 260, that he entered upon what must be regarded as, historically considered, the career of his life. Here he became a scholar of the Neo-Platonist Plotinus, with whom, as well as with another member of of the same school, named Amelius, P. entered into an animated controversy, but eventually adopted so fully the opinions of Plotinus, that he became himself, if not the leader of the school, at least the most trusted of the disciples of its master. After six years' residence in Rome, he went to Sicily, where, if St. Jerome's account is to be relied on, he wrote his once celebrated treatise in 15 books against the Christians, now known only from the replies which it elicited, having been burned by order of the Emperor Theodosius. From Sicily, he went to Carthage, and afterwards to Athens; but eventually, Plotinus having died soon after P. left Rome, he returned to that city, where he continued to teach, as it would seem, until his death, which was probably about 305 or 306. For a view of P.'s position in the history of the Neo-Platonic school, see NEO-PLATONISTS. P. was a very voluminous writer. Of his works, the titles of more than 60 are still preserved, 43 of which are entirely lost. His *Life of Pythagoras;* his work *On Abstinence from Animal Food;* his *Commentary on Aristotle's Categories*, with the *Introduction;* and *On the Harmonies* of Ptolemy; and the book *Ad Marcellam*, addressed to his wife, are preserved entire. The rest are known chiefly by fragments, nor has any complete edition of his works been published.

PO'RPHYRY (Gr. purple), a term originally confined to an Egyptian rock used in sculpture, and known now as Rosso antico. It is composed, according to Delesse, of a red felspathic base, in which are disseminated rose-colored crystals of the felspar called oligoclase, with some plates of blackish hornblende, and grains of oxidized iron ore. The term is not now, however, used to denote any particular rock, but is applied to any rock which, like the Rosso antico, has a homogeneous earthy or compact base, through which are scattered distinct crystals of one or more minerals of contemporary origin with the base. Thus, gray volcanic trachyte often abounds in crystals of glassy felspar, forming a trachytic porphyry; or crystals of felspar, quartz, or calcareous spar, disseminated through a base of greenstone, form a greenstone porphyry. In the same way, there are pitchstone porphyry, basaltic porphyry, claystone porphyry, &c.

PO'RPOISE, or PORPESSE (*Phocæna*), a genus of Cetacea, of the family *Delphinidæ*, having a form similar to the dolphins, but the muzzle short, uniformly convex, and without a beak; a dorsal fin; the teeth very numerous, simple, and equal. The COMMON P. (*P. communis*) is the most plentiful of the Cetacea on the Brit-



Porpoise (*Phocæna communis*).

ish coasts, abounding particularly on the western coasts of Ireland and of Scotland. It is found also on all the coasts of Europe from the Mediterranean northwards, on the coasts of North America, and in the arctic regions. It is one of the smallest of the Cetacea, its length sometimes not exceeding four feet, although individuals occur of six or even eight feet in length. The body is spindle-shaped; its greatest diameter is near the dorsal fin. The skin is perfectly smooth, and destitute of hair. There are from 40 to 50 teeth in each jaw, not conical, as in most of the Cetacea, but compressed. The eye is rather small, and the pupil in the form of a V. The opening of the ear is very minute, like a hole made with a pin. The blow-hole is crescent-shaped, with the horns of the crescent directed forwards, and is situated exactly over the eyes.

The P. is gregarious, and large numbers are often seen together, sometimes swimming in file, when their backs, appearing above the surface of the water, are apt to suggest the idea of a great sea-serpent; sometimes gambolling, either in fine weather, or when a storm is approaching, or even in the midst of a storm. The P. feeds on fish, which its teeth are admirably adapted to catch, and herds of porpoises pursue the vast shoals of herring, mackerel, &c., into bays and estuaries. The P. sometimes ascends rivers, apparently in pursuit of salmon, as far as the water is brackish, and is not unfrequently itself caught on such occasions. It is an object of pursuit on account of its skin, its oil, and its flesh. The skin is nearly an inch thick, but is planed down until it becomes translucent, and is made into excellent leather, which is used for covering carriages and for other purposes. Little use is made of it in Britain, but it is used in America. Under the skin is a layer of fat, about an inch in depth, which yields oil of the finest quality. The flesh is dark-colored and bloody, but was in former times highly esteemed, and reckoned fit for the table of royalty, perhaps partly because among Roman Catholics it was accounted *fish*. In the time of Queen Elizabeth, it was still used by the nobles of England, and was served up with bread-crumbs and vinegar. It is now used only in very northern regions. It is a chief dainty of the Greenlanders.—The Grampus (q. v.) is commonly referred to this genus.—Another species of P. (*P. Capensis*) is found near the Cape of Good Hope.—The name P. is from the French *porc-poisson*, or the Italian *porco-pesce* (Hog-fish), corresponding to the French *marsouin* (Sea-hog) and the German *meerschwein*.

PORRI'GO. See FAVUS and RINGWORM.

PORSE'NNA, also PO'RSENA, LARS or LARTH (*Lar*, in Etruscan means 'lord' or 'prince'), in the early and uncertain history of Rome, appears as a powerful king of Clusium in Etruria. According to the legend told by Livy for history, when Tarquin the Proud was expelled from Rome, he sought the help, first of the Veii and the Tarquinii (his Etruscan kinsmen), against his revolted subjects; but their efforts not proving successful, he turned to P., who willingly espoused his cause, and marched a great army against Rome. The Etruscan king seized the Janiculum, a fortified hill on the west side of the Tiber; and would have forced his way into the city across the 'Bridge of Wooden Piles' (*Pons Sublicius*), had not a brave Roman, Horatius Cocles, kept the whole of P.'s army at bay, while his comrades behind him hewed down the bridge; after which he plunged into the Tiber, and safely swam across its waves. P., we are informed, now laid siege to Rome; and after a while, the inhabitants began to suffer so severely from famine, that a desperate expedient was had recourse to. Three hundred of the noblest Roman youths swore to peril their lives in cutting off the Etruscan king. The first on whom the lot fell was C. Mucius, who stole into the camp of P., but not knowing the person of the king, killed his secretary instead. He was instantly seized, and put to the torture; but the unshrinking audacity with which he thrust his right hand into the fire and let it burn, moved the king so much, that he pardoned him; whereupon Mucius (ever afterwards called *Scævola*, 'the Left-handed') told him of the jeopardy in which he was placed. P. resolved to make peace with Rome at once, and his conditions, which were pretty favorable, being accepted by the sorely-pressed citizens, he withdrew his forces. This version of the story is wholly discredited by modern criticism, and is believed to have been invented by the patriotic annalists of ancient Rome to conceal the fact of a temporary Etruscan conquest, and the evidence in favor of this view is overwhelming.

Tacitus even expressly affirms that P. conquered the city; Dionysius informs us that the senate sent him an ivory sceptre, a golden crown, and a triumphal robe, which was the form that had been adopted by the Etruscan cities themselves of acknowledging the supremacy of the Roman king, Tarquinius Priscus; and Pliny mentions a circumstance which is quite conclusive as a proof of the subjugation of Rome—viz., that P. forbade the citizens to use iron, except for agricultural purposes. Niebuhr, who has placed this view beyond all doubt, notices various minor incidents which are perfectly unintelligible, except on the hypothesis of an Etruscan conquest. The whole details of the ancient legend, therefore, may be regarded as fabulous—the product of patriotic unveracity—and what seems most reasonable to believe, is, that a great rising of the Etruscan against the Latin races took place, and that Rome, forming the Latin frontier towards Etruria, was exposed to the first brunt of the war, and suffered a disastrous defeat; but that shortly after, the Etruscans themselves were decisively beaten, and forced back into their own territories; for after the conquest of Rome, Aruns, a son of P., proceeded against Aricia, where (according to Livy) his army was routed under the walls of that city by the combined forces of the Latin cities, with the help of Greek auxiliaries from Cumæ. It is worth while quoting, as a proof of Niebuhr's wonderful talent for felicitous conjecture, that he explains the long-surviving Roman custom of beginning an auction by offering for sale the goods of King P., by the supposition, that in the recovery of their independence, the Romans probably captured property belonging to their late master, which they may have publicly sold. The sepulchre of P. at Clusium is described by Varro, but his description is not credible. The ancient legend has been magnificently rendered in modern verse by Macaulay. See the *Lays of Ancient Rome*.

PORSON, RICHARD, the greatest Greek scholar England has ever produced, was born on Christmas 1759, at East Ruston, Norfolk, where his father was parish clerk. The curate of the parish conceiving a liking for the boy, on account of his omnivor-

ous appetite for books and his marvelous memory, took charge of him, and had him educated along with his own sons. P. afterwards found a patron in Mr. Norris (the founder of the Norrisian professorship at Cambridge), who sent him to Eton in 1774, where he remained four years, but did not acquire any of the ordinary distinctions, although it is evident that it was there that his mind acquired a fixed bias towards classical studies. Another patron, Sir George Baker, sent him, in 1778, to Trinity College, Cambridge, of which he was elected a scholar in 1780. Next year he won the Craven Scholarship, and subsequently, the first Chancellor's medal. In 1782, he was chosen a fellow of Trinity. It was about this time that he began to give indications of his subtle sagacity and taste in the difficult verbal criticism of the Greek dramatists. For four years he contributed to Maty's *Review*—his first critique being on Schulz's Æschylus, and his finest on Brunck's Aristophanes. He also opened a correspondence with Professor Ruhnken. If, however, we are to judge from a quatrain written at a later period of his life, he did more than correspond:

> I went to Strasburg, where I got drunk
> With that most learned Professor Brunck;
> I went to Wortz and got more drunken
> With that more learned Professor Ruhnken.

In 1787 appeared, in the *Gentleman's Magazine*, his sarcastic letters on Hawkins's *Life of Johnson*. For the same periodical, he also wrote his far more famous and trenchant *Letters to Travis on the Three Witnesses*. The dispute concerned the genuiness of John i. 7, 8, and was occasioned by a blundering and pretentious defence of the passsge by Archdeacon Travis, against the scornful attack of Gibbon. P. naturally incurred great odium on account of the side which he took in this controversy. One old lady who had him in her will for a legacy of £300, cut it down to £30, when she heard that he had written a book against Christianity.

In 1792, he resigned his fellowship, as he found that he could not conscientiously take orders in the church. Some of his friends now raised a fund to preserve him from want, and about £100 a year was secured. He was also appointed to the Regius professorship of Greek in the university of Cambridge—an office, indeed, only worth £40 a year; yet so splendid was his learning, so admirable his taste, so vigorous and epigrammatic his style of criticism, that he might easily have—by the exercise of a moderate degree of continuous literary labor—succeeded in gaining a handsome income. But already 'two devils had him in their grip'—procrastination and a raging thirst for drink—and they held him firm to the end of his melancholy career. The only thing he ever did in connection with his Greek professorship was to deliver a *prælectio* so excellent, that it has been said, if he had passed from verbal to æsthetic criticism, he would have surpassed all his countrymen in that too. In 1794, he edited the plays of Æschylus for the Foulis press, Glasgow; and between 1797 and 1801 four of Euripides, the *Hecuba*, the *Orestes*, the *Phœnissæ*, and the *Medea*. He also collated the Harleian MS. of the *Odyssey* for the *Grenville Homer*. In 1806 he was appointed librarian of the 'London Institution' with a salary of £200; but was so grossly negligent of his duties, that the directors officially notified their dissatisfaction in these emphatic words: 'We only know that you are our librarian by seeing your name attached to the receipts for your salary.' He died of apoplexy, 25th September 1808, in the 49th year of his age, and was buried with great pomp in the chapel of Trinity College, Cambridge.

P.'s rage for drink was fearful. He would pour anything down his throat rather than endure the 'terrible torture of thirst.' Ink, spirits of wine for the lamp, an embrocation, are among the horrible things he is reported to have swallowed in his extremity. 'He used to return to the dining-room after the company had left it; pour into a tumbler the drops remaining in the wine-glasses, and drink off the collectanea.' In fact, his thirst was so outrageous, that P. cannot be considered a mere wilful drunkard; one must believe that he was driven into his excesses by some unknown disease of his constitution. See POLYDIPSIA. P.'s memory was as amazing as his thirst. The anecdotes told by his biographers almost surpass belief, yet are thoroughly authenticated. His critical acumen has never been matched in England. His tracts, reviews, letters, &c., were collected and edited, with a biographical notice, by Kidd, in six volumes. See 'Porsoniana' in Rogers' *Table-Talk*, and the Rev. J. Selby Watson's *Life of Richard Porson, M.A.* (1861).

PORT, in Naval Language, has at least three significations; first, a port is a harbor were ships are admitted to embark or discharge cargoes, or for other purposes—a free port being one in which the embarkation and discharge can be conducted without the payment of customs or port dues.—A port in a ship's side is the aperture for admitting light and air, or for pointing a gun through. See PORT-HOLE.—Port is also the official name for the left-hand side, when looking towards the bow of a ship—i. e., looking forwards. The term was, a few years ago, arbitrarily substituted for Larboard (q. v.)

PORT ARMS, in Musketry Drill, is derived from *portare*, to carry, and applies to a motion in which the fire-arm is brought to a slanting position in front of the body, lock to the front, the barrel crossing opposite the front of the left shoulder.

PORT-AU-PRINCE, or PORT-REPUBLICAN, the capital of Hayti (q. v.), is situated on the west coast, at the head of a bay of the same name, and has a fine appearance from the sea, but the interior is filthy in the extreme. The houses are chiefly of wood, and dungsteads obtrude everywhere, even in the thoroughfares. The most notable buildings are the palace and the senate-house; other public edifices are the churches, a lyceum, college, custom-house, mint, and hospital. P. carries on a trade in mahogany, logwood, honey, coffee, cocoa, and rags. Pop. about 21,000. The town has suffered frequently from earthquakes.

PORT D'URBAN, or PORT NATAL, the only seaport of the colony of NATAL (q. v.).

PORT ELI'ZABETH, an important seaport of South Africa, commercial capital of the Eastern Province of the British colony of the Cape of Good Hope, stands on the western shore of Algoa Bay (q. v.), in lat. about 34° S., long. 25° 35′ E. Many of the streets are elegant. One range of houses, consisting of four streets, which will bear comparison with the best streets in England, forms a continuous line two miles in length. In the style of the buildings, this town is superior to any other in South Africa. Its magnificent warehouses are constructed on a palatial scale, and resemble the finest in London, and its public buildings are all solid and substantial edifices. The principal are the town-house, 90 feet square and three stories high, containing the public library, the athenæum, and the municipal chambers; the public hospital, furnished with 100 beds; the Presbyterian and other churches, and the Roman Catholic cathedral. Its educational institutions are of a superior description. In 1854, under the auspices of Governor Sir George Grey, a system of schools was introduced known as the Grey Institute Schools, founded on a magnificent grant of town-lands, lately yielding a revenue of over £1000 per annum, and which affords a very excellent education at a very moderate charge. The chief of these are a high-school or college, and three elementary or district training-schools.

The town was founded in 1820, and the census of 1865 showed the population of the municipality of P. E, to be 8700; in 1878, it was close on 14,000. P. E. has made more rapid advancement than any other town in the colony; and the inhabitants are particularly notable for their enterprise and business energy. It owes its commercial importance in great part to the circumstance of its being the emporium of the great wool trade of the colony; and besides this it carries on a rapidly-increasing home and foreign trade. The transactions of its four banks are extensive. Two lines of railway run inland from Port E. The imports are valued at near £1,500,000 a year; and the exports about £2,000,000. As much as thirty or forty millions of pounds of wool may be exported in one year. The other colonial exports fall mainly under the heads of skins, hides, horns, ivory, and feathers.

The shore is open to the swell of the Indian Ocean, which often rolls in upon the beach with such violence that, until recently, cargoes could only be got to land by the use of surf-boats. Kaffirs, tempted by the high pay offered, used to come from a great distance to do the difficult and dangerous work of unloading the boats. But this system of landing is now in a great measure done away with, and ships now unload at several jetties. A breakwater has been constructed, and there are three lights for the direction of vessels.

PORT-GLA'SGOW, a parliamentary burgh and seaport of the county of Renfrew, Scotland, is situated on the Clyde, about 2 miles east of Greenock and 20 miles north-west of Glasgow. It was founded in 1668 by the magistrates of Glasgow as a harbor for the ships that belonged to or traded with their city—the Clyde at Glasgow being then inconveniently shallow, and the idea of deepening the river not having yet occurred. In 1695, the town and a small adjacent district were made into an independent parish; in 1710, it was constituted the principal custom-house on the Clyde, and for a while took the lead of Greenock; in 1775, it was incorporated as a municipality, and by the Reform Bill of 1832, it was raised to the rank of a parliamentary burgh, uniting with Kilmarnock, Rutherglen, Dumbarton, and Renfrew in electing a member of the legislature. P.-G. is rather a well-built town. The principal buildings are the town-house, custom-house, and churches of the different denominations. P.-G. has extensive manufactures of sail-ropes, chain-cables, several sugar-refineries, foundries, building-yards, commodious quays, and an extensive wet-dock. The deepening of the Clyde, enabling large vessels to ascend to Glasgow, seriously injured its commercial prosperity, but the trade has been for many years improving; the shipping employed is considerable. In 1876, 38 ships, of 17,066 tons, were registered at P.; and in the same year 53 vessels, of 27,406 tons, were built here. Pop. (1871) 9851; (1881) 10,801.

PORT LOU'IS, the capital and principal port of the British colony of Mauritius, is situated on an inlet on the north-west coast. Its streets, though narrow, are straight, and are furnished with foot-paths and macadamized. It contains a number of public buildings, among which are a theater, library, hospital, and botanic garden. Its harbor is capacious, but is quite safe only during the fine season. The imports and exports of the colony are mainly transacted at P. L.; and their quantity, value, and character are mentioned under the article Maritius (q. v.). Pop. of the port is estimated at 65,000 (1871).

PORT MAHO'N (anc. *Portus Magonis*), the capital of the island of Minorca (q. v.), is beautifully situated on a deep and narrow inlet in the south-east of the island. Its harbor, sufficiently spacious to accommodate a large fleet of men-of-war, is one of the finest in the Mediterranean, and is protected by three forts. It has no architectural features worthy of special notice, but is on the whole well built. The military governor and the bishop of the island reside here. The government buildings were constructed when Minorca was English. Pop. 13,000.

PORT PA'TRICK, a burgh of barony and small seaport of Scotland, in Wigtown, 8 miles S.W. of Stranraer, with which it is connected by rail. It was formerly a mail-packet station for Ireland; £250,000 were spent on government works, including a lighthouse, demolished in 1869. In Scotland, P. is the nearest point to Ireland, distant 21½ miles. Pop. (1871) 685; (1881) 591.

PORT PHI'LLIP. See MELBOURNE.

PORT ROYAL-DES-CHAMPS, a convent of Cistercian nuns, near Versailles, which obtained much celebrity during the 17th century. It was founded for nuns by a member of the family of Montmorenci, in the early part of the 13th c.; and soon after its establishment, obtained from the pope the privilege of receiving lay persons, who, without taking monastic vows, desired to live in religious retirement. This portion of the P. R. institute in later times became of great importance. The discipline of the convent having been much relaxed in the 15th and 16th centuries, one of its worst abuses—that of appointing the superior, not on account of fitness, but from considerations of family or other worldly or political motives—became in the end the occasion of its complete reformation. Angelique Arnauld, sister of the celebrated brothers Arnauld, was appointed, when a mere child, co-adjutrix of the abbess, and on the death of this lady, although she was then only in her eleventh year, herself succeeded to the office. As Mére Angelique advanced in years, she felt moved, although still very young, by a profound sense of her responsibilities, and undertook a complete and rigid reformation of the community, which she carried out in all its details—as the strict observance of religious poverty, abstinence from meat, complete seclusion, and the most severe ascetic exercises. The community was removed to Paris in 1626, and in 1633 to a new convent, which was thenceforward called Port Royal-de-Paris; and from this time the old establishment of P. R.-des-Champs was exclusively devoted to the use of a lay community, in accordance with the original papal privilege. This community quickly became very celebrated, and soon numbered among its inmates some of the most distinguished scholars of that age, Antony Arnauld, Le Maistre, Antony and Louis Isaac le Maistre de Sacy, Nicole, Lancelot, Sericourt, and several others. Their rule of life was most austere, rising at 3 A.M., devoting many hours to prayer and spiritual reading and instruction, and a portion of the day to manual labor. One of their most important public services was the establishment of a school, for which they prepared the well-known educational books known under the name of Port Royal, the Greek and Latin Grammars, Geometry, Art of Thinking, &c. This school was for a time transferred to Paris, a portion of the nuns being sent back to P. R.-des-Champs; but eventually it was established at an out-farm of the latter place, called Les Granges.

P. R., however, is even more known in history through its relations with the Jansenist controversy. The nature and origin of these relations have been explained in the article JANSEN (q. v.). It only remains to relate the later fortunes of P. R. and its members, in so far as they were affected by the proceedings taken in consequence by the authorities, whether civil or ecclesiastical. The nuns of P. R. having refused to subscribe the formulary condemning the Five Propositions, a royal order was issued in 1660 for the suppression of the school, and the removal of the boarders of P. R.-des-champs; and at length the abbess, and several of the nuns, were arrested, and confined as prisoners in other monasteries. After the 'Peace of Clement IX.,' they were permitted to return; but the two communities, P. R.-des-Champs and P. R.-de-Paris, were placed under separate government. This led to many disputes, and to a perpetuation in P. R.-des-Champs of the Jansenistic spirit and the Jansenistic opinions; and when the final steps for the repression of that party were taken about 1707, a formal bull was issued by Pope Clement XI. for the suppression of that convent, and the transfer of its property to P. R.-de-Paris. The nuns, accordingly, were finally dispersed and distributed over convents of different orders throughout France. The property of the convent and church were transferred to the Paris house, and all the buildings of P. R.-des-Champs were levelled to the ground, by order of the king. Most of the eminent names connected with P. R. are under separate heads.

PORT SAID. See SUEZ CANAL.

PORT WINE (i. e., *Porto* or *Oporto Wine*), a species of red wine, hot and heady, which is produced chiefly in a mountainous district of Portugal, called Cima de Douro, and exported from Oporto and Lisbon. The vine from which this wine is produced is generally planted on craggy slopes with a southern exposure. The grapes are gathered from the commencement of September to the middle of October. The cultivation and gathering of the grapes for port wine employ annually 10,000 cultivators and 20,000 gatherers. The wine, when pure and unadulterated (which is very seldom the case), does not acquire its full strength and flavor till it has stood for some years, but care must likewise be taken that it is not allowed to become too old. The color of new port wine varies from pale rose to deep red, and changes with age, becoming a deep tawny brown, which is permanent. By far the greater portion of the wine made is mixed with spirit even during the time of fermentation, in order to give the new wine the ripeness and strength which exporters require, and which the wine does not naturally attain till it has stood for some time; the proper color is also given by an ingredient known as *jeropiga*, which is a preparation of elder-berries, molasses, raisin-juice, and spirit. It is an excess of this jeropiga in the inferior sorts of port which communicates to them the medicated odor so frequently noticed. The extreme 'headiness' of port is chiefly due to the liberal admixture with spirit,, and this is the case with all the sorts generally exported. From the time when port came into demand (about 1700, though it was known in England for a considerable time before this) down to 1826, its export was a monopoly in the hands of the English merchants, and the amount of wine produced increased, with tolerable steadiness, year after year till 1836, when it reached 38,459 pipes, valued at £1,122,500.

The ultimate effect of this monopoly was to increase the price of port wine in England, and at the same time so to deteriorate its quality, that in course of time it became of less demand, and was gradually, to some extent, supplanted by Southern French and other wines. Since 1836 it has fluctuated, being sometimes more and sometimes less than this figure; in 1850 the exportation reached 37,487 pipes. Between 1876 and 1880 the exports to Great Britain ranged from 4,000,000 gallons to 3,000,000, and the value from £900,000 to £1,300,000.

PORTADOW'N (Ir. *Port-na-Doon*, Port of the Fort), a market and manufacturing town of the county of Armagh, Ulster, Ireland, on the Bann, 11 miles north-east of Armagh by railway. It was formerly the seat of the M'Canns, a clan tributary to the O'Neil, and formed part of the territory 'settled' by James I., and afterwards by Charles I. It is a place of considerable trade in corn, flax, and other agricultural produce, and is the seat of an extensive manufacture of linen yarns and linen. Communicating by canal with the sea at Newry, and by railway with Belfast, it has also a considerable import trade. The population in 1871 was 6735, of whom 3147 were Protestant Episcopalians, 1932 Roman Catholics, 857 Presbyterians, 715 Methodists. At the census of 1881 it had increased to 7850. P. is connected by the Ulster Railway with Armagh, Dungannon, and with several north-west counties.

PO'RTAL, the recess of a large doorway, such as the entrance to a church. See PORCH.

PORTAME'NTO (Ital. *portare*, to carry), a musical term used for the sustaining of the voice, and passing from one note to another.

PORTA'RLINGTON, a market town and parliamentary borough, partly in the King's County, partly in the Queen's County, Leinster, Ireland, on the Barrow, 44 miles west-south-west from Dublin, with which it communicates by the Great Southern and Western Railway. Pop. in 1871, 2424, of whom 1688 were Roman Catholics, and 673 Protestant Episcopalians; (1881) 2426. P. was anciently called Cooltetoodra; but being granted by Charles II. to the Earl of Arlington, was called by his name. By him it was sold to Sir Patrick Traul; and on the attainder of Sir Patrick, was granted by William III. to General de Rouvigny, who planted in it a colony of French and Flemish Protestants, many of whose descendants still remain. It is now the property of the family of Dawson, Earls of Portarlington. It returns one member to parliament. The town is well built, and provided with two national, two endowed, and also private schools of considerable reputation, at one of which the late Duke of Wellington and his brother Lord Wellesley received part of their education. The rateable value of property is £4339.

PORTCU'LLIS (Fr. *porte*, gate, and *coulisse*, from *couler*, to flow), a frame of wood strengthened with iron in the form of a grating, and sliding in vertical grooves in the jambs of the entrance gate of a fortified place, in order to defend the gate in case of assault. The vertical bars were pointed with iron below, and struck on the ground, when the grating was dropped, so as to injure whatever it fell upon. In Heraldry, the portcullis is repre-

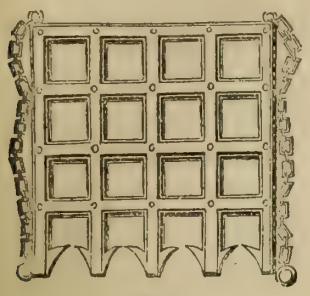


Fig. 1.

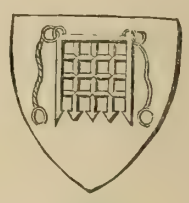


Fig. 2.

sented with rings at its uppermost angles, from which chains depend on either side. It was a badge of the Beaufort family, and borne in virtue of their Beaufort descent by the Tudor sovereigns. Portcullis is the title of a pursuivant in the English College of Arms, whose office was instituted by Henry VII.

PORTE, Sublime Porte, or Ottoman Porte, the name given to the Turkish government. The origin of this name is to be referred to the ancient oriental custom of making the gates of cities and of king's palaces places of assembly in connection with the affairs of government and of the administration of justice. In the Byzantine empire this custom was adopted, and the term was transferred from the high gate of the imperial palace to the government whose authority was there exercised. The Turks found the term in common use among the Byzantines some time previous to their establishment at Constantinople, and adopted it on the organization of their empire. The use among European nations, of the French term *Sublime Porte* ('Lofty Gate') is accounted for by the fact that French is the language of European diplomacy.

PORTER, David D., Admiral of the American navy, son of Commodore David Porter who commanded the *Essex* frigate in the war of 1812, was born in Philadelphia in June 1813, entered the navy as midshipman in 1829, was employed from 1836 to 1841 in the survey of the coast of the United States; and employed four years on the Mediterranean and Brazil stations; in 1845, transferred to the National Observatory at Washington; again to the coast-survey; and from 1849 to 1853, engaged in command of the California mail-steamers. At the commencement of the war of 1861, he was appointed commander of the steam sloop-of-war *Powhatan*, and ordered to Pensacola; distinguished himself in the capture of New Orleans and of Vicksburg, and in other events of the war. At the termination of the war, he was appointed superintendent and president *ex officio* of the U. S. Naval Academy, Annapolis. He was made vice-admiral in 1866, and in 1870 he became admiral, a rank which carries with it the command of the whole U. S. navy, subject only to the president.

PORTER, a kind of malt liquor which came into use in London in 1722. According to Leigh, 'the malt liquors previously in use were ale, beer, and twopenny, and it was customary to call for a pint or tankard of half-and-half—i. e., half of ale and half of beer, half of ale and half of twopenny, or half of beer and half of twopenny. In the course of time it also became the practice to ask for a pint or tankard of three-thirds [or, as it became corrupted, *three threads*], meaning a third each of ale, beer, and twopenny; and thus the publican was obliged to go to three casks for a single pint of liquor. To avoid this trouble and waste, a brewer of the name of Harwood conceived the idea of making a liquor which should partake of the united flavors of ale, beer, and twopenny. He did so, and succeeded, calling it entire, or entire butt beer, meaning that it was drawn entirely from one cask or butt; and being a hearty nourishing liquor, it was very suitable for porters and other working people. Hence it obtained the name of Porter, and was first retailed at the Blue Last, Curtain Road, Shoreditch.' The chief characteristics of porter are its dark-brown color, peculiar bitter flavor, and agreeable freshness in drinking. Until within the last twenty years it was generally brewed with malt roasted until slightly brown; now, however, under the improved system of brewing, pale malt, with the addition of some highly roasted, for the sake of color only, is used. Enormous quantities are brewed by the London brewers. A kind much stronger than ordinary porter is also extensively brewed in London, Dublin, and elsewhere, under the name of *stout*. The name porter is now seldom used in England, beer being the general designation.

PORTFIRE is a sort of slow match for firing guns. It consists of a paper tube from 16 to 20 inches in length, filled with a composition thus proportioned—saltpetre 666 parts, sulphur 222 parts, mealed gunpowder 112 parts. The composition is rammed with force into the paper barrel, and then, when ignited, it burns for a considerable period. As a substitute, may be employed soft brown paper dipped in a solution of two ounces of nitre to a gallon of water, dried, and rolled up to the size of a common portfire. Another portfire consists of a rod cut square, of lime, birch, or poplar, boiled for six hours in a solution formed by dissolving one pound of nitre of lead in one quart of water. The rod is subsequently boiled in spirits of turpentine. When thoroughly dried, one yard will burn three hours.

PORTHOLES are embrasures or openings in the side of a ship of war to enable the guns to be ranged in battery. The portholes are ordinarily square, of size sufficient to enable the guns to be pointed at a considerable angle. In stormy weather the ports are closed, the guns being run in. When the guns are run out, and no fighting is anticipated, half-ports are employed to keep the water out. There is a row of ports for each gun-deck, and by these rows the rating of the vessel is described as a three-decker, two-decker, &c. Within the port, rings are fixed through which the ropes are passed for working the heavy guns.

PO'RTICI (formerly *Portico*), a town of Southern Italy, is situated on the slope of Vesuvius, near Herculaneum, 4 miles south-east from Naples, with 11,288 inhabitants. Its environs are delightful, and are dotted all over the country with houses. There is a royal palace built by Charles III., but it is crossed by the high road, which divides it in two. Facing the palace is a fortress rising out of the sea, and there is a small harbor called the Granatello.

PO'RTICO, a covered space with a roof supported by columns. It is usually attached to an important building, but sometimes detached, as a shady walk. A portico is called tetrastyle, hexastyle, octostyle, and decastyle, according as it has four, six, eight or ten columns in front.

PORTION, though not a legal term, is often used in the law of intestacy and lagacies, and means a sum of money given to a child in discharge of the obligation incumbent on a parent; and from the circumstance of its being often given on marriage it is called a marriage-portion. By the law of England and Ireland, therein differing from the law of Scotland, a parent is not bound at common law to give any portion to his children. But he often does so by will; and, in the event of his dying intestate, the law does so for him. When a testator by will leaves a legacy to a daughter, child, or person, towards whom he stands *in loco parentis* and afterwards in his lifetime gives the child a like sum of money or even a less sum as a portion on marriage, such portion is *prima facia* presumed to be in satisfaction, or an ademption of the legacy, unless there is something in the will or settlement to rebut that presumption. But in Scotland there is no such presumption, unless the father was liable by contract to give the portion. See Tocher.

PO'RTIONERS, in the Law of Scotland, mean two or more females who succeed jointly to heritable estate in default of heirs male, corresponding to Coparceners in England. See Heirs-Portioners. The holder of part of a fief was also called a portioner.

PO'RTLAND, a seaport of Maine, U.S., on an arm of Casco Bay, 105 miles north-east of Boston. It is situated on a peninsula three miles long by three-fourths of a mile broad, with broad shaded streets, and handsome public and private edifices, including a Court and Custom-house, a city hall, and Athenæum. There are near a score of newspapers, several of which are daily. The harbor of P. is large, deep, and well sheltered, and is the winter station of the Canadian steamers. It is defended by two forts. There are five railways, engine manufactories, sugar refineries, and a large coasting trade. P., first named Falmouth, was settled by an English colony in 1632, and was three times burned in the wars with the French and Indians. In 1866, a fire destroyed $10,000,000 worth of property. Pop. (1870) 31,413; (1880) 33,810.

PORTLAND, the largest city of Oregon, U.S., 50 miles north of Salem, the capital of the state, is on a tributary of the Columbia River. It is the terminus of the Oregon Central Railway, has rapidly growing trade and thriving foundries, planing mills, and breweries. Pop. (1870) 8293; (1880) 17,598.

PORTLAND BEDS, a division of the Upper Oolites (q. v.), occurring between the Purbeck Beds and the Kimmeridge Clay, and so named because the rocks of the group form the promontory of the Isle of Portland. They consist of beds of hard oolitic limestone and freestone, interstratified with clays, and resting on light-colored sands, which contain marine fossils. The corals found in the sands are often converted into flints, the original structure being beautifully preserved in the hard silex. The beds

may be traced from the Isle of Portland, capping the oolitic hills as far as Oxfordshire. The fossils are chiefly mollusca and fish, with a few reptiles.

PORTLAND CEMENT. See CEMENT.

PORTLAND ISLE, a rocky peninsula projecting into the English Channel from the shore of Dorsetshire, 17 miles west-south-west of St. Alban's Head. Its appearance suggests the shape of a *beak*, and it is therefore called also the *Bill of Portland*. It is 9 miles in circumference, is composed of oolitic limestone, and slopes southward, with an even surface from the height of 490 feet to that of 30 feet above sea-level. Its sides are extremely rugged, and are worn into fantastic caverns by the furious action of the waves. The peninsula is supposed to have been once an island, but for ages it has been connected with the mainland by *Chesil Bank*, an extraordinary ridge of loose shingle, which, after running north-west in a straight line close to the shore for about 10 miles, joins the mainland at Abbotsbury. South-west winds prevail on this part of the coast, and during their continuance the long ridge of Chesil Bank is lashed by a frightful sea, and is the scene of frequent shipwrecks. A long narrow inlet of the sea, called the *Fleet*, extends between Chesil Bank and the shore, and is the haunt of numerous wild-fowl. *Portland Castle*, in the north of the isle, is a ponderous building, erected by Henry VIII. as a protection for this part of the coast in 1520. The peninsula furnishes the famous Portland Stone (q. v.). Portland Breakwater, built of stones obtained on the island, partly described under the article BREAKWATER (q. v.), has provided a secure harbor for hundreds of the largest ships; in connection with it are also a naval station, harbor of refuge, and batteries. *Pennsylvania Castle*, in a most romantic district on the east coast, was built by John Penn, the grandson of the founder of Pennsylvania. *Rufus Castle*, or, as it is commonly called, *Bow and Arrow Castle*, also on the east coast, is now in ruin, and is generally said to have been built by William Rufus. On Portland Bill, the southern extremity of the island, are two lighthouses, one 130, and the other 197 feet above sea-level. Between the southern point and the *Shambles*, three miles to the south-east, a dangerous surf, well known as the *Race of Portland*, is raised by the rushing of the impetuous tides.

The convict prison, near the east coast, erected in 1848, consists of eight wings, besides the hospital, chapel, barracks, and cottages for the warders. It accommodates upwards of 1500 convicts, besides the officers, and is maintained at an annual cost of upwards of £50,000, or at the rate of £33 per prisoner. The inhabitants of the island long remained a peculiar people, intermarrying, and preserving, generation after generation, the many curious customs of their ancestors. The island itself is chiefly remarkable for its abundant supply of excellent spring water, for its building-stone, and for its breed of sheep, the flesh of which, well known as Portland mutton, is celebrated for its flavor. The pop. of the parish of P. amounted in 1871 to 9907; in 1881, to 10,046.

PORTLAND SAGO. See ARUM.

PORTLAND STONE. This celebrated building stone, of which many of the principal buildings of London, including St. Paul's Cathedral, Somerset House, and many of the churches are constructed, is the oolitic limestone of Dorsetshire, constituting geologically the *Portland and Purbeck Beds*. The quarries are chiefly located in the islands of Portland and Purbeck, and in the Vale of Wardour. The quantity raised is very large. During the heavier works at the Portland Breakwater 730,000 tons per annum were required for that structure alone, and about 30,000 to 40,000 tons are sent annually to London and other places. There are three different qualities of the stone in the same quarry: the uppermost contains numerous fossils, and is of a coarse grain; it is therefore used chiefly for rough work, such as foundations. It is called Roach by the quarrymen. The middle bed is much broken, and is called the *rubble* or *rubbly bed*, and is of little value; and the lower one is fine, white, and compact, and is called the *whit*, or *best bed*. This last is that which is used for fine building purposes. An analysis of this stone by Professor Daniell shows the following composition:

Silica	1·20
Carbonate of Lime	95·16
Carbonate of Magnesia	1·20
Iron and Alumina	0·50
Water and loss	1·94

Besides which ingredients, there is often a trace of bitumen present.

PORTLAND VASE. A beautiful cinerary urn, of transparent dark-blue glass, found about the middle of the 16th c. in a marble sarcophagus near Rome (see the article GLASS, where it is figured and described). It was at first deposited in the Barberini Palace at Rome (and hence often called the Barberini Vase); it then became (1770) the property, by purchase, of Sir William Hamilton (q. v.), from whose possession it passed into that of the Duchess of Portland. In 1810 the Duke of Portland, one of the trustees of the British Museum, allowed it to be placed in that institution, retaining his right over it as his own property. In 1845 a miscreant named William Lloyd, apparently from an insane love of mischief or a diseased ambition for notoriety, dashed this valuable relic to pieces with a stone. Owing to the defective state of the law, only a slight punishment could be inflicted; but an act was immediately passed, making such an offence punishable with imprisonment for two years, and one, two, or three public or private whippings. The pieces of the fractured vase were carefully gathered up, and afterwards united in a very complete manner; and thus repaired; it still exists in the Museum, but is not shown to the public. A small number of copies of the Portland Vase were made many years ago by Mr. Wedgwood, and were sold at 25 guineas each.

PORTLAW', a small manufacturing town of the county of Waterford, Munster, Ireland, about 10 miles west-north-west of Waterford. P. has risen within the last 40 years from a small village into a town of great activity and of extensive manufactures, through the enterprise of a single family named Malcomson, by whom the cotton manufacture has been introduced with great success. The population in 1871 was 3774, considerably more than 3000 of whom were Roman Catholics, the remainder being principally Protestant Episcopalians. P. is admirably provided with schools and other institutions for the social and moral improvement of the population.

PO'RTO ALE'GRE, a town of Brazil, capital of the province of Rio Grande do Sul, stands at the north-west extremity of the Lake of Patos, by means of which it communicates with the sea. It was founded in 1743, is well built, and contains 20,000 inhabitants. It is provided with wharfs; and its trade, though by no means inconsiderable, has hardly shared to the full in the recent advancement of the prosperity of Brazil.

PORTOBE'LLO, a parliamentary burgh and watering-place, occupies a plain on the south bank of the Firth of Forth, in the county of Edinburgh, and three miles east of the city of that name by the North British Railway. A commodious new town-hall was recently built. This town is a favorite resort for sea-bathing and summer quarters during the season. A marine promenade, a mile in length, runs along the shore; and there is an elegant iron pier, 1250 feet long, with seats to accommodate 2000 persons, and a spacious saloon for the use of visitors. P. is also a manufacturing town, and its manufacturing establishments comprise potteries, and earthenware, bottle, brick, and paper works, &c. Pop. (1881) 6793; and, in summer, between 7000 and 8000. The town derives its name from the first house built here about the time of the seizure of the town of Puerto Bello, in the Isthmus of Panama, and called Portobello.

PORTO BELLO. See PUERTO BELLO.

PO'RTO FERRA'JO. See ELBA.

PORTO-MAURI'ZIO, a seaport town of North Italy, capital of a province on the Gulf of Genoa, 58 miles directly south-west of Genoa city. Area of province, 467 sq. miles; pop. (1880) 132,218. The town stands on a high promontory, projecting boldly into the sea. The harbor, defended by a mole, is generally crowded with the picturesque coasting-vessels of the Mediterranean. There is an extensive trade in olive-oil and agricultural produce. Pop. 7000.

PO'RTO NO'VO, a town in the Madras Presidency of India, situated on the Coromandel coast, in lat. 11° 31′ N., and long. 79° 51′ E. Both the Danes and the Dutch had formerly a factory here. The place is celebrated for the battle fought here on 1st July 1781, when Sir Eyre Coote defeated Hyder Ali. The British force consisted of only 7878 men, including artillery; Hyder's army numbered over 60,000. Coote was retiring before Hyder. After leaving P. N., he had only advanced a few miles along the seashore, when he found his path intercepted by the enemy's batteries, the sea confining him on the right, and a range of sand-hills on the left. The British army made two assaults; in one, they carried the batteries; in the other, they took advantage of an opening in the sand-hills, which Hyder had neglected to guard, and came suddenly upon the enemy's flank. A schooner of war meantime standing in close, poured her broadsides of small guns into the enemy. Their rout was complete. P. N. is celebrated for its iron foundry, which of late years has supplied much of the material for the Madras railways. Pop. of P. N., called by the natives *Parangipetta*, about 7200.

PO'RTO RI'CO. See PUERTO RICO.

PORTREE. See SKYE.

PO'RTREEVE (from *port* and *reeve*, Saxon *gerefa*, a word of similar origin to the German *graf*, signifying a governor or chief magistrate), the principal magistrate in a maritime town. This

was the early name of the officer afterwards called mayor in London and elsewhere.

PO'RTSEA ISLAND, a small island on the south coast of Hampshire, has on its west side Portsmouth Harbor, on its south-east side Langston Harbor, on its east side Chichester Harbor, and is separated from the mainland on the north by a narrow channel, crossed by several bridges. It is four miles long, by from two to three miles broad, and contains the important towns of Portsea and Portsmouth (q. v.).

PO'RTSMOUTH, the chief naval arsenal of Great Britain, and an important seaport, market-town, and municipal and parliamentary borough, in the south of Hampshire, stands on the south-west shore of Portsea Island (q. v.), at the entrance to Portsmouth Harbor, and opposite the town of Gosport, with which it communicates by means of a steam-bridge. It is 74 miles south-west of London by the London and South-western Railway. Besides the parish of P., the limits of the municipal and parliamentary borough, which are co-extensive, include also the parish and town of Portsea, and the out-wards Landport and Southsea. Pop. of the borough (1871), 113,569; (1881) 127,953. P. is for the most part a mean-looking, dirty town; but has the most complete fortifications in Britain. These comprise, on the landward side, the outer line of the Portsdown forts and the Hilsea lines; to seaward, the Spithead forts (q. v.). The bastioned ramparts, which formerly encircled both P. and Gosport, and were so imposing in appearance, have recently been removed as useless. Southsea, which is situated outside the walls skirting Southsea Common, is rapidly increasing and is now a fashionable watering-place. In the town proper, there are few objects of note. Pleasing views may be had from the ramparts and batteries, as the harbor, the roadstead of Spithead, and the Isle of Wight. Many improvements have been recently carried out in P., including improved drainage, and the opening of the Victoria Park in 1878. Among the few notable buildings may be mentioned the church of St. Thomas, which dates partly from the 12th c., and contains a ghastly cenotaph in memory of the murdered Duke of Buckingham (see *infra*). In front of the Garrison Chapel is buried the brave Sir Charles James Napier (q. v.), who died in this neighborhood in 1853.

The dockyard of P., in the district of Portsea, was till lately only 116 acres in extent; but vast works have recently been carried out, at a cost of £2,500,000, which have increased the area to a total of 293 acres. Of this immense naval establishment, the most noteworthy, if not the most recent, features are the mast and rope houses, hemp-stores, rigging-stores, sail-loft, and the dry docks, spacious enough to admit the largest vessels, and offering every facility for their speedy repair. The 12 docks vary from 22 to 36 feet deep, lined with solid masonry, and roofed over, and closed by lock-gates. Of the various building-slips, one of them, roofed and covered in, is so large that three or four vessels can be in process of construction under it at the same time. The Wood Mills contain a number of most ingenious block-making machines, the invention of Sir Isambard Brunel, in which rough timber, introduced at one end, is cut, squared, drilled, bored, and turned into the required shape. About 150,000 blocks are made here annually, and the machines require the attendance of no more than four men. In the smithy, anchors are forged by aid of a Nasmyth's hammer. The dockyard also contains the residences of the superintending officers, and a school of naval architecture.

Portsmouth Harbor, about 420 yards wide at its entrance, expands into a spacious basin, extending inland for about 4 miles, and having a breadth of 3 miles along its northern shore. Large war-vessels can enter and lie at anchor at all times of the tide. The outward entrance is defended by Monkton Fort and Southsea Castle. The position of this harbor is highly favorable. It is situated in the middle of the channel, close to the magnificent anchorage of Spithead, where 1000 ships of the line may ride without inconvenience, and is under shelter of the Isle of Wight, and opposite the French arsenal at Cherbourg.

The local trade of P. is supported by the dock-yard and the other public establishments of the town. Brewing is largely carried on. Coals, cattle, sheep, corn, and provisions are imported from our own coasts, and timber and wine from abroad. In 1880, 2021 vessels, of 201,110 tons, entered, and 2020, of 206,729 tons, cleared the port.

The importance of this port dates only from the reign of Henry VIII. Its defences were strengthened by Elizabeth, and afterwards in a more thorough manner by William III. Here, in a house that still remains in the High Street, and which was then an inn called the 'Spotted Dog,' the Duke of Buckingham (the 'Steenie' of King James) was assassinated by John Felton. On the 29th of August 1782, when its commander, Admiral Kempenfeldt, was writing in his cabin, the *Royal George* went down in the harbor, and nearly 1000 lives were lost.

PORTSMOUTH, a city and the only seaport of New Hampshire, U. S., is on the south bank of the Piscataqua River, three miles from the Atlantic, and 54 miles north-north-east of Boston; a well-built town, having 10 churches, athenæum, state arsenal, academy and public schools, 2 market-houses, almshouse, 5 banks, manufactories of cotton and hosiery, foundries, and breweries. There is a safe and deep harbor, a United States' navy-yard, having a balance-dock, 350 feet long, and two forts, M'Cleary and Constitution. Settled in 1623. Pop. (1870) 9211; (1880) 9698.

PORTSMOUTH, a city and port of Virginia, U. S., on the west bank of Elizabeth River, opposite Norfolk, and 8 miles from Hampton Roads. It has a court-house, scientific and military academy, 5 newspapers, 13 churches, tobacco-factories, &c., and connections with the southern railways. Its proximity to Fortress Monroe caused it to be held during the War of Secession, by the Federal forces. Pop, (1870) 10,492; (1880) 11,388.

PORTSMOUTH, a village of Ohio, U. S., on the north bank of the Ohio River, at the mouth of the Scioto, the terminus of the Scioto and Hocking Valley Railway, and Ohio and Erie Canal, 115 miles east-by-south from Cincinnati, and 90 south of Columbus. It has 14 churches, 2 iron foundries, 3 machine-shops, 2 distilleries, 6 banks, and 5 newspapers. Pop. (1870) 10,592; (1880) 11,314.

PO'RTUGAL, the most westerly kingdom of Europe, a part of the great Spanish peninsula, lies in 36° 55′—42° 8′ N. lat., and 6° 15′—9° 30′ W. long. Its greatest length from north to south is 368 miles, and its average breadth from east to west about 100 miles. The census of 1878 showed a population for continental P. of 4,348,551, and with the Azores and Madeira, 4,745,124. The table gives the area and pop. in 1875 of the seven old provinces, with the corresponding official districts :

Provinces.	Districts.	Area in Sq. Miles.	Pop. 1875.
MINHO	Viana, Braga, Porto.	2810	973,332
TRAS OS MONTES	Braganza, Villa-Real.	4275	374,857
BEIRA ALTA	Aveiro, Coimbra, Viseu.	4533	930,730
BEIRA BAIXA	Guarda, Castello-Branco.	4688	388,868
ESTREMADURA	Leiria, Santarem, Lisboa.	6907	853,876
ALEMTEJO	Portalegre, Evora, Beja.	9389	342,979
ALGARVE	Faro.	1868	192,916
	Total,	34,470	4,057,538

Islands.—The Azores, 920 square miles; pop. (1875) 261,746. Madeira, &c., 330 square miles; pop. 121,753. The islands are officially reckoned as belonging to the home territories.

The colonial possessions of P. are, in *Africa*—Cape Verd Islands, 1630·02 square miles; pop. 76,003. Senegambia, 35,437·50 square miles; pop. 8500. Islands of San-Thome and Principe, off Guinea, 448·56 sq. m.; pop. 23,681. Ajuda, 12 sq. m,; pop. 700. Angola, Benguela, 200,602·50 square miles, pop. 2,000,000. Mozambique and dependencies, 283,500 square miles; pop. 300,000. In *Asia*—Goa, Salcete, 1440·6 square miles; pop. 474,234. Damao, Diu, 94·08 square miles; pop. 53,283. In the Indian Archipelago, 2877 sq. m.; pop. 250,000. Macao, 11·76 sq. m.; pop. 71,739. Total of colonies, 526,041·48 square miles; pop. 3,258,140.

Physical Aspect, &c.—P. must be regarded as essentially a littoral country, forming the Atlantic or western part of the Spanish peninsula, from which it is separated by political, rather than physical boundaries. Its mountains and rivers are, with few extions, mere western prolongations of those of Spain. The principal mountain ranges lie about half-way inland, leaving almost the whole of its 500 miles of coastline a flat sandy tract, with a few rocky headlands, and hence there are scarcely any harbors or places of safe anchorage, except at the embouchures of the larger

rivers. The highest range is the Serra de Estrella, which, passing from north-north-east to south-south-west, through Beira and Estremadura, terminates in the steep acclivities of Cintra and Cap la Rocca, near Lisbon. The principal chain, which is also known as the Serra da Junto, merges in a series of ridges, which cover a tract thirty miles in length, between the Tagus and the sea. Another mountain range named the Serra de Calderão and the Serra de Monchique, but constituting a mere continuation of the Spanish Sierra Morena, crosses the southern part of P. from east to west, and terminates in its most southern promontory of Cape St. Vincent.

These ranges, with the numerous mountain-spurs that intersect the northern districts in every direction, so thoroughly occupy the area of P., that there are only two or three plains of any extent in the whole country, and these are situated to the west of the Guadiana, in Alemtejo, and in Beira and Estremadura, near the Tagus and Vouga. The valleys are very numerous, and by their great fruitfulness, present a striking contrast to the barren and rugged mountains by which they are enclosed. The principal rivers enter P. from Spain. Of these, the largest are the Guadiana, which, leaving Spain near Badajoz, forms in part the boundary between the southern provinces of the neighboring kingdom; while the Minho and Douro, flowing west, form a part of the boundary in the north and north-east. The Tagus, or Tejo, intersects P. from its northern frontier to the southern termination of the Estrella Mountains, where it enters the sea a little below Lisbon. The Mondego, the largest river belonging entirely to P. after receiving numerous affluents in its course, falls into the sea about midway between the Douro and the Tagus. The larger rivers, although obstructed at their mouth with dangerous bars, afford admirable means of internal navigation, together with the numerous lesser streams, and might through canals be connected into one great system of water-routes; but hitherto nothing has been done to improve these great natural advantages. Except a few mountain tarns, P. has no lakes. It has salt-marshes on the coast, near Setubal in Estremadura, and Aveiro in Beira, whence large quantities of salt are annually obtained by evaporation. Mineral springs are abundant in many parts of the country, but hitherto they have been almost wholly neglected.

The vicinity to the western ocean tempers the climate of P., and exempts it from the dry heat by which Spain is visited. The great inequalities of the surface produce, however, great diversities of climate; for while snow falls abundantly on the mountains in the northern provinces, it is never seen in the lowlands of the southern districts, where spring begins with the new year, and harvest is over by midsummer. Rain falls abundantly, especially on the coast, from October to March, and, as a general rule, the climate is healthy in the elevated districts even of the southern provinces; but malaria and fever prevail in low flat lands and near the salt marshes. The mean annual temperature at Lisbon is 61° Fahr.

The natural products correspond to the diversity of the physical and climatic conditions, for while barley, oats, and wheat, maize, flax, and hemp, are grown in the more elevated tracts, rice is cultivated in the lowlands, the oak thrives in the northern, the chestnut in the central, and the cork, date, and American aloe in the southern parts, while every species of European, and various kinds of semi-tropical fruits and vegetables, are grown in different parts of the country. The soil is generally rich, but agriculture is everywhere neglected, and is scarcely made subservient to the wants of the population. The cultivation of the vine and that of the olive are almost the sole branches of industry; from the former is derived the rich red wine familiarly known to us as Port, from its being shipped at *O Porto*, 'the port.' The mineral products include gold, antimony, lead, copper, marble, slate, coal, iron, and salt, but of these the last is alone worked in sufficient quantity for exportation, and is in eager demand for the British market, on account of its superior hardness, which adapts it specially for the salting of meat for ships.

The finest cattle are reared in the north, the horses of Alemtejo and the sheep of Beira are most valued. Mules and asses are the principal beasts of burden. Goats and pigs are numerous, and are raised at a very low cost, in all the mountain districts. The rearing of bees and silk-worms is being pursued with somewhat increased energy of late years. Fish is abundant in all the rivers and on the coast. The tunny and anchovy fisheries of Algarve are of considerable importance.

Commerce, &c.—The commercial industry of the country falls very far below its physical capabilities, and Oporto and Lisbon are the only centers of manufacture and trade, the former of which has important silk and glove manufactories, and produces an inconsiderable quantity of linen, cotton, and wool fabrics, metal and earthenware goods, tobacco, cigars, leather, &c. But in the 19 years preceding 1870, the agricultural exports had doubled. In 1880, the mercantile marine of P. comprised 498 vessels, measuring 87,060 cubic metres. In 1879, 3221 foreign vessels entered, and 4657 cleared the ports of P.; of Portuguese sea-going vessels (excluding coasters), 1021 entered, and 796 cleared. In 1880, 786 miles of railway were open, and 280 more in course of construction, principally in the environs of Lisbon, Oporto, Santarem, and Vigo; but the country is almost entirely without roads, the few which exist having been made only within the last thirty years, before which time the whole of the kingdom was in the same impassable condition in which the southern provinces still remain. The scarcity and inefficiency of bridges, and the total want of canals, render internal traffic almost impracticable, and, as a matter of course, put an impassable barrier in the way of the progress of civilization, and the growth of material prosperity.

The exports, which consist almost entirely of wine, fruits, oil, and cork, are chiefly sent to Great Britain and her colonies. In 1880 the exports from P. to England were valued at £3,762,504, the value of the total exports being about £7,000,000. Amongst these exports, the wine alone monopolized one-third of the total value. The Portuguese imports from the United Kingdom in 1880 had a value of £2,603,318; the value of all the exports being above £4.000,000.

The budget for 1881–82 gives the public revenue, derived from direct and indirect taxation and from the national domains, at £6,841,000; while the expenditure, including home and foreign debts, the charges of the state, public works, &c., amounts to £7,613,000. There has been no budget for the last 30 years without a deficit. The budget for the foreign possessions of P. gives for the same year the receipts at near £430,000, considerably exceeded by the expenditure. The national debt in 1876, including foreign loans, amounted to close on £78,000,000.

Army and Navy.—The actual strength of the army was, in 1881, rated at 1643 officers and 33,231 men. The colonial army has 447 officers and 8156 men. The navy consisted, in 1881, of 27 steam-vessels, carrying 139 guns, and 14 vessels without steam-power, with 39 guns. The principal naval depôts are at Lisbon and Oporto. P. has 55 fortresses, the greater number of which are mere fortified castles. Among the more important are Elvas, S. Julians Cascaes, Pininhe, Almeida, and Valença. There are six orders of knighthood—viz., the Order of Christ, founded in 1319; St. Benedict of Avis; the Tower and Sword, founded in 1459, and re-organized in 1808; Our Lady of Villa Viçosa, established in 1819; and the order of St. John of Jerusalem, which was separated in 1802 from that of Malta. Besides these, there is one civil service order, founded in 1288.

Religion, Education.—P. belongs almost exclusively to the Church of Rome, and shows little toleration to other creeds. At Lisbon and Oporto, Protestant places of worship are, however, sanctioned by the government. P. is divided into three dioceses, which are presided over by the Cardinal Patriarch of Lisbon, the Archbishop of Braga, who is primate of the kingdom, and the Archbishop of Evora; and these, with the fourteen bishops, belong to the Grandeza, or higher nobility. The number of clergy holding cures is given at 18,000. The monasteries have been dissolved since 1834, but convents for nuns still exist. P. stands below the other countries of Europe in regard to education; which is now superintended by a superior council, at the head of which is the Minister of the Interior. Public education is entirely free from the supervision and control of the church. Compulsory education was enacted in 1844, but is far from fully enforced. In 1874 there were in P. and its islands 2631 elementary schools, with 2212 male and 509 female teachers, and 113,000 pupils; there are 18 lyceums, and 57 other secondary schools; polytechnic academies at Lisbon and Oporto; and clerical, medical, naval, and military training-schools. The one university at Coimbra, one of the oldest in Europe, has five faculties, 52 professors, and about 1000 students. Lisbon has a learned society (the Academy of Sciences), and a public library of 300,000 volumes.

Law, Government, &c.—The administration of the law is effected by means of 111 courts of justice, 6 of which are located at Lisbon, where also the high court of appeal holds its sittings. The courts are public, and in some cases trial by jury is adopted. Excepting in regard to suits referring to trade, law is still administered in accordance with the Alfonsine code of the 15th c. and the Código Filippino, or code of Philip IV. of Spain.

P. is a constitutional monarchy, the crown being hereditary alike in the female and male lines. The houses of representatives are called *Cortes*, and consist of the *Camaras dos Pares*, and the *Camaras dos Diputados*, the former composed of grandees, chosen for life by the sovereign, and the latter of 149 members, elected by voters. The monarch is assisted by a cabinet of six ministers of state, and a council composed of members chosen for life. He bears the title of King of Portugal and of Algarve 'on both sides of the ocean.' The heir-apparent bears the title of Prince of Beira The winter residence of the king and court is the Palace dos Necessidades at Lisbon, which at other seasons is exchanged for the palaces at Mafra, Queluz, Benfica, and Ramalhão. The nobility is divided into *Titulados* and *Fidalgos*, and these, with the upper officials, higher clergy, &c., constitute one-eighth of the

whole population. Very many of the Fidalgos having been reduced to the condition of paupers, subsisting on charity, a law was passed in 1844, partly abolishing hereditary aristocracy, it being made dependent on the possession of an annual income of £500, together with an academical degree. The members of the second chamber are chosen directly by all citizens having an income of £22. The deputies must have at least £89 per annum; but graduates of any of the learned professions need no property qualification. Lisbon (q. v.), the capital, is the center of the small amount of literary, artistic, and manufacturing activity in P. Besides Oporto (q. v.) and the capital, there is no city whose population exceeds 20,000, and only 11 which have more than 10,000 inhabitants.

Race.—The Portuguese are a mixed race. In Algarve and Alemtejo, the Arabic element is still very perceptible, and the people of those provinces have dark-brown skins, and tall, slim, but lithe and active figures; while the natives of the more northern districts, with lighter skins, have less regular features, small eyes, and short, thick-set figures. Although the Portuguese may very probably be regarded as the remains of the original population of the peninsula, they differ essentially from their Spanish brethren, whom they now regard with inveterate hatred and jealousy on account of their attempts a few centuries ago to annihilate the independence of Portugal. They indulge in interminable verbosity, ceremonious flattery, and servile politeness, and they are inclined to extravagance and display. They are, however, intensely patriotic, brave, persevering, enterprising, hospitable, cheerful, and ready to oblige. As a people, they are dirty and slovenly; few persons among them possess any great degree of mental culture, and the lower orders are even unable to read or write, and hence the grossest superstition and bigotry prevail in every class of the population.

History of Portugal.—The earliest notice which we have of the western portions of the Spanish peninsula, is derived from the Romans, who followed the Carthaginians as conquerors of the territories of the ancient Iberians and western Celts. Under Augustus, the peninsula was divided into three provinces, governed by prætors, of which the western province of Lusitania comprised the greater part of the present kingdom of P., besides portions of Leon and Spanish Estremadura. When the Romans withdrew from the peninsula, which was rapidly overrun by Visigoths from the north, and at a later period by Saracens from the south, Lusitania was overwhelmed in one common ruin with Iberia or ancient Spain. About the middle of the 11th c., it fell under the sway of Ferdinand I. of Castile.

In 1095, Henry of Burgundy, who had married a natural daughter of Alfonso VI., king of Castile, the successor of Ferdinand, received from that monarch the government of Portugal from the Minho to the Tagus, as a dependent fief. It is maintained, however, by Portuguese authorities, that even from this time the country was independent. His son, Alfonso I., gained signal advantages over the Arabs, and, by his gallantry and prudence, secured the affections of the people. After the great victory which he gained over the Moslems, in the plain of Ourique, in Alemtejo, in 1139, his soldiers proclaimed him king. His successes on this occasion inflicted a serious check on the advance of the Infidels, and in recompense for the services which he had thus conferred on Christendom, the pope confirmed his title, which had been unanimously ratified by the Cortes of Lamego. The Burgundian House, which continued in possession of the throne for 400 years, gave to P. some of its noblest and best kings. The immediate successors of Alfonso I. were engaged in many severe struggles with the clergy and nobles, who were always ready to combine against the sovereign; but although often baffled in their attempts to uphold the independence of the crown, the dignity of the kingdom was, on the whole, well maintained by the representatives of this family, who are, moreover, distinguished as the promoters and upholders of the maritime glory of Portugal. Dinis (Dionysius), who succeeded Alfonso III. in 1279, must be regarded as the founder of Portuguese commerce and mercantile enterprise. This king, moreover, encouraged the industrial arts, and protected learning, in furtherance of which he founded, in 1284, a university at Lisbon, which was transferred, in 1308, to Coimbra. Dinis was succeeded in 1325 by his son, Alfonso, surnamed the Brave, whose reign was almost wholly occupied in wars with the Castilians and the Moslems. With Alfonso's grandson, Ferdinand I., the legitimate branch of the Burgundian House became extinct in 1383.

After some disturbances, his illegitimate brother, Joam (John), was recognized by the Cortes as king in 1385. His reign was eventful, not merely on account of the internal reforms which he introduced into the state, and of his steady maintenance of the prerogatives of the crown, but chiefly as being associated with the commencement of those vast and important geographical discoveries and commercial enterprises, to which P. owed the position she occupied during that and the succeeding age as the greatest maritime power of Europe. To Joam's son, Enrique (Henry) the Navigator, is due the merit of having organized various voyages of discovery, and inaugurated a regular system of colonization, which, during the reign of Joam II. (who ascended the throne in 1481), culminated in the successive acquisition by P. of the Azores, Madeira, Cape de Verde, and other islands; in the doubling of the Cape of Good Hope under Bartholomeo Diaz; and, as the result of the latter, in the successful achievement of the passage by sea to India, which was effected, in 1497, under the command of Vasco de Gama, in the reign of Joam's successor, Manoel. The discovery of Brazil, and the settlements made there and on the western coast of India, increased the maritime power and fame of P., which were further extended under Manoel's son, Joam III., who ascended the throne in 1521. At this period, P. ranked as one of the most powerful monarchies in Europe, and Lisbon as one of its most important commercial cities. Sudden as this course of prosperity had been, its decline was almost more abrupt, and may in a great measure be referred to the influence of the priests, for the introduction into P. of the Inquisition in 1536, led to the expulsion of the numerous wealthy and industrious Jews, on whose able financial management the commercial interests of the Portuguese were largely dependent, and gave rise to an amount of social tyranny and oppression, both in the colonies and at home, which, coupled with a bad system of government, depressed the energy and crippled the resources of the nation.

The influence of the Jesuits under the minority of Joam's grandson, Sebastian, and their evil counsels in urging the young king to enter upon a fatal expedition to Africa against the Infidels, led to still further miseries. The defeat of the Portuguese, and the capture and death of their young king at the battle of Alcazar in 1578, and the extinction of the old Burgundian line in 1580, after the brief reign of Sebastian's uncle, Enrique, plunged the country into difficulties and misfortunes of every kind, which lost none of their weight, although they changed in character. After a struggle for the throne between many eager candidates, none of whom found favor with the nation at large, who persisted in cherishing the delusive hope that Sebastian was still alive, and would return from the hands of his Infidel captors, Philip II. of Spain succeeded in securing to himself the crown of P., and annexing the Portuguese kingdom to the Spanish monarchy. This event proved disastrous in the extreme to P., for, besides bringing the country to the brink of ruin, by mal-administration and misappropriation of its resources, it involved it in all the ruinous wars of Spain in the Low Countries and in Germany, a great part of the expenses of which it was made to bear; while the Dutch, in retaliation for Spanish aggressions at home, attacked the Portuguese settlements in Brazil, and almost completely deprived them of their possessions in the Indian Archipelago. The insolence of Philip IV.'s minister, Olivarez, brought matters to a crisis; and in 1640, after a forced union of 160 years, P. was freed, by a bold and successful conspiracy of the nobles, from all connection with Spain, and the Duke de Braganza, a descendant of the old royal family, placed on the throne, under the title of Joam IV. The war with Spain, which was the natural result of this act, terminated in 1668, when, by the treaty of Lisbon, the independence of P. was formally recognized by the Spanish government.

For the next hundred years, P. vegetated in a state of inglorious apathy. Her ancient glory had departed never to return, the nation was steeped in ignorance and bigotry, and from having been one of the greatest maritime powers of Europe, the Portuguese were content with becoming a commercial dependent, rather than ally, of Great Britain. Under the reign of Joseph I., who died in 1777, the genius and resolution of the minister, Pombal (q. v.), infused temporary vigor into the administration, and checked for a time the downward tendency of the national credit. Pombal's efforts to rouse the people from their sloth, and infuse vigor into the government, were frustrated by the accession of Joseph's daughter, Maria, who, with her uncle-husband, Pedro III., allowed things to fall back into their old channels. The mental alienation of Maria led, in 1789, to the nomination of a regency under her eldest son, Joam. This prince, who showed considerable capacity in early life, finding that he could not maintain even a shadow of independence on the outbreak of the war between Spain and France, threw himself wholly on the protection of England; and finally, when he learned that Napoleon had determined on the destruction of his dynasty, left P. in 1807, accompanied by all his family, and transferred the seat of his government to Rio Janeiro, the capital of Brazil. This act was immediately followed, on the part of the French, by the occupation and annexation of P.—a measure which gave rise to the Peninsular War. The victory of Vimeira, gained by the combined English and Portuguese army in 1808, freed the land from its French assailants; and in 1810, on the death of Queen Maria, the regent succeeded to the joint crowns of P. and Brazil. The continued residence of the new king, Joam VI., at Rio Janeiro, gave occasion to abuses and discontent, which resulted, in 1820, in the

outbreak of a revolution at Lisbon, and the proclamation of a constitutional form of government in the place of the pre-existing absolutism.

After a period of great national excitement and political disturbance, the differences between the sovereign and people were so far adjusted, that Joam agreed to and signed the constitution of P., and ratified the independence of Brazil, which was to be governed by his son, Dom Pedro, while he himself retained only the title of emperor. On the death of Joam in 1826, Pedro IV., after organizing the government of P. on the model of the French charter, renounced the Portuguese crown in favor of his daughter, Doña Maria da Gloria, on condition of her marriage with her uncle, Dom Miguel. The latter, who, during the lifetime of Joam, had availed himself of every opportunity to thwart the more liberal policy of his father and brother, waited only for the embarkation of the English troops to break the oath which he had taken to maintain the constitution, and gathering round him all who were in favor of restoring the old order of things in P., he was through their aid declared king by the Cortes, which met in June 1828. A period of indescribable confusion, misrule, and anarchy followed. The nobles, monks, and rabble ruled the land; 13,000 Portuguese citizens went into exile, while double that number of persons, suspected of favoring the Constitutional party, were kept in confinement.—At length, in 1832, Dom Pedro was enabled, chiefly by means of a loan from Englishmen, to raise a fleet, and make a landing at Oporto. Admiral Napier, in the meanwhile, operated on the coast of Algarve successfully in favor of the young queen, whose cause, by these victories, and the support of an alliance with the great powers, finally proved victorious. Doña Maria made her entry into Lisbon in 1833; and in the following year Dom Miguel signed the Convention of Evora by which he renounced all pretensions to the throne, and agreed to quit Portugal. The death of Dom Pedro in the same year, after he had effected several important reforms, proved a heavy misfortune to P., which suffered severely from the mercenary rule of those who occupied places of trust about the person of the young queen. Her marriage, in 1835, with Ausgustus, Duke of Leuchtenberg, his death at the end of a few months, and her second marriage, in 1836, with Prince Ferdinand of Saxe-Coburg, were followed by grave political disturbances, which in course of time were aggravated by the personal avarice and want of good faith of those in whom the young queen placed her confidence.

A branch of the democrats, known as the Septembrists, from the month in which they made their first decisive stand against the government, loudly demanded the abrogation of the charter promulgated by Dom Pedro (and known as the *Carta de ley de* 1826), and the restoration of the constitution of 1820. This contest of the charters may be said to have continued through the entire reign of Doña Maria. The government was alternately in the hands of Septembrists and Chartists, towards both of whom the queen acted with a degree of duplicity that frustrated every effort at an adjustment of the national disorders. Insurrections and counter-insurrections were of frequent occurrence, the troops were not to be depended on in moments of emergency; guerrilla bands scoured the country at will, and openly defied the queen's authority. The Absolutists, or Miguelites, took advantage of the general disorder to produce a reaction in favor of the old church party. The financial embarrassments were complicated in the extreme; while the obstinacy of the nation in regard to the maintenance of the slave-trade, in defiance of treaties and pledges, brought them into temporary collision with Great Britain, the only ally on whom Doña Maria could rely. An armed intervention of the great powers in 1847 produced a partial abatement of the national disorders; and matters might have permanently improved, had not the queen's partiality for her unpopular ministers, Count Thomar and his brother Cabral, and her determination to leave the administration of affairs in their hands, exasperated the general discontent and distrust of the court, and led to the insurrection, which, without bloodshed, made the national idol, the Marquis de Saldanha, *de facto* military dictator of Portugal, and evoked a general expression of the popular wish for the queen's abdication. Saldanha's ministry, although begun under good auspices, soon manifested the same readiness to succumb to the views of the court which had characterized former ministries.

One Cortes was dissolved after another, and finally, in 1852, the government declared itself prepared to carry out necessary reforms without the concurrence of the Cortes, and to demand at a future period a bill of indemnity for its acts. At this crisis, the queen died suddenly, and her eldest son ascended the throne in 1853, as Pedro V., under the regency of the king-consort his father. The latter used his power discreetly; and by his judicious management, the financial disorders were partially adjusted. Upon the sudden death in 1861 of Pedro, his brother was proclaimed king as Luis I. He has steadily adhered to constitutional principles, and aims at the internal improvement of the country; and in spite of frequent ministerial crises, and continual financial difficulties, the resources of the country are developing. When the insurrection of General Prim broke out in Spain, the Portuguese chambers declared unanimously against any proposals for an 'Iberian Union.'

PORTUGUESE LANGUAGE AND LITERATURE. The Portuguese, like every other branch of the Romance family of languages, has grown out of a local form of the *Lingua Romana Rustica*, which in course of time had ingrafted upon it many elements of Arabic from the Saracen invaders of the country, and numerous verbal and idiomatic characteristics of the Frankish and Celtic dialects, which were introduced with the Burgundian founders of the Portuguese monarchy. The earlier forms of Portuguese bore close affinity with the Galician, and although, in course of time, it presented strong resemblance to its sister language, the Castilian, in as far as both possessed numerous words of identical origin, it differed so widely from the latter in regard to grammatical structure, as almost to merit the designation of an original tongue. The antipathy existing between the Portuguese and Spaniards, and the consequent strenuous efforts of their best writers to keep their language distinct, and to resist the introduction of further Castilian elements, had the effect of making Portuguese still more dissimilar from the sister tongues of the peninsula, and the result is the production of a language differing from pure Spanish in having an excess of nasal sounds, and fewer gutturals, with a softening or lisping of the consonants, and a deepening of the vowels, which renders it the softest, but least harmonious, and the feeblest of all the Romance tongues.

The earliest specimens of genuine Portuguese belong to the beginning of the 13th c., and consist for the most part of collections or books of songs (*Cancioneiros*), which, both in regard to form and rhythm, resembled the troubadour or *minne* songs of the same period. Of these, the oldest is the *Cancioneiro dél Rei Dom Diniz*, or Book of Songs, by King Diniz, who had long been regarded by the Portuguese as their earliest poet, but whose poems were supposed to be lost, till they were discovered, about forty years since, in MS. in the library of the Vatican, and published at Paris and Lisbon in 1847. In the 14th and 15th centuries, the court continued to be the center of poetry and art, as it had been under Diniz; but Castilian was in greater vogue than Portuguese, which was despised by the numerous royal poets, who emulated the example of Diniz, and composed love-songs and moral or didactic poems. Under the culture of these noble bards, the poetry of Portugal remained weak and effeminate, without acquiring even the tenderness and pathos which characterized the Spanish romances of that age. The poetry and literature of Portugal acquired new vigor with the growth of her maritime and commercial glory, and the *Cancioneiro Geral* (Lisb. 1516) of the poet Garcia de Resende, which gives a general summary and extracts of all the Portuguese poets of the latter half of the 15th, and beginning of the 16th c., affords evidence of this improvement, which is most strongly exemplified in the sentimental pastorals or romances, and the national eclogues of Bernardino Ribeiro and Sá de Miranda, whose eclogues and prose dramatic imitations of Plautus and Terence, mark the transition period between the medieval lyrical and the later classical style.

These first attempts at the drama were followed by Antonio Ferreira, whose *Ines de Castro* is the oldest Portuguese tragedy. But the classical school, whose chief cultivators were the courtiers of Lisbon and the professors of Coimbra, found little favor among the people at large, for the discoveries and conquests of the nation in Asia, Africa, and America, excited an enthusiasm and self-consciousness in the people, which led them to crave for something more practical and natural than the stilted style of the classicists. At this crisis, when P. was at the zenith of her material prosperity, appeared her greatest poet, Camoens, who in his immortal epic, *Os Lusiadas*, which appeared in 1572, struck out a new path in the domain of epic poetry; while his numerous sonnets, 300 in number, his *Cançoes* or songs, his *Redondillas*, dramas, and other poetic productions, exhibit a versatility of genius and graceful tenderness which place him in the foremost rank of European poets.

With Camoens and his contemporary, Gil Vicente, the language and poetry of P. reached the culminating point of their development. During the dominion of Spain, the Portuguese so far lost all feeling of national independence and patriotism, that they at length renounced their native tongue, and adopted the language of their foreign rulers. With the restoration of political independence, under the sway of the Portuguese House of Braganza, a reaction took place; but the 17th and 18th centuries produced few Portuguese writers who attained more than an ephemeral and purely local reputation—bombast, or slavish imitation of Spanish and Italian writers, being the predominant characteristics of the Portuguese school of light literature. Some good historical writers belong, however, to this period, as Jacinto Freire de Andrade, whose life of Joao de Castro, Viceroy of India, still holds its place as the most perfect monument of classical prose; the great Indian missionary, the Jesuit Father Antonio Vierra,

who died 1699, and whose sermons and letters—of which a collection was published at Lisbon in 1748, and at Paris in 1838—are regarded by his countrymen as models of style and diction; F. X. da Menseses, the author of *O Portugal Restaurado* (1741), &c.

In the beginning of the present century, Portuguese poetry was partially redeemed from its previous low grade by two men, who, although they professed to observe a strictly classical style, possessed a delicacy of taste, and a genial creative power, which saved them from falling into the absurdities that had generally characterized the school in Portugal. The elder of these, F. M. do Nascimento, who died in exile at Paris in 1819, although specially noted as an elegant lyrist, deserves notice for his gracefully written miscellaneous papers; while Manoel de Bocage, his less cultivated rival and contemporary, must undoubtedly be regarded as the most original and truly national of the modern poets of Portugal. His sonnets rank as the finest in the language, and these, with his numerous idylls, epigrams, and occasional poems, composed in various styles and modes of versification, have had a host of imitators, among the best of whom are the dramatist J. B. Gomes, J. M. da Costa e Silva; the satirist, T. da Almeida; and the Brazilian, Antonio Caldas, distinguished for his sacred epics, and various imitations of Milton and Klopstock. The best of the recent Portuguese poets are M. de Albuquerque, A. de Castilho, and A. de Carvalho, and J. B. d'Almeida Garrett. The last-named, whose collected poetic and prose works appeared at Lisbon in 1840, was at once the most versatile and popular writer of his time in Portugal. In the departments of travels, geography, and history, P. has produced good writers from the earliest periods of its literary history; and in recent times, the works of B. Machado, J. Ferreira, and A. de Cajo, have well maintained the national reputation.—Portuguese literature is also cultivated in Brazil, and, of late years, with more success than in the parent country. The principal names in Brazilian poetry are, Gonçalves Diaz, Macedo Abreo, and Magalhaens; in history, Varnhagen, author of the *Historia general de Brazil* (1854), and P. da Silva, author of the *Brazilian Plutarch;* besides some divines, philosophers, and translators from the classics.

PORTULA'CEÆ, or PORTULACACEÆ, a natural order of exogenous plants, nearly allied to *Caryophyllaceæ*, from which it differs chiefly in the generally perigynous stamens, the calyx consisting of two sepals which are united at the base, and the capsule frequently opening transversely. The species are not very numerous; they are much diffused over the world, and are shrubby or herbaceous, generally succulent, mostly growing in dry places. The flowers are often large and beautiful, but ephemeral. The foliage is bland and insipid. Some species are used as salads and pot-herbs, of which the best known is Purslane (q. v.). The tuberous roots of *Claytonia tuberosa*, a Siberian plant, are used for food, as are those of the Melloco (*Melloca tuberosa* or *Ullucus tuberosus*), a Peruvian plant sometimes referred to this order. The genus *Calendrinia* furnishes some beautiful annuals.

POSCHAREVATZ. See PASSAROWITZ.

POSEI'DON. See NEPTUNE.

PO'SEN, a province of Prussia, bounded N. by Pomerania and East Prussia, E. by Poland, S. by Silesia, and W. by Brandenburg and Pomerania. Area, 11,150 square miles. Pop. at the close of 1880, 1,703,397. It is divided into the two governmental districts of Posen and Bromberg; and the principal towns are Posen, Bromberg, Lissa, Rawitsch, and Gnesen. The principal river is the Wartha, which traverses P. from east to west, and is navigable throughout the greater part of its course, as is also the smaller Netze. The country is almost everywhere level, and its surface extensively covered with bogs, ponds, and small lakes. The soil is on the whole fruitful, and the numerous swamps and forests which covered the land during its annexation to Poland, have of late years been converted into rich meadow and good arable land, where cattle of superior quality are raised, and good crops of wheat, barley, oats, and flax are procured. The forests are extensive and productive, and contribute largely to the exports of the province, of which, however, the most important articles are corn, wool, tallow, hides, wax, and honey. With the exception of coal, which is obtained from beds near the town of Wronki, P. has no mineral products. Good broad-cloth, linens, and lace are manufactured in many of the small country-towns.

Since the annexation of P. to Prussia, much has been done to supply the previous deficiency in regard to popular instruction; and there are now nine gymnasia, several normal and training schools, a seminary for priests, and upwards of 2000 burgher and national schools. The greater part of the population belongs to the Roman Catholic Church, which is under the spiritual jurisdiction of the Archbishop of P. and Gnesen, while 74,000 of the remainder are Jews. The inhabitants may still be said to be Poles, more than 800,000 persons employing Polish as their mother-tongue. P. formed an integral part of Poland till 1772, when, at the first partition of the Polish territory, the districts north of the Netze were given to Prussia. At the second and third partitions, which were made 20 years later, the remainder was incorporated in the Prussian kingdom under the name of South Prussia. In 1807, P. was included in the duchy of Warsaw; but by the act of the Congress of Vienna, it was separated in 1815 from Poland, and re-assigned to Prussia under the title of the Grand Duchy of Posen. In 1848, the Poles, who had never amalgamated with their new German compatriots, took advantage of the general political excitement of that period to organize an open rebellion, which gave the Prussian government considerable trouble, and was not put down till much blood had been spilled on both sides. On the cessation of disturbances, the German citizens of the province demanded the incorporation of P. with these Prussian states which were members of the German Confederation, and the Berlin Chambers gave their approval of the proposed measure in 1850; but on the subsidence of revolutionary sentiment in Germany, the subject was dropped.

POSEN (Polish *Poznan*), the chief town of the province of Posen, and a Prussian fortress of the first rank, is situated on the low and sandy banks of the Wartha, nearly 150 miles east of Berlin. Pop. (1871) 56,374; (1880) 65,713—of whom not quite the half are Protestants and towards 10,000 are Jews. P., which ranks as one of the most ancient cities of Poland, became the seat of a Christian bishop in the 10th c. Till 1296 it was the seat of the Polish dukes; and it was a member of the Hanseatic League during the middle ages, when it was an important trading mart between Western Europe and the Slavonic lands bordering on Asia. At this time many German, English, and Scottish traders settled in P., which latterly fell into decay. It passed into the possession of Prussia in 1815. At the great fire of 1803, when many of the older parts of the town were destroyed, P. lost the most striking features of its semi-oriental style of architecture; but it still retains a certain picturesque character, from the number of its church towers and lofty houses. Among its 15 principal churches, the most noteworthy are the cathedral, a recently restored and elaborately ornamented building, and St. Stanislaus, a splendid specimen of Italian architecture. P., which has been strongly fortified since 1828, is encircled by six suburbs. It is the see of an archbishop, the seat of the provincial government, and has a fine town-hall, two gymnasia, a public library with 20,000 volumes, training-schools for teachers of both sexes, a school for midwives, a theater, &c. Recent restorations and improvements have rendered it one of the pleasantest-looking towns in Prussia, and it can now boast of many fine regularly built streets and squares, in which are situated the winter residences of many of the provincial Polish nobles. A considerable trade in wood, corn, wool, broad-cloth, and linen, is carried on here, principally by the Jews, and the annual fairs held in summer attract large crowds from all parts of the province. The chief manufactures of P. are cloth, leather, carriages, copper vats and other vessels used in distilling, and tobacco; while there are likewise several breweries, distilleries, and sugar-refineries.

POSES PLASTIQUES (Fr. 'statuesque attitudes'), equivalent to Tableaux Vivants (q. v.).

POSILI'PO, a mountain on the north-west of Naples, close by the city, remarkable for the tunnel known as the Grotta di Posilipo, through which the road from Naples to Pozzuoli (anc. *Puteoli*) passes. The grotto is in some places 70 feet high, and 21 feet wide, and is 2244 feet long. It is very ancient. Seneca mentions it as the *Crypta Neapolitana*. Strabo assigns its construction to M. Cocceius Nerva, superintendent of aqueducts in the time of the Emperor Tiberius. Above the eastern archway of the grotto is the so-called 'Tomb of Virgil.' At the base of the hill of P. anciently stood the poet's villa, in which he composed the *Eclogues* and *Georgics*, if not also the *Æneid*. During the middle ages, the common people firmly believed the grotto to be the work of the poet, whom they regarded as a great magician.

PO'SITIVE PHILO'SOPHY. See COMTE.

POSITIVISM, the System of Thought and Life founded by Auguste Comte (q. v.) is defined by him as consisting essentially of a 'philosophy and a polity which can never be dissevered; the former being the basis, and the latter the end, of one comprehensive system, in which our intellectual faculties and our social sympathies are brought into close correlation with each other.' He chose the word *Positive* on the ground of its indicating the *reality* and *constructive tendency* which he claimed for the doctrine in its theoretical aspect, while he anticipated that in the future the term would acquire a wider meaning by suggesting also similar ideas in the sphere of feeling and action. The two primary characters of P., the philosophy and the polity, were finally welded into a whole under the conception of a religion, which has for its creed the new synthesis established by the one, and for its practice the scheme of moral and social reorganization proposed by the other. We may best consider P. under these three aspects.

Positive Philosophy.—Comte's primary aim was to put an end

to the intellectual and social anarchy which had resulted from the destructive criticism and the revolutionary upheaval of the eighteenth century, by supplying an interpretation of phenomena which should organize our knowledge of the world, of man, of society, into a consistent whole. Such a universal synthesis must the new philosophy provide, to form a sure basis for a new art of life.

Historical analysis revealed to Comte, as a law of mental growth, the progress of all human conceptions through three distinct phases. The primitive stage he called the *theological;* the transition stage, the *metaphysical;* and the final stage, the *positive.* The meanings which he attaches to these words are most concisely explained by Stuart Mill's translation of them into volitional, abstractional, experiential (see COMTE). The transition was effected by the gradual acceptance of the scientific method of induction from observation of phenomena as the only sound basis of explanation, all inquiry into causes other than phenomenal being finally given up as fruitless. Science, therefore, is the instrument capable of effecting the desired unity; and the problem of the positive philosophy is a three-fold one: (1) To bring all knowledge within the sphere of scientific investigation; (2) To extend scientific methods through the whole territory of each division; (3) To co-ordinate the results obtained from the separate sciences, so as to approach an expression of all our knowledge in terms of a single doctrine. All three parts of this problem Comte considered to be in a large degree solved by his *Classification of the Sciences.*

He observed that the several classes of conceptions advanced from the theological to the positive stage with different degrees of facility, and on inquiring into the law of progression, he found that the order of emancipation of the various sciences was determined by the degree of complexity and the consequent relations of dependence. A preliminary distinction was made between the abstract and the concrete sciences, the former treating separately of the general laws manifested by all the phenomena of any class, and the latter depending on these and treating of definite objects under the several aspects in which they may be viewed. The concrete sciences, Comte considered, did not yet admit of co-ordination, and he confined his classification to the abstract sciences, which he placed in the following series: 1. Mathematics; 2. Astronomy; 3. Physics; 4. Chemistry; 5. Biology; each of these drawing its data from the preceding science, and adding a new order of conceptions peculiar to itself. This series he found coincident with the sphere of knowledge then supposed to admit of scientific treatment. But there remained the phenomena of human character and society, forming a wide field of inquiry to which positive methods had never yet been applied. Certain tentative efforts had indeed been made to construct a so-called science of history—notably by Condorcet and St. Simon—but no one before Comte had formulated the principles on which such a task might be accomplished. By his discovery of the methods proper to a rational study of social phenomena, his dicta—that owing to the complexity of the conditions involved, the laws of such phenomena cannot be determined *a priori,* but must be inductively observed, and afterwards verified and co-ordinated by deductive application of the general laws of life; that the statical condition of each historical period must be viewed in its totality, as determined by the interaction of the various classes of social factors; that intellectual evolution affords the true measure of social progress; by his enunciation of these and other doctrines, Sociology was created and established in the hierarchy as the last and crowning science of the series.

The whole realm of fact was now included in the domain of positive inquiry, and Comte next addressed himself to the task of rationalizing the separate departments of knowledge. In the earlier portion of this task, his mathematical aptitude insured him a large measure of success; while in biology he paved the way for further developments by his organization of the materials then available. His main services, however, in scientific co-ordination were in the department of sociology. Besides the formal constitution which he gave to the new science, his chief substantive contribution was his enunciation of the fundamental law of intellectual development, already referred to as the cardinal doctrine of the positive philosophy. The progress of thought, moreover, from theological to positive conceptions, was shown to be coincident with a progression in social action from an aggressive militarism, through a period of defensive attitude to the final régime of industrialism. The two series of transitions are mutually dependent, our increasing knowledge of the conditions of our existence, and our systematic efforts to modify them, naturally reacting on each other.

The main problem of the positive philosophy, the unification of knowledge, was not yet ripe for its final solution in the days of Comte, but his classification of the sciences is regarded by his followers as affording an admirable framework for the theory of evolution advanced at a later date with the claim of supplying this want. Comte was fain to be content with the demonstration of a subjective unity in the subservience of all the sciences to the needs of man.

Positive Polity.—On the basis of the philosophy he had thus established, Comte founded a scheme of individual and social conduct. The ethical portion he did not live to complete, but in his elaborate exposition of the art of social politics we have ample insight into his views on what he considered an integral part of his system. We have space here only for a bare outline.

The most complete life must be that which rests on the fullest knowledge. We naturally strive to improve those conditions of our existence which we can affect, in the direction indicated by the clearer light of a new synthesis. What, then, are the evils or imperfections of our lot which may be remedied by applying positive philosophy to life? Cosmical laws are wholly beyond our direct influence, and we can only to a limited extent affect the conditions of their action. But in the science of man we ourselves are the factors, and our efforts to modify our environment form the subjective aspect of what is, objectively considered, a law of social development.

Comte believed the first requisite of systematic action to be the recognition of a central intellectual and moral authority dissociated from practical politics, which he proposed to secure by organizing a *Spiritual Power,* consisting of philosophers, supported by the state. This class, exerting a purely *moral* control, yet supreme in all affairs of private and social life in virtue of its natural prestige, would have only an indirect influence on political action. The temporal power should be in the hands of capitalists, the captains of industry—chosen by their own order and naming their successors—who would feel a moral responsibility to the spiritual power, especially when the authority of the thinkers should be strengthened by the support of women and of the working classes, whose ready adherence to positive principles Comte firmly anticipated. Besides the corrective influence of each of these powers on the other, an efficient check on despotic control on the part of either is provided in the perfect freedom of opinion and expression allowed—a freedom the more valuable that it would rest on a system of scientific and moral education, which it would be one of the chief functions of the spiritual power to direct and enforce.

With the decline of militarism and the growth of industrialism, Comte foresaw that political action would in the future be mainly directed on the organization of labor for the benefit of society at large. No idleness would be permitted; all would be workers. The distinction between the capitalists and the workmen, the rich and the relatively poor, would remain; but the former would be taught to hold their wealth and power as in trust from society to be used for the benefit of all, while the latter would also come to regard themselves as performing public functions, serving society each in his place. These views are substantially similar to such more recent economic teaching as that of Carlyle and Ruskin in our own country.

In the sphere of morals, the main office of the spiritual power would be to strengthen the social tendencies of man at the expense of the personal, a process made possible by the development of the affections originally called forth in family life. In the sphere of intellect, it should regulate and concentrate the labors of its members, putting an end to the present 'dispersive specialty' of scientific aims, and determining the direction of all intellectual efforts by reference to social needs. In pursuance of the constructive principles of P., Comte applies these general doctrines to the immediate future, by propounding a scheme of concerted action for a great Western Republic, embracing the French, English, German, Italian, and Spanish nations—an organization imperfectly effected by the influence of Feudalism and Christianity.

Positivist Religion.—Such are the creed and the practice of P. But a religion is more than creed and practice; there must be a sentiment, an appeal to the heart, a satisfaction of the feelings. The conception of an object of love and reverence proposed by Comte to succeed the idea of a Deity (whose existence he considered it impossible either to affirm or deny), is that of *Humanity,* regarded as a collective unity, a *great being,* consisting of all the men and women past, present, and to come, whose lives have been, or shall be devoted to the well-being and progress of the race. This being, partly ideal yet wholly real, capable of being definitely conceived, and not beyond the reach of our services, would gather round it all our affections for our fellow-men; gratitude and reverence for those whose struggles and achievements in the past have made us what we are; love and sympathy for all around us who are striving after better things; hope and effort for the more perfect life of those yet unborn. Comte looked on the religion of humanity as fulfilling all the highest aims sought by the religions of the past, and especially as succeeding naturally to Christianity, the historical value of which he thoroughly appreciated as a transitional phase of religious development. The worship of humanity was to consist in prayer, taking the form of high resolve strengthened by effort after ideal communion with

the noble spirits among the dead; and in public commemorations, for the observance of which a calendar was suggested, associating each day of the year with some great name in the roll of mankind, and arranged so as to illustrate the course of human progress. The spritual power would carry on the traditions of the priesthoods of former religions, preaching self-abnegation as the rule of life bringing the highest happiness, and offering no reward, save a place in the 'choir invisible' of the great and good, whose names are cherished in the hearts of those who follow them, and whose influence will live to the end of time.

P. is of too recent origin to be adequately treated except in an account of its genesis, and the above outline of the system has therefore been entirely confined to the works of its founder. In his lifetime, Comte attached to himself a body of disciples more remarkable for intellectual eminence than for numbers. The most prominent of these was the late M. Littré (q. v.), who afterwards edited his master's works, and established a review with the title of *La Philosophie Positive*. His discipleship, however, did not extend to the later developments of the system. Near the end of his life, Comte founded the Positivist Society, the present director of which is M. Pierre Laffitte. The organization has its headquarters in Paris, but it has extended to most other countries, and the number of adherents increases slowly but steadily. The *Revue Occidentale*, their organ in the press, is published quarterly in Paris. Among the best known of the English Positivists are Dr. Congreve, Mr. Frederic Harrison, Dr. Bridges, and Professor Beesly.

Among sympathetic critics of P. are many thinkers of eminence imbued with the positive spirit, and more or less indebted to the genius of Comte. Stuart Mill, in his work on *Auguste Comte and Positivism*, though taking an independent standpoint, speaks in terms of high appreciation not only of the leading doctrines of the positive philosophy, but also of the conception of humanity as a *Grand Etre*, which is the keystone of the new religion. Many of the details of ritual and worship, however, were repugnant to him, as they have proved to many; and while exaggerating the importance of these, he makes an arbitrary separation between the earlier and the later portions of Comte's career. His book should be read along with Dr. Bridges' reply, entitled *The Unity of Comte's Life and Doctrines*. Mr. Herbert Spencer, though undoubtedly owing much to Comte, has been more careful to vindicate his independence than to acknowledge his obligation. His references to his great predecessor mostly concern their disagreements.

In two essays, one on *The Genesis of Science*, and the other on *The Classification of the Sciences*, he opposes Comte's views on these subjects—not to the satisfaction of other competent critics—and he has even thought it necessary to publish an article entitled *Reasons for dissenting from the Philosophy of M. Comte*. Mr. Spencer's exposition of the theory of evolution is regarded by Positivists as a valuable contribution to that scientific philosophy, the inauguration of which they claim for their master. G. H. Lewes, in the chapter on Comte in his *History of Philosophy*, calls him the greatest thinker of modern times, and declares himself an ardent adherent of the positive philosophy. For the religious aspects of P., however, Lewes's feeling is one of partial sympathy only. In 'George Eliot's' works, the influence of Comte's doctrines is evident, and she has devoted one of her poems to the interpretation of the positivist conception of immortality.

Among critics, wholly antagonistic to P. are naturally to be found the theologians and so-called metaphysicians, i. e., all whose explanations of phenomena either assume the action of supernatural beings, or are expressed in terms of abstractions such as *vital principle*, *inherent tendency*, *nature*. Such thinkers, generally profess little knowledge of scientific fact; but with these may be included many scientific specialists whose contracted view of the phenomenal world unfits them for general conceptions, and leaves them open to theological and metaphysical influences beyond the immediate sphere of their own specialty. The opposition of these classes follows from the refusal of P. to recognize the claims of such modes of thought to other than an historical importance.

POSITIVE PRINTING, in Photography. This term is used to designate that process by which impressions from a Negative (q. v.) are produced upon suitably prepared paper. The term, however, does not belong exclusively to positives produced on paper, and intended to be viewed by reflected light, since transparent positives for examination by transmitted light are produced on glass. The means by which this kind of positives is obtained are so exactly similar to the dry negative collodion process, that a detailed notice thereof is hardly necessary in the present article, which will be confined exclusively to the means of obtaining positive proofs on paper.

Regarding, then, the negative, not so much as the picture as the means of producing one, the first thing which presents itself for notice is the paper. This may be either German or French, known in the markets under the respective names of Saxe and Rive. They are used in the simply salted condition, or more generally in the salted and albuminized state, the purpose of the albuminizing being to prevent the chemicals used in the process from sinking into the paper, whereby the delicate details of the negative would become defective on the surface. The process is briefly as follows: Float the paper on the salting bath from one to five minutes; drain for one minute; hang up to dry. Float the paper on the exciting bath from five to ten minutes, according to its strength; drain and hang up to dry. Expose in a pressure-frame under a negative. The necessary depth of impression, being obtained (a point only to be determined by experience), wash the print in common water. Some operators at this stage immerse the print in a bath containing one per cent. of ammonia for two or three minutes. This is by no means absolutely necessary; should it, however, be done, it should be afterwards washed in water for five or ten minutes; after which it is immersed in the toning bath from one to ten minutes, or until the desired *tone* be obtained; it is then washed in several changes of water, preparatory to immersion in the fixing bath. This last operation occupies from fifteen to thirty minutes, according to the strength of the fixing solution, and the depth to which the printing has been carried. The print is then copiously washed in *many* changes of water, and hung up to dry.

The *baths* referred to above are composed as follow: *Salting Bath*, water, 1 ounce; albumen, 4 ounces; good common salt, 48 grains. *Exciting Bath*, nitrate of silver, 240 grains; water, 4 ounces; glacial acetic acid, half a dram. *Toning Bath*, chloride of gold, 4 grains; water, 24 ounces; carbonate soda, 100 grains. *Fixing Bath*, hypo-sulphite of soda, 4 ounces; water, 1 pint.

Printing in carbon, lamp-black, or other impalpable powder, which doubts as to the stability of silver prints had long made a *desideratum*, has recently been brought to a considerable degree of perfection. It is based on the discovery by Mungo Ponton, that a mixture of gelatine and bichromate of potass is rendered insoluble by the action of light, and on the experiments of Poitevin, Fargier, and Blair. There are three typical processes—the *Autotype*, *Woodburytype*, and *Lichtdruck*. The *Autotype* consists in coating a sheet of prepared paper with a mixture of gelatine, bichromate of potass, and carbon, and when dry, exposing it under a negative. On removal from the printing frame, the pigment is moistened with water, and laid, prepared side down, on a support of glass, zinc, or shellac-coated paper, to which a gentle pressure makes it adhere. The paper is then removed, and the print developed by immersion in warm water, which dissolves the unaltered gelatine, but cannot touch the parts rendered insoluble by the light which has passed through the negative. The developed print is again transferred to paper, when the high lights are found to consist of those parts where the gelatine has been completely dissolved, the middle tints of the parts less soluble, and the shadows of the parts quite insoluble.—In the *Woodburytype*, a bichromated gelatine film, but without carbon is prepared, exposed, and developed in a somewhat similar way, but dried without being transferred to paper, the result being a sheet of gelatine with a picture in *relief*. This is laid on a plate of soft metal, and covered with a plate of steel, and the whole subjected to the action of a hydraulic press; by which the soft metal takes the impression of the gelatine film.

In printing from the plate so produced, an ink, consisting of carbon and gelatine, is poured on the center, the paper is laid on the ink, and the pressure of a suitable press applied, whereby the ink is squeezed into the shadows and half tones, and the high lights are left clean, the result being a really fine print. Glass may be used instead of paper, with very fine results.—*Lichtdruck* is a method of printing photographs in an ordinary lithographic press, with printer's ink, from gelatine films prepared on the same principle as the *Woodbury* tissue, except that the soluble gelatine is not washed away. The film is attached to a thick plate of glass fixed in the press and when sponged over, the soluble parts absorb water, and so are prevented from taking on ink, while the insoluble portions remain dry, and the ink adheres to them.

PO'SSÉ COMITA'TUS means the whole force of the county, consisting of knights and men above the age of 15, with constables, who attend the orders of the sheriff to assist in enforcing process or quelling riots. Justices of the peace can also, if apprehensive of an organized resistance, command the services of the posse comitatus, and it is the sheriff's duty to raise the necessary number of men. But practically, in modern times, constables and special constables are all the assistance given or required.

POSSE'SSION OF PROPERTY, in point of law, is the most intimate relation that can subsist between the owner and his property. Strictly speaking, the idea of property consists merely of a certain relation between a human being and a portion of external nature, whereby he appropriates to himself all the ordinary uses of which such external nature is capable. If it is land, he reaps the fruits, and excludes all other persons from interfering with

his operations; if it is a chattel, he keeps it under his exclusive control. Possession, therefore, is nothing but the legal result of the relation of property. Possession, though originally constituting the whole substance of property, has, as civilization advanced, become a separable part of it; and while the radical right is now the ownership, the possession is viewed as an incident of such ownership. It is now not only separable but saleable, and constitutes the foundation of the contract between landlord and tenant, whereby the owner, by way of a lease, sells for a limited period the exclusive use, otherwise called the possession.

So long, therefore, as an owner exists, he has, as a necessary consequence, the right, more or less immediately and directly, to the possession of property. When all record of ownership is lost, then the law permits a resort to first principles, and allows any person who has been in possession for a limited time to retain it, and so ultimately to acquire the ownership. If the possession is suddenly or wrongfully interfered with, the usual remedy, in England, to recover possession of real property, such as land or houses, is an action of ejectment; if the property is a chattel, it is an action of trover or detinue. But the possession may be recovered also by other modes. See also OWNERSHIP and LOST PROPERTY.

PO'SSET, a dietetic preparation, made by curdling milk with some acidulous liquor, such as wine, ale, or vinegar. White wine or sherry is usually preferred, but sometimes old ale is used. The milk is boiled; and whilst it is still on the fire, the acidulous matter is added; if sherry, about a wine-glassful and a half to the pint of new milk is the proportion; or twice the quantity if ale. A teaspoonful of vinegar or of lemon-juice is sometimes used instead; one or two tablespoonfuls of treacle are added, to sweeten. Taken at bedtime, it is used for colds and coughs.

POST-CAPTAIN, an obsolete title applied to captains in the royal navy: it has been disused for many years. See CAPTAIN.

POSTE RESTANTE (Fr., to remain at the post-office till called for), a usual mode of addressing letters to persons who are merely traveling in, or passing through a country in which they have no fixed residence. English travelers on the continent have very generally their letters so addressed to some town through which they expect to pass. The *poste restante* office is open at certain hours, and the letters are given out when called for, production of a card, passport, or other evidence of identity being sometimes required. Letters unclaimed for a certain time are opened, and either destroyed or returned to their writer. There is a *poste restante* office in London, under stringent regulations as to the conditions on which letters are given out. If the applicant for a letter be a British subject, or subject of a state not issuing passports, he must state the place from which he expects letters, and he, or the messenger who applies for him, must be provided with some proof of identity. If he be the subject of a country which issues passports, his passport must be produced.

In the provincial post-offices of Great Britain, commercial travelers, tourists, and persons without a settled residence, may have their letters addressed *poste restante*, and they are kept at the post-office till called for; but residents are not allowed to have their letters so addressed, and the post-office authorities have orders to deliver them. In the British post-office, letters addressed *poste restante* are kept one month, and then returned to the writer through the dead-letter office.

PO'STERN, in Fortification, is a small doorway communicating usually through the flank of a bastion between the fort and the ditch. Its object is to afford unseen egress to troops marched out to relieve sentries on the external works, to make sallies, &c. The postern is often called the 'sally-port.'

POSTING, the forwarding of passengers from place to place by means of relays of horses. The application of the same words —post and postmaster—to the transmission of letters and to the stations where post-horses are kept, is, both on the continent of Europe and in Britain, a source of ambiguity. Posting was long in Britain, as it is yet in most parts of the continent, a government monopoly. A statute of Edward VI. fixed the charges of posting at 1*d.* per mile in 1548. The post-office act of 1656 confirmed the monopoly of furnishing post-horses for travelers in favor of the postmaster and his deputies; for a long time past, however, posting has been in the hands of private individuals. Post-chaises were first used in France, and introduced into England in the early part of last century. The payment is estimated per mile for each pair of horses, without regard to the number of persons conveyed; and a second pair of horses is charged at the same rate as the first.

Over the continent generally, posting is managed by the state, which retains the monopoly of supplying post-horses, and usually of forwarding the mails and diligences. The prices are fixed by government, as well as the number of horses that may be employed, which is regulated by the weight and number of persons conveyed.

POSTIQUE, an ornament in sculpture, marble, &c., applied or added after the work is otherwise finished.

POST-NU'PTIAL CONTRACT means, in Scotch law, an agreement, or, as it is called in England, a settlement, made between husband and wife after the marriage has taken place, with a view to affect the property of the parties, and generally to make provision for the wife and children. As a general rule, a post-nuptial settlement is not so effectual as an ante-nuptial settlement in securing the rights of a wife, because in the former case the marriage is considered a valuable consideration in point of law, and puts it on the footing of a sale. Nevertheless, if the husband is quite solvent, he and his future creditors will be bound by the provisions of a post-nuptial contract. See HUSBAND AND WIFE.

POST-O'BIT is a bond or security given by heirs and others entitled to reversionary interests, whereby, in consideration of a sum of money presently advanced, the debtor binds himself to pay a much larger sum after the death of some person, or of himself. Whenever, as is not unusual, the payment is uncertain, and depends on the obliger outliving somebody else, very high interest is required, or rather a very much larger sum is agreed to be repaid than what is advanced. These are generally usurious bargains; but the obligee or creditor can enforce payment of the full amount; though, if there is a gross case of inadequacy in the proportions amounting to fraud, a court of equity will interfere.

POST-OFFICE, a place for the reception of letters, and the management of the various departments connected with their dispatch and conveyance. The name originated in the posts (from Lat. *positum*, placed, fixed) placed at intervals along the roads of the Roman empire, where couriers were kept in readiness to bear dispatches and intelligence; but the posts of ancient times were never used for the conveyance of private correspondence. The first letter-post seems to have been established in the Hanse Towns in the early part of the 13th century.

A line of letter-posts followed, connecting Austria with Lombardy, in the reign of the Emperor Maximilian, which are said to have been organized by the princes of Thurn and Taxis; and the representatives of the same house established another line of posts from Vienna to Brussels, connecting the most distant parts of the dominions of Charles V. This family continue to the present day to hold certain rights with regard to the German postal system, their posts being entirely distinct from those established by the crown, and sometimes in rivalry to them.

In England, in early times, both public and private letters were sent by messengers, who, in the reign of Henry III., wore the royal livery. They had to provide themselves with horses until the reign of Edward I., when posts were established where horses were to be had for hire. Edward IV., when engaged in war with Scotland, had dispatches conveyed to his camp with great speed by means of a system of relays of horses, which, however, fell into disuse on the restoration of peace. Camden mentions the office of 'Master of the Postes' as existing in 1581, but the duties of that officer were probably connected exclusively with the supply of post-horses. The posts were meant for the conveyance of government dispatches alone, and it was only by degrees that permission was extended to private individuals to make use of them. A foreign post for the conveyance of letters between London and the continent seems to have been established by foreign merchants in the 15th c.; and certain disputes which arose between the Flemings and Italians, regarding the right of appointing a postmaster, and were referred to the privy-council, led to the institution of a 'chief-postmaster,' who should have charge both of the English and the foreign post. Thomas Randolph was the first chief-postmaster of England. The first proper postal communication for private letters in England came into operation 100 years after the institution of the foreign post.

The increased intercourse between the English and Scottish capitals, brought about by King James's accession, led to a great improvement in the system of horse-posts, but their services were still confined to the conveyance of government dispatches. That king, however, instituted a foreign post for letters going abroad from England, and conferred the office of postmaster of England for foreign parts on 'Mathewe de Quester the elder, and Mathewe de Quester the younger.' This appointment was considered by Lord Stanhope, the English chief-postmaster, to interfere with his functions, and a dispute and law-plea between the heads of the two establishments was settled in 1632, after Charles I. had become king, by the retirement of Lord Stanhope, and an assignment of their office by the De Questers, under royal sanction, to William Frizell and Thomas Witherings. In 1635, Witherings was authorized to run a post night and day between London and Edinburgh, 'to go thither and back again in six days.' Eight main postal lines throughout England were at the same time instituted, and the post was allowed to carry inland letters. Two years later, a monopoly of letter-carrying was established, which has been preserved in all the subsequent regulations of the post-office. The rates of postage were 2*d.* for a

single letter for a distance less than 80 miles, 4*d.* up to 140 miles, 6*d.* for any longer distance in England, and 8*d.* to any place in Scotland. An attempt, in 1649, by the Common Council of London to set up a rival post-office for inland letters, was suppressed by the House of Commons. A practice of farming the post-office revenues, which began in 1650, continued, as regards some of the by-posts, till the close of last century.

An important post-office statute was passed under the Protectorate in 1656, and re-enacted by 12 Car. II. c. 35. It ruled that there should be one general post-office and one postmaster-general for England, who was to have the horsing of all through posts and persons riding post. A tariff was established for letters, English, Scotch, Irish, and foreign, and the only non-governmental posts allowed to continue were those of the universities and the Cinque Ports.

In 1685, a penny-post was set up for the conveyance of letters and parcels between different parts of London and its suburbs. It was a private speculation, originating with one Robert Murray, an upholsterer, and assigned by him to Mr. William Docwray. When its success became apparent, it was complained of by the Duke of York, on whom the post-office revenues had been settled, as an encroachment on his rights; a decision of the Court of King's Bench adjudged it to be a part of the royal establishment, and it was thereupon annexed to the crown. In this way began the London district-post, which was improved and made a two-penny-post in 1801, and continued as a separate establishment from the general post down to 1854.

The first legislative enactment for a Scottish post-office was passed in 1695, prior to which time, the posts out of Edinburgh had been very few and irregular. About 1700, the posts between the capitals were so frequently robbed near the borders, that acts were passed both by the parliament of England and that of Scotland, making robbery of the post punishable with death and confiscation. The post-office of Ireland is of later date than that of Scotland. In the time of Charles I., packets between Dublin and Chester, and between Milford-Haven and Waterford, conveyed government dispatches; and after the Restoration, the rate of letter-postage between London and Dublin was fixed at 6*d.*

Act 3 Anne, c. 10, repealed the former post-office statutes, and put the establishment on a fresh basis. A general post-office was instituted in London for the whole British dominions, with chief offices in Edinburgh, Dublin, New York, and other places in the American colonies, and one in the Leeward Islands. The whole was placed under the control of an officer appointed under the Great Seal, called the Postmaster-general, who was empowered to appoint deputies for the chief offices. Rates higher than those formerly charged were settled for places in the British dominions, and also for letters to foreign parts. A survey of post-roads was ordered, for the ascertainment of distances. Letters brought from abroad by private ships were ordered to be handed over to the deputy-postmasters of the ports who were to pay the master a penny for each letter. A complete reconstruction of the cross-post system was effected in 1720, by Ralph Allen, postmaster of Bath, to whom the Lords of the Treasury granted a lease of the cross-posts for life: at his death, they came under the control of the postmaster-general. The rates of postage were further raised by act 1 Geo. III. c. 25, which also gives permission for the establishment of penny-posts in other towns, as in London. The Edinburgh penny-post was instituted in 1766, by one Peter Williamson, a native of Aberdeen, whom the authorities induced to take a pension for the good-will of the concern, and merged it in the general establishment.

Mail-coaches owe their origin to Mr. John Palmer, manager of the Bath and Bristol theaters, who, in 1783, submitted to Mr. Pitt a scheme for the substitution of coaches, protected by armed guards, for the boys on horseback, who till then conveyed the mail. After much opposition from the post-office authorities his plan was adopted, and Mr. Palmer, installed at the post-office as controller-general, succeeded in perfecting his system, greatly increasing the punctuality, speed, and security of the post, and adding largely to the post-office revenue.

In 1837, a plan of post-office reform was suggested by Mr. (afterwards Sir) Rowland Hill, the adoption of which has not only immensely increased the utility of the post-office, but changed its whole administration. Its principal features were the adoption of a uniform and low rate of postage, a charge by weight, and prepayment. The change met with much opposition from the post-office authorities, but was eventually carried by a majority of 100 in the House of Commons, becoming law by 3 and 4 Vict. c. 96. The new system came into full operation on January 10, 1840. Previously to the change, members of parliament had the right of sending their letters free, but this privilege of franking was entirely abolished. A penny was adopted as the uniform rate for every inland letter not above half an ounce. Facilities for prepayment were afforded by the introduction of postage-stamps, and double postage was levied on letters not prepaid. Arrangements were made for the registration of letters; and the money-order office, by a reduction of the commission charged for orders, became available to an extent which it had never been before. As far back as 1792, a money-order office had been established as a medium for sailors and soldiers to transmit their savings, and its benefit had afterwards been extended to the general public; but the commission charged had been so high, that it was only employed to a very limited extent. The immediate result of the changes introduced in 1840 was an enormous increase in the amount of correspondence, arising in part from the cessation of the illicit traffic in letters, which had so largely prevailed before; but for some years there was a deficit in the post-office revenue. The reduction of postage-rates was, however, a reduction of taxation, and if the Exchequer lost revenue from one source, it gained it in other ways.

With the development of the railway system came the carriage of letters by train instead of by mail-coaches; and one novelty which arose out of this change was the adoption of traveling post-offices, forming part of the mail-train, where letters are arranged during transit, and which sometimes receive and drop the letter-bags while the train is going at full speed. The conveyance of the mails by railroad added greatly to the expenses of the post-office establishment; but, nevertheless, the former gross revenue of the post-office was exceeded in 1851, and the net revenue in 1863. According to the annual report of the postmaster-general for 1880–81, there are 912 head post-offices in the United Kingdom, 13,637 branch offices or receiving-houses, and about 13,160 road or pillar letter-boxes. Above 1176 millions of letters passed through the post-office in 1880–81—more than twice as many as in 1861, and thirteen times as many as in 1839, the last year of the dear postage. In 1880–81, the gross revenue of the post-office, exclusive of that yielded by the telegraphs was £6,733,427; the expenditure, also excluding the telegraphic service, £4,135,659; leaving a surplus of £2.597,768. The number of money orders transmitted within the United Kingdom, in the same year, was 16,329,476; the amount of money transmitted being £24,228,763. This is a decrease on previous years, probably caused by the introduction of postal orders. (See below, under *Money Orders*.)

The postal service of the three kingdoms is now under the immediate control of the postmaster-general, assisted by the general secretary of the post-office in London. There are also chief officers in Edinburgh and Dublin, with secretarial and other departmental staffs. The postmaster-general is a member of the privy council and sometimes a cabinet minister. He has a salary of £2500, and is the only officer connected with the department who leaves office on a change of government. The secretary is his responsible adviser, and has a salary of £2000. The receiver and accountant-general keeps account of the money received by each department, receiving remittances from branch and provincial offices, and taking charge of the payment of all salaries, pensions, and items of current expenditure.

The surveyors are the connecting link between the metropolitan and provincial offices, each postmaster, with some exceptions, being under the superintendence of the surveyor of his district. In 1881, the staff of officers employed in the post-office, including those engaged in telegraph work, was upwards of 47,000; of this number, about 12,000 were engaged solely in telegraph work, and about 11,000 were employed in London alone.

Act 24 Vict. c. 19 instituted a system of savings banks in connection with the post-office. The rate of interest payable to depositors is 2½ per cent., calcutated on complete pounds and complete months, being a halfpenny per pound month. The number of depositors at the end of 1880 was 2,184,972; the amonnt of their deposits in the year, £10,219,631; and the number of banks, 6233. A novel extension of this system took place in 1880. Blank forms, with twelve ruled spaces, are now issued to intending depositors, who may secure their penny savings by affixing ordinary postage-stamps to the form. When the twelve spaces are filled, the form is presented at the bank, and credit is given for a shilling.

The Savings-bank Act (1880) permits the investment of small sums in government stocks; in Consols, Reduced, or New 3 per Cents. The sums invested must not be less than £10, and must not exceed £100 in any one year; the total sum for any one investor is limited to £300. The postmaster-general is empowered to insure the lives of applicants for not less than £20 or more than £100, and also to grant immediate or deferred annuities. See POST-OFFICE INSURANCE.

Halfpenny post-cards were introduced in 1870, and in the first year 75 millions were used. The number in 1880–81 reached 122 millions. The ordinary penny stamp is now a 'Postage and Inland Revenue' stamp, and may be used as a receipt stamp.

In 1869 the post-office acquired the existing electric telegraphs. About 30 millions of telegraphic messages wese sent in the year ending March 31, 1881. Gross revenue, £1,633,884; working expenses, £1,189,425; net revenue, £444,459.

The home and foreign mail-packet service was, in the 17th and

18th centuries, in the hands of the post-office authorities, but was removed to the Board of Admiralty, under whose control it remained till 1860, when it was again restored to the post-office. Steam-vessels were first used for conveying the mail in 1821; and in 1833, mail-contracts were introduced, the first being with the Mona Steam Company to run steamers from Liverpool to Douglas in the Isle of Man. Of the home mail-packet contracts, the most important are those with the City of Dublin Steam-packet Company for conveying the Irish mails between Holyhead and Kingstown. The principal foreign contracts are for the Indian and Chinese mails, entered into with the Peninsular and Oriental Steam-navigation Company, the mails to North and South America, the West Indies, the Australian colonies, and the Cape.

The post-office statute of Queen Anne contains a prohibition repeated in subsequent acts, for any person employed in the post-office to open or detain a letter, except under a warrant from one of the principal secretaries of state. During last century, such warrants were often granted on very trivial pretences. In 1723, at Bishop Atterbury's trial, copies of his letters, intercepted at the post-office, were produced in evidence against him; and in 1735, it appeared that an organization existed, at an immense expense, for the examination of home and foreign correspondence. In 1782, the correspondence of Lord Temple, when Lord-lieutenant of Ireland was subjected to a system of post-office espionage. In the beginning of the present century, an improvement took place in this matter, and Lord Spencer introduced the custom, in 1806, of recording the dates of all warrants granted for the opening of letters and the grounds on which they were issued.

Since 1822, the warrants have been preserved at the Home Office; and a House of Commons' return in 1853 shows that, in the preceding ten years, only six letters were detained and opened —four in cases of felony, and two that they might be properly returned to those who claimed them. One of these cases of interference with the privacy of correspondence occurred in 1844, when Sir James Graham, as Home Secretary, issued a warrant for opening the letters of Mazzini, and caused certain information contained in them to be conveyed to the Austrian Minister, an act which involved the ministry of the day in considerable popular obloquy, and produced a wide-spread, though very groundless, distrust of the security of the ordinary correspondence of the country. See GRAHAM, SIR JAMES.

The following is a summary of the most important regulations of the British post-office, reference being made for the minute details to the *British Postal Guide*.

Inland Letters.—The rates of postage, prepaid, are 1*d*. for a letter weighing not more than 1 oz.; 1½*d*. when the weight is 1 oz. and not above 2 oz.; 2*d*. 2 oz. and not above 4 oz.; 2½*d*. 4 oz. and not above 6 oz.; 3*d*. 6 oz. and not above 8 oz.; 3½*d*. 8 oz. and not above 10 oz.; 4*d*. 10 oz. and not above 12 oz. A letter exceeding 12 oz. is charged 1*d*. per oz.; *e.g.*, for a letter weighing 16 oz. the postage is 16*d*. A letter posted unpaid is charged double postage. Letters insufficiently stamped are charged double the deficiency on delivery. Redirected letters are charged additional postage at the prepaid rate; and this may either be prepaid, or charged on delivery. Letters for officers, soldiers, or seamen on actual service abroad, are redirected without charge, also with several restrictions, at home. By paying ½*d*. extra postage, letters may now be posted in the boxes attached to mail trains, in which sorting is performed.

No inland letter can be conveyed by post which is more than one foot six inches in length, nine inches in width, and six inches in depth, unless sent to or from one of the government offices.

Registration.—The registration fee of 2*d*.—in addition to the ordinary postage—prepaid in stamps, secures careful treatment to any letter, newspaper, or book-packet, and renders its transmission more secure, by enabling it to be traced from its receipt to its delivery. Letters may be registered for a fee of 2*d*. to any place in the British colonies, and for various rates of charge to different foreign countries. Letters containing coin, if not registered, are treated as if they were, and charged on delivery with a registration fee of eightpence; the same fee is charged on letters marked 'Registered' and posted in the usual way instead of being given to a post-office servant. If lost, the contents are only made good to the extent of £2.

Foreign and Colonial Letters.—For the rates payable, reference is made to the *British Postal Guide*. Prepayment must be wholly in stamps. In some cases, prepayment is optional; in others, compulsory; and to some countries the whole postage cannot be prepaid. A letter posted unpaid or partially paid, directed to go by a route by which prepayment is compulsory, is returned to the writer, unless there be another route to send it by, by which prepayment is not required. Letters, however, for Australia and New Zealand, if prepaid as much as one rate, are forwarded, charged with the deficient postage and an additional rate. Letters for the Cape of Natal posted unpaid (wholly or in part), in addition to the deficient postage are charged 6*d*. each. Those for St. Helena and British West Indies, not included in the General Postal Union, are charged 1*s*. each in addition to the deficient postage. No letter for any foreign country may be above two feet in length or one feet in width or depth.

Letters to be sent by private ship must be so marked; their postage varies from 2½*d*. upwards for half an ounce, and prepayment is obligatory in some cases, and in others not.

Letters to passengers on board the American or Mediterranean packets must be registered, and must be addressed to the care of the commander of the packet.

The post-office monopoly is applicable to *letters* only; and it does not include letters sent specially by private messenger, or letters concerning goods or merchandize sent to be delivered along with the goods which they concern.

Newspapers.—In 1870, the impressed duty stamp was abolished; and now, any newspaper published at intervals not exceeding seven days, and on a sheet or sheets unstitched, and registered at the General Post-office, is transmissible by post within the United Kingdom at a postage of one halfpenny for each transmission. The postage must be prepaid, either by an adhesive stamp or by a stamped wrapper. A packet of newspapers is not chargeable at a higher rate than a book packet—namely, one halfpenny for every 2 oz. or fraction of 2 oz. The cover, if there is one, must be open at both ends, and such that the packet can be easily removed for examination. There must be no writing outside or inside, except the address of the person to whom the newspaper is sent. Registration for inland circulation includes registration for transmission abroad. Newspapers for foreign countries and the colonies are subject to the same general regulations as for inland circulation, except that they may be published at intervals of thirty-one days, and printed on sheets stitched together. They must be posted within eight days from the day of publication.

Parliamentary Proceedings.—The printed proceedings of parliament, with the words 'Parliamentary Proceedings' written or printed on the cover, may circulate throughout the United Kingdom at the rate of one halfpenny for every 2 oz. or fraction of 2 oz. Prepayment is optional. Parliamentary notices may be forwarded by post under certain regulations and restrictions, the postage chargeable, and a registration fee of 6*d*., being payable in stamps.

Book-post.—This branch of the post-office was first established in 1848, and further improved by regulations issued in 1855, 1857, and 1870. The postage is now one halfpenny for every 2 oz. or fraction of that weight. A book-packet may contain books, paper, or parchment, whether plain, or written, or printed upon (provided there be nothing of the nature of a *letter*); maps, prints, &c. (but not in glass frames). *Circulars*, when wholly or in great part printed or lithographed, may also be sent by book-post, singly or in packets. The postage must be pre-paid by adhesive stamps, or by a stamped wrapper; if not prepaid, the packet is charged double the book-postage; if not sufficiently prepaid, it will be charged double the deficiency. If there is a cover, it must be open at the ends. No book-packet must exceed 5 lbs. in weight; it must not be over 1 foot 6 inches in length by 9 inches in width and 6 inches in depth; nor must it contain anything sealed against inspection. An entry on the first page of the book stating who sends it, or to whom it is given, is allowed. In order to secure the return of book-packets that cannot be delivered it is recommended to have the names and addresses of the senders written or printed outside. No writing in the way of a letter or communication is allowed; if any such communication be found within a packet, the whole will be charged the unpaid letter rate, and forwarded. The book-post has been extended to the colonies and to foreign countries at varying rates.

Colonial and Foreign Pattern and Sample Post.—This post extends to most colonies and foreign countries, at rates corresponding with those for book-packets. It is restricted to *bonâ-fide trade patterns or samples of merchandise*. Goods sent for sale, or in execution of an order (however small the quantity may be), or any articles sent by one private party to another which are not actually patterns or samples, are not admissible. The patterns are to be sent in covers open at the ends or sides; but samples of articles which cannot be placed in open covers, may be inclosed in transparent bags. Such articles as knives, scissors, &c., may be sent to places abroad, except France and the French colonies, provided they are so packed as to do no damage.

Post-cards, bearing a halfpenny impressed stamp, are transmissible within the United Kingdom. On the stamped side, the address alone is to be written. On the other side, any communication may be written or printed. *Reply* post-cards, which were introduced in 1882, allow the sender to prepay the reply. Foreign post-cards cost 1*d*. and 1½*d*.

The Parcels Post Act, passed in 1882, provides for the carriage of small parcels within the United Kingdom at the following rates: For parcels not exceeding 1 lb.—3*d*.; 3 lbs.—6*d*.; 5 lbs. —9*d*.; 7 lbs.—1*s*.

Money Orders.—Inland money orders may be obtained at any of the post-offices of the United Kingdom, on payment of the fol-

lowing commission: For sums under 10*s.*—2*d.*; for 10*s.* and under £2—3*d.*; for £2 and under £3—4*d.*; for £3 and under £4—5*d.*; and so on, up to £9 and under £10—11*d.*; £10—1*s.* Money orders may now be issued to the colonies, to most European countries, the United States, Egypt, &c., the commission being about three to four times the above rate. In applying for a money order, the surname and initial, at least, of one Christian name of the sender, and the name of the person to whom payable, must be given; but the designation of a firm will suffice, and the name of the person to whom the order is payable may be withheld, if it is to be paid through a bank.

A money order in the United Kingdom becomes void if not presented for payment before the end of the twelfth calendar month after that in which it was issued. Orders drawn on France or Italy must be paid within three months. The lower rates for inland money orders entail a loss on each transaction. Provision was further made for the issue of ten classes of 'postal notes' for small fixed sums, under Mr. Fawcett's Post-office (Money Orders) Bill of 1880.

Any person with a fixed residence may have a private box at the post-office on paying an appointed fee; but in no other case can a resident have his letters addressed to the post-office. See POSTE RESTANTE.

Letters containing anything liable to injure the contents of the mail-bag are not allowed to be sent by post. This comprehends glass in any form, vessels containing liquids, meat, fruit, explosives, sharp instruments, &c.

Telegrams.—The charge for the transmission of messages by telegraph throughout the United Kingdom is 1*s.* for the first twenty words, and 3*d.* for each additional five words, or part of five words. Press telegrams cost 1*s.* for 100 words by day, and for 75 by night.

The Universal Postal Union.—In October, 1874, a conference at Berne resulted in the establishment of the 'General Postal Union,' embracing all the European countries, with Egypt and the United States, and resulting in a great simplification of international postal arrangements. This was followed in June 1878 by the treaty of Paris, signed or subsequently adhered to by all the parties to the former treaty, with the addition of British India, the colonies of France, Spain, Holland, and Portugal, various British colonies, Persia, Japan, Liberia, Brazil, Peru, Mexico, &c., the new convention receiving the name of the 'Universal Postal Union.' Under this important treaty, all the consenting nations were declared to be 'a single postal territory for the reciprocal exchange of correspondence.' Equal rates, weights, and rules are established, and considerable reductions of postage have followed its adoption. Except in the case of lengthy sea transit, a uniform rate of 25 centimes (2½*d.*) is adopted for a letter of 15 grammes (½ oz.); of ten centimes (1*d.*) for post-cards; of five centimes (½*d.*) for packets of print, &c., of 50 grammes (2 oz.); and of 25 centimes (2½*d.*) for registration in Europe, and 50 centimes (5*d.*) for registration beyond Europe.—See *Her Majesty's Mails*, by Lewins; the Postmaster-general's Annual Reports; Martin's *Statesman's Year Book; Life of Sir Rowland Hill; and the History of Penny Postage*, by Sir R. Hill and G. B. Hill (1880).

POST-OFFICE, OFFENCES AGAINST. Owing to the conspicuous part which the post-office plays in modern civilization, a small code of laws belongs to it, the substance of which is as follows: Every person employed by the post-office who steals a post-letter, is guilty of felony; and if it contain money or a valuable chattel, the punishment is increased. So whenever letters are stolen by strangers out of the custody of the post-office or its officers. The moment a letter is put into the post-office or delivered to the postmaster, the protection of the statutes commences. Many nice questions have, however, arisen as to the application of the rule to special circumstances, and as to what constitutes an employment by the post-office. Whoever steals, secretes, or destroys printed papers or newspapers sent by post, commits a misdemeanor. So if a letter-carrier delay the delivery wilfully; or if an official messenger disclose or intercept a telegraphic message, or violate the rules on that point. Receivers of letters improperly taken or stolen from the post-office, are guilty of felony. By the 1st Vict. c. 33, s. 2, any person conveying otherwise than by post a letter not exempted from the exclusive privilege of the post-master-general, incurs a penalty of £5 for every letter. This exclusive privilege of carrying letters extends to letters only, and not to printed books or newspapers. There are also exceptions to the general rule, that letters can only be sent by the post-office. Thus, one may send a letter by a private friend, and not by the post-office. So letters sent by messenger on purpose on the private affairs of the sender or receiver, commissions and legal writs, merchants' letters sent by vessels or along with goods, are excepted. But no person is authorized to collect and send these excepted letters, though in the legal manner described, for this is doing the work of the post-office. Moreover, there are certain persons expressly prohibited from carrying letters even gratuitously, as common carriers, except the letters relate to goods in their carts or wagons; owners, masters, or commanders of ships, except such letters relate to goods on board; and passengers on board ships. Statutes and rules made thereunder secure the monopoly to the postmaster-general of sending telegraphic messages, and telegrams are put nearly on the footing of letters.

POST-OFFICE INSURANCE is a valuable addition to the many useful services which our postal establishments has been enabled to render within the last few years. Book-post, sample-post, money-orders, and postal savings-banks, all additions to the original letter-post, and newspaper-post, have been found to work so satisfactorily, that the legislature has been encouraged to intrust to the same organization a new system of insuring lives and granting annuities—specially intended to foster provident habits among persons whose savings can be but small.

In 1853, an act of parliament made an improvement in the then existing state of insurance law, by facilitating the purchase of government annuities through the medium of the savings-banks; and in 1864, another statute gave a great extension to those portions of the system which had been found to work well, effecting at the same time alterations in those which had exhibited certain defects during eleven years' working. Great facilities are introduced by this act for securing annuities by small payments. Not only may the National Debt Commissioners employ the trustees of savings-banks to receive and pay the moneys, at a certain rate of remuneration; but the Postmaster-general joins in the arrangement, acting as a medium between the public on the one hand and the commissioners on the other. Ample tables and regulations have been printed, for the guidance of the Commissioners, the Postmaster-general, and the local postmasters throughout the kingdom. On the completion of these tables and regulations in 1865, the practical working of the system began. The tables of the premiums to be charged for life-insurances, for immediate annuities, for deferred annuities, and for deferred monthly allowances, are sold by Messrs. Eyre and Spottiswoode, the government printers, for 5½*d.* (the cost of the paper and printing); but similar tables are kept for inspection at the local post-offices without charge.

In regard to insurance, distinct from annuities, persons of either sex may insure through the medium of the post-office. The limited ages are from 16 to 60, and the limited sums from £20 to £100. In order to afford every possible facility in the payment of the premium, minute calculations have been made of the exact sum to be paid at each instalment, by yearly, quarterly, monthly, or fortnightly payments, and terminable or not at a particular age. In order that there may be some limit to the labor thus placed on the postal authorities, no periodical instalment is made smaller than two shillings. No one life can be insured for less than £20 in the whole; but when a life has been insured for £20, further insurances may be effected on the same life from time to time, until the whole sum for which it is insured amounts to £100. The following is a tabulated example of nine different modes of paying the premium on one particular insurance, to suit the convenience of the insurer. A man in his 30th year may insure £100 to his survivors at his death:

	£	s.	d.
1. By a single payment of	43	3	7
2. By an annual payment for life of	2	6	7
3. By a quarterly " "	0	13	0
4. By a monthly " "	0	4	4
5. By a fortnightly " "	0	2	2
6. By an annual payment, until the insurer reaches 60 years, of	2	13	10
7. By a quarterly payment, until the insurer reaches 60 years, of	0	15	0
8. By a monthly payment, until the insurer reaches 60 years, of	0	5	0
9. By a fortnightly payment, until the insurer reaches 60 years, of	0	2	6

If an insurer who has duly paid all instalments for five years, should desire, or be compelled by circumstances to withdraw from the engagement, a portion of the past premiums will be repaid to him—never less than one-third of the total amount.

In regard to immediate annuities, persons of either sex may purchase annuities of not more than £50, and for lives from 10 years old and upwards. The premiums necessarily vary with sex, age, and amount. Thus, a man aged 65 can purchase an immediate annuity of £10, paid half-yearly, for £88, 18*s.* 4*d.*; whereas, a woman of the same age would have to pay £103, 16*s.* 8*d.* Two or more small annuities may be purchased for the same life, provided the total amount does not exceed £50. Any two persons may purchase an annuity on their joint lives, with or without continuance of the annuity to the survivor.

Deferred annuities form another element in the scheme. These annuities are very varied in kind, and the amount of premium de-

pends on a great number of conditions—amount of annuity; age and sex of the person; length of term for which the annuity is deferred (that is, the number of years which are to pass before the commencement of the annuity); mode in which the premium is to be paid; and the condition whether or not there is to be any return of purchase-money under certain contingencies. As examples, take the following: A man aged 30 may purchase a deferred annuity of £10, to commence on his reaching the age of 60, and due half-yearly, for one immediate payment of £21, 3*s*. 4*d*., or an annual payment of £1, 8*s*. 4*d*.; in the case of a woman, the immediate or total payment would be £32, 8*s*. 4*d*., and the annual payment £1, 17*s*. 6*d*. If the person on whose life the annuity is to depend should die before the annuity itself commences, all the premiums paid up to that date may be returned to his or her representatives provided a contract to this effect is made in the first instance. The premiums are necessarily higher for such a contract. The four sums just mentioned, where past premiums are *not* returnable, would be raised respectively to £40, 9*s*. 2*d*., £2, 0*s*. 10*d*., £47, 0*s*. 10*d*., and £2, 7*s*. 6*d*., with the returnable clause included.

Many persons in humble life would prefer that the annuities due to them should come more frequently than half-yearly. To suit this class, a system of deferred monthly allowances is established. A man aged 30 may purchase a deferred allowance of £2, 7*s*. 3*d*. per month, to commence when he reaches the age of 60, by a payment of 8*s*. per month, until he reaches that age; the same monthly payment by a woman would realize a monthly allowance of £1, 16*s* 7*d*. If the returnable clause (above noticed) is included in the contract, the man's monthly allowance would be £1, 14*s*. 2*d*., and the woman's £1, 9*s*. 4*d*., for the like payment of 8*s*. per month. In regard to married couples, a husband and wife may each be insured to the full amount of £100, and may each purchase an annuity of £50, or a monthly allowance of £4, 3*s*. 4*d*.

Persons whose lives are insured, or to whom annuities are granted, through the post-office, have direct government security for the payment of the money at the proper time; and this is one of the many valuable features of the system. It is not necessary here to describe the exact routine of proceedings for making an insurance or purchasing an annuity; the postmasters whose post-offices have been raised to the rank of insurance offices, are fully instructed in the matter, and will give all requisite information to applicants. We may add, that the *British Postal Guide*, an authorized publication, issued quarterly at 6*d*., gives a considerable list of tables of premiums payable at various ages for various kinds of insurance and annuity.

PO'STULATE. This word occurs in Geometry, and signifies something that is *demanded*, and must be granted before the demonstrations of the science can be wrought out. The postulates of Euclid have reference to certain constructions indispensable to the reasoning. They are these three: 'A straight line may be drawn from one point to another;' 'A line already drawn may be produced;' and 'A circle may be described from a given center, with a given radius.' The object of laying down these in the shape of demands, is to fulfil one great condition of demonstrative science, which is, that nothing shall be proceeded on, in the course of the reasoning, without being explicitly stated at the outset. It has been noticed by critics that the three postulates of Euclid do not exhaust the demands actually made in the course of his demonstrations. Thus, in the 4th and 5th Propositions, Book I., this postulate is assumed: 'Any figure may be removed from place to place without alteration of form, and a plane figure may be turned round on the plane.'

The postulate is something different from the axiom. An axiom is a general and fundamental principle, such as no one can deny, and serving as the ultimate foundation (in Logic, the major premise) of deductive inferences; as, for example, 'Things equal to the same thing are equal to one another.' The postulate, in Euclid's sense, is a special accessory to the reasoning, different from the axioms.

But in Philosophy, the postulate takes a much wider sweep, and expresses the most fundamental concessions implied in all reasoning, being pre-requisite in order to the establishment of the axioms themselves.

Thus, it is a postulate necessary to reasoning and discussion that a reasoner shall be consistent with himself—that he shall not affirm a thing one minute and deny it the next. The so-called Laws of Thought—Identity, Contradiction, and Excluded Middle—are so many forms of the postulate of consistency. These laws are tantamount to demanding that the same thing shall not be maintained in one form, and denied in another. If we say this room is hot, we must not, at the same time, say that it is not hot. So the ordinary law of the syllogism, 'Whatever is true of all the members of a class, is true of each,' is not so much an axiom as a postulate of consistency; we must be prepared to repeat individually the statements that we have affirmed collectively.

The ultimate premises of all truth and reasoning may be put in the form of postulates, as follows: 1. Present Consciousness must be admitted as a ground of certainty. 'I am thirsty,' 'I hear a sound,' as facts of present consciousness, are to be held as trustworthy in the highest degree, or as amounting to the highest certainty. 2. But present consciousness is not enough; it must further be conceded that Past Consciousness is a ground of certainty. Present cosciousness does not amount to an experience of value for future purposes, unless taken with past. Now, although a remembrance that is long past is often uncertain, a recent remembrance must be pronounced absolutely certain, not less than a present consciousness. That 'I was thirsty a short time ago,' I must be certain of, in order to establish the induction, 'that water quenches thirst.' 3. It must further be conceded, that 'What has been in the past, all circumstances holding the same, will be in the future.' That a thing has been, does not imply that it will be. We may admit that the sun has risen to-day, and rose yesterday, and so on, and without inconsistency, refuse to admit that it will rise to-morrow. People are generally well enough disposed to treat this as a certainty; indeed, there is a strong natural tendency of the mind to expect that the future will resemble the past, which, when corrected and regulated by experience, constitutes our belief in causation and the uniformity of nature. Still, a blind instinct is no guarantee for truth; and as the assertion of the future is a distinct position, it should be formally assumed in a separate postulate. However often a thing may have happened, we still make a leap, and, so to speak, incur a risk in venturing to predict its future recurrence. Our confidence no doubt increases with repetition, but nothing can obliterate the line between what *has been* and what *is to be*.

These three Postulates of Experience, coupled with the Postulate of Consistency, seem adequate as a basis of all the recognized axioms and truths of experience. In other words, the concession of them is enough to commit any one to the reception of all inductive and deductive evidence.

POSTULA'TION (Lat. 'an asking'), in Canon Law, means a presentation or recommendation addressed to the superior, to whom the right of appointment to any dignity belongs, in favor of one who has not a strict title to the appointment. It is one of the forms of proposing to the pope persons nominated, but not, strictly speaking, elected, to a bishopric. It is also used in the case of elections in which the candidate, although regularly chosen by the electors, yet labors under some legal disability which involves the necessity of a dispensation. The presentation of candidates for the episcopacy, as it exists in the Roman Catholic Church in Ireland, is called postulation.

PO'STURES, the name given to the attitude observed in worship, whether private or public, but especially the latter. They are the natural expressions of the feeling which accompanies or characterizes the particular devotion in which they are employed, and are used by suppliants to man as well as to God. Four postures are found to have been used by the ancient Christians in their prayer—the standing, the kneeling, the bowing or inclined, and the prostrate. Of these, the ordinary one was kneeling; but for it was substituted, during the Easter-time and on the Sundays, a standing posture, which was understood to symbolize the resurrection of our Lord. To this usage we find allusions as early as the time of Justin the Martyr. In the paintings of the catacombs, and on the ancient enamelled glasses found therein, the standing posture in prayer is accompanied by outstretched and upraised hands. The bowing posture was rather a special act of reverence accompanying a particular address or a particular part of an address, than a sustained posture. It occured at frequent intervals in the ancient liturgy, and is still used in the Roman mass as well as (even more profusely) in those of all the various rites, Greek, Syrian, Coptic, Armenian, and Russian. The prostrate posture was the attitude of the deepest humiliation, and was mainly used by the Penitents (q. v.), especially in that grade of public penance which was known under the name 'prostration.' It is also used still in the solemn ordination of subdeacons, deacons, and priests, as performed in the Roman Catholic Church. The question as to the use of particular postures was a subject of much controversy between the Puritans and the Church of England; and has recently been revived in the Presbyterian Church of Scotland.

POT-WALLERS, or POT-WALLOPERS (from *pot*, and Old English *wall*, to boil or bubble), the popular designation of a class of electors forming the constituency of varous English boroughs—as Ilchester, Honiton Tregoney, Old Sarum—before the Reform Act of 1832, whose qualification as housekeepers was considered to be established by their boiling a pot within the limits of the borough over a fireplace erected in the open air. The doing so was regarded as evidence that the elector was in circumstances to provide for his own subsistence, and not necessitated to apply for parochial relief.

PO'TASH AND PEARL-ASH, in Commerce. See POTASSIUM. The chief source of this important article in Britain is Canada, where it is derived from the vast quantities of wood cut down and burned in clearing the forest for culture, and also from the branches of the trees felled for timber. The ashes, mixed with a small quantity of quicklime, are put into large wooden cisterns, and covered with water. The whole is well stirred up, and allowed to settle; the next day, the clear liquor is drawn off, and evaporated to dryness in iron pots, whence it is called *potash*. When a sufficient quantity is got to fill a cask of 5 cwt., it is fused at a red heat, and poured into the cask. The mass when cold is colored gray externally, but when broken shows a pinkish tint internally. It is very deliquescent, and consequently the casks require to be nearly air-tight. In this state, potash contains a large quantity of foreign materials, amounting to about 40 per cent., amongst which sulphur and carbonaceous matter predominate. This is the crude American potash of commerce. If it is calcined by a reverberatory furnace, the sulphur is driven off, and the carbonaceous matter burned out; the carbonic acid, however, combines with the potash, and forms it into a carbonate. To form it into *pearl-ash*, it is then broken up, and dissolved in water in a wooden cistern, having a perforated bottom, covered with straw, through which it filters, and is afterwards evaporated in flat-bottomed iron pans. As it approaches dryness, it is stirred with iron rods, which break it up into round lumpy masses of a pearly-white color, and in this state it is the pearl-ash of commerce, and contains about 50 per cent. of pure potassa.

All land-plants yield potash when burned, and many in much greater proportions than the timber trees of North America; but the circumstances in which the materials are obtained, give an advantage to our colonial manufacturers, which hitherto has enabled them to compete with the whole world. The quantity imported annually of 'pots' and 'pearls' as they are technically called, reaches the value of nearly half a million sterling. See POTASSIUM.

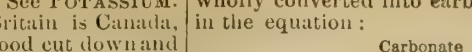
POTA'SSIUM (symb. K, eqiv. 39, sp. gr. 0·865) is one of the alkaline metals. The letter K is selected as its symbol, as being the first letter of *Kali*, the Arabic word for potash, the letter P being preoccupied as the symbol for phosphorus. The following are the chief characters of this metal. It is of a bluish-white color, and presents a strong metallic lustre. At 32°, it is brittle, and has a crystalline fracture; at a somewhat higher temperature, it is malleable; at 60°, it is soft, and of the consistence of wax; at 130°, it is completely liquid; and at a red heat, it becomes converted into a beautiful green vapor. Its affinity for oxygen is so great, that on exposure to the air it immediately becomes covered with a film of oxide. When heated, it burns with a violet flame, Its intense affinity for oxygen is well shown by throwing it into water, on which, from its low specific gravity, it floats. The metal abstracts oxygen from the water, and forms oxide of potassium (potash); while the liberated hydrogen carries off a small portion of the volatilized potassium, and taking fire from the heat evolved by the energetic chemical action, burns with a brilliant violet flame. The experiment is a very beautiful one, the burning metal swimming about rapidly on the water, and finally disappearing with an explosion of steam when the globule of melted potash becomes sufficiently cool to come in contact with the water. At an elevated temperature, this metal removes oxygen from almost all bodies into the constitution of which that element enters; and in the laboratory it is often employed to remove any traces of oxygen from hydrocarbons, by distilling the latter with a small quantity of the metal. From the above facts, it is obvious that potassium must always be kept in some fluid, such as purified rock-oil or naphtha, which contains no oxygen.

Potassium does not occur in the native state, and can only be obtained by the reduction of its oxide, potash. There are three principal modes of reduction, all of which deserve a brief special notice, either on historical grounds or for their practical value.

1. Davy, in 1807, decomposed a fragment of hydrate of potash, by the current of a strong voltaic battery, into potassium, which separated as globules at the negative pole, and oxygen, which was evolved at the positive pole. This mode of procuring potassium yields only very small quantities, and is expensive; but the experiment was a most important one for the progress of chemistry, as showing for the first time that potash is not, as was previously supposed, a simple body.

2. Stimulated by Davy's discovery, Gay-Lussac and Thenard, in the following year (1808), succeeded in obtaining the metal by purely chemical means in greater abundance, by decomposing potash by means of metallic iron at a white heat. The oxygen of the potash combines with the iron, and the potassium in a gaseous form is condensed in a receiver filled with naphtha, and kept cool.

3. The method now usually adopted consists in the distillation of a mixture of carbonate of potash and charcoal at a white heat, in an iron retort. If proper proportions are taken, the mixture is wholly converted into carbonic oxide and potassium, as is shown in the equation:



Potassium forms two compounds with oxygen, viz., a protoxide, KO, which constitutes potash, and is strongly basic, and a teroxide, KO_3, which does not combine with acids, and of which it is unnecessary to say more than that it is a yellowish-brown substance, which is found when the metal is burned in an excess of oxygen gas.

Potash can be procured in the anhydrous form by oxidizing thin slices of the metal in air perfectly free from moisture or carbonic acid. It is white, very deliquescent, and caustic. When moistened with water, it becomes incandescent, and the water cannot be expelled by any degree of heat. A far more important substance is the *Hydrate of Potash* or *Caustic Potash* (KO.HO). This is commonly prepared by dissolving carbonate of potash in ten times its weight of water, and gradually adding to the boiling solution a quantity of slaked lime, equal in weight to half the carbonate of potash used. The resulting compounds are carbonate of lime, which falls as a precipitate, and hydrate of potash, which remains in solution; the changes being expressed by the equation:



The clear supernatant fluid is removed by decantation, or by means of a syphon, into a clean silver or iron basin, and is rapidly evaporated till it flows tranquilly like oil; it is then either cast into cylinders in metallic moulds, or is poured upon a cold slab, and solidifies on cooling. It may also be obtained in acute rhombohedrons, if allowed to crystallize from a hot concentrated solution; the crystals containing four atoms of water. A solution of hydrate of potash being one of our most important chemical re-agents, it is very essential that it should be obtained pure. When obtained in the method that has been described, it is apt to be contaminated with carbonic, sulphuric, hydrochloric, and silicic acids, lime, alumina, oxides of iron, &c., any of which substances can be detected by the appropriate tests. Pure caustic potash is, however, perfectly soluble in alcohol, which does not dissolve any of the above-named impurities. Hence, by forming an alcoholic solution of potash, and by evaporating it in a silver vessel till the whole of the alcohol is expelled, we obtain this substance in a state of purity.

Hydrated potash, on solidifying after fusion, occurs as a hard, grayish-white, opaque body, with a crystalline fracture, which may be readily again fused into a colorless oily fluid, but which only volatilizes at a very high temperature. It is soluble in about half its weight either of water or of alcohol, and rapidly absorbs both carbonic acid and moisture from the atmosphere. It acts as a powerful caustic, and quickly destroys both animal and vegetable tissues, and hence its solutions can only be filtered through pounded glass or sand. Its affinities are so powerful that few vessels are capable of resisting its influence. Its solution must be preserved in glass bottles, into the composition of which no oxide of lead enters, as it has the property of dissolving this oxide out of the glass. Vessels containing silica (porcelain, earthenware, &c.) are decomposed, and platinum itself is oxidized when heated in contact with it. The principal uses of this substance are thus briefly summed up by Professor Miller. 'Potash decomposes the fixed oils, and converts them into soluble soaps; when fused with silicious minerals, it displaces the bases, and combines with the silica, forming silicate of potash. Potash is extensively employed in the arts: to the soap-boiler and the glass-maker, it is indispensable; when combined with nitric acid, it enters largely into the manufacture of gunpowder; and, in greater or less quantity, it furnishes important aids to a variety of processes employed in the manufactures of the country. In the laboratory, potash is in constant use for absorbing acid gases, such as carbonic acid, and for separating the metallic oxides from solutions of their salts, since, owing to the powerful affinity of the alkali for acids, it readily decomposes the salts of all the metals which produce oxides insoluble in water.'—*Elements of Chemistry*, 2d edition, vol. ii. p. 353.

The *salts* which potash forms with acids are for the most part readily soluble in water, and colorless, unless (as, for example, in permanganate of potash) the acid is colored. Most of them are crystallizable, and they all communicate a violet tint, characteristic of potash, to the flame of spirit of wine and to that of the blowpipe. Many of them occur in the animal and vegetable kingdoms, and the ashes of plants contain them in large quantity. We shall now briefly notice the most important of these salts. *Carbonate of Potash* (KO,CO_2) is obtained by burning plants in dry

pits, dissolving the ashes in water, evaporating till the sulphates, chlorides, &c., separate in crystals, and then boiling the mother liquid to dryness in iron pots. See POTASH. The quantity of pure carbonate of potash contained in it is liable to great variation, and the process termed *Alkalimetry* has been invented, with the view of rapidly determining the amount of this salt, on which the commercial value of the pearl-ash depends. Different plants furnish varying quantities of this salt, and the leaves and young shoots are the parts which furnish it most abundantly. The potash is, of course, obtained by the plants from the soil, which, when capable of supporting vegetable life, always contains that substance; and does not exist in the plants in the form of carbonate, but in union with various organic acids (such as ascetic, malic, tartaric, and other acids), which, by incineration, become decomposed into carbonates. The purified carbonate of potash, employed in pharmacy and for chemical purposes, is prepared from the crude salt by adding an equal quantity of cold water, agitating, and filtering. By this means, all the less soluble foreign bodies are got rid of. The solution is then boiled down to a small bulk, and allowed to cool, when the carbonate separates in small crystals, containing 20 per cent. of water, and represented by the formula $KO,CO_2 + 2Aq$. Carbonate of potash is extremely deliquescent, and is soluble in less than its own weight of water, but is insoluble in alcohol. It has an acrid, alkaline taste, and its reaction upon test-paper is strongly alkaline. It is a compound of great importance, both as a chemical re-agent, and as entering largely into the preparation of most of the other compounds of potash, and into the manufacture of soap and glass.

Bicarbonate of Potash ($KO,CO_2 + HO,CO_2$) is obtained in white rhombic prisms, by passing a current of carbonic acid gas through a strong solution of carbonate of potash. These crystals are permanent in the air, but are decomposed by heat; water and carbonic acid being evolved, and the simple carbonate left. This salt is much less soluble than the carbonate, requiring four parts of cold water for its solution, which is nearly neutral to test-paper, and has a much milder taste than the preceding salt. It is employed largely in medicine for making effervescing draughts. *Sulphate of Potash* (formerly known as *sal polychrest*) is obtained by dissolving in water the acid residue of bisulphate of potash ($KO,SO_3 + HO,SO_3$) which is left in the retort in the preparation of nitric acid. This solution, on being neutralized with carbonate of potash, furnishes hard transparent crystals of this salt. From its extreme hardness, this salt is used in medicine (as, for example, in Dover's Powder), for the purpose of finely comminuting vegetable matters. The *Bisulphate of Potash*, from which the preceding salt is obtained, is the *sal enixum* of the older chemists. Except that it is occasionally employed as a flux it is of no special importance. *Nitrate of Potash* has been already described under the head NITRE. *Chlorate of Potash* (KO,ClO_5) occurs in white rhomboidal tablets of a pearly lustre. It has a cooling taste like that of nitre. It fuses at a gentle heat without decomposition, but on increasing the heat, it gradually gives off all its oxygen, and is converted into chloride of potassium, according to the equation :

Chlorate of Potash.		Chloride of Potassium.		Oxygen.
KO,ClO_5	=	KCl	+	6O.

It is not very soluble, as it requires for its solution 16 parts of cold and 1·7 parts of boiling water. It even exceeds nitrate of potash as an oxidizing agent; and if combustible substances, such as carbon, sulphur, or phosphorus be heated, or forcibly rubbed with it, a detonation or explosion occurs. This salt is employed in the manufacture of lucifer-matches, in certain operations in calico-printing, and for filling the friction-tubes employed for firing cannon: the best mixture for these tubes consisting of 2 parts of this salt, 2 of sulphide of antimony, and 1 of powdered glass.

A mixture known as *White Gunpowder*, consisting of chlorate of potash, dried ferrocyanide of potassium, and sugar, has been employed for blasting purposes, but its preparation is accompanied by so much danger, that it is seldom used. This salt does not occur as a natural product, but may be obtained by passing a current of chlorine gas through a hot solution of caustic potash; 6 eq. of chlorine combining with 6 eq. of potash to form 5 eq. of chloride of potassium, and 1 eq. of chlorate of potash, according to the equation : $6\,Cl + 6(KO,HO) = 5KCl + KO,ClO_5 + 6HO$. The two salts are easily separated by crystallization, as the chlorate is comparatively insoluble, and the chloride extremely soluble. *Hypochlorite of Potash* (KO,ClO) can only be obtained in solution. Under the title of *Eau de Javelle*, it is sold as a bleaching agent. It is obtained by passing chlorine gas through a cold dilute solution of carbonate of potash, when chloride of potassium and hypochlorite of potash are formed, from which the chloride may be removed by crystallization. The *Phosphates of Potash* formed by the different varieties of phosphoric acid, are sufficiently noticed in the articles PHOSPHATES (in Physiology) and PHOSPHORUS. The *Silicates of Potash* are important compounds in connection with the manufacture of glass; they also enter into the composition of Fuch's *Water-glass*, or *Soluble Glass*, and have been employed by Ransome and others as a coating by which the decay of magnesian and other limestones may be prevented. The *Chromate* and *Bichromate of Potash* are sufficiently noticed in the article CHROMIUM. The haloid salts of potassium may be passed over very briefly. The *Chloride of Potassium* (KCl) is obtained in large quantity in the preparation of chlorate of potash, or may be procured by burning potassium in chlorine gas, when the result of the brilliant combustion which takes place is this salt. In its general characters, it closely resembles common salt (NaCl), except that the former communicates a violet, and the latter a yellow tint to the flame of alcohol. It is a constituent of sea-water, of salt marshes, and of many animal and vegetable fluids and tissues. The *Bromide* and *Iodide of Potassium* are sufficiently noticed in the articles BROMINE and IODINE.

Fluoride of Potassium (KFl) possesses the property of corroding glass. There are no less than five *sulphides of potassium*, commencing with the protosulphide (KS), and terminating with the pentasulphide (KS_5). The latter is the main ingredient in the *Hepar sulphuris*, or *Liver of sulphur*, used in medicine. It is a brown substance, obtained by fusing, at a temperature not exceeding 482°, 3 eq. of potash and 12 eq. of sulphur, the resulting compounds being 2 eq. of pentasulphide of potassium ($2KS_5$) and 1 eq. of hyposulphide of potash (KO,S_2O_2). From this mixture, the pentasulphide may be removed by alcohol, in which it dissolves. The *Yellow* and the *Red Prussiate* (or the *Ferrocyanide* and *Ferridcyanide*) *of Potash* are noticed in the articles FERROCYANOGEN and FERRIDCYANOGEN. The *Cyanide of Potassium* (KCy) may be procured by heating potassium in cyanogen gas, when brilliant combustion occurs, and the resulting product is this salt. It may, however, be more cheaply and easily prepared by Liebig's process, which does not, however, yield it pure, but mixed with cyanate of potash—an impurity which is of no consequence for most of the applications of cyanide of potassium, as, for example, electro-plating and gilding. Eight parts of anhydrous ferrocyanide of potassium are mixed with three parts of dry carbonate of potash; the mixture is thrown into a red-hot earthen crucible, and kept in fusion till carbonic acid gas ceases to be developed, and the fluid portion of the mass becomes colorless. After a few moments' rest, the clear fused salt is decanted from the heavy black sediment, which consists chiefly of metallic iron in a state of minute division. It has recently been derived from an unexpected source. In some of the iron furnaces where raw coal is used for fuel in the hot-blast, a saline-looking substance is sometimes observed to issue in a fused state from the tuyere-holes of the furnace, and to concrete on the outside. Dr. Clark of Aberdeen has shown that this substance is mainly cyanide of potassium. This salt forms colorless deliquescent crystals very soluble in water. It exhales an odor of hydrocyanic acid, and is said to be as poisonous as that acid. Its great deoxidizing power at a high temperature renders it a valuable agent in many of the finer operations of metallurgy.

The following are the ordinary tests for the potassium compounds : 1. Solution of tartaric acid added in excess to a moderately strong solution of a potassium salt, gives after some time a white crystalline precipitate of cream of tartar. See TARTARIC ACID. The result is hastened by stirring or shaking. 2. Solution of bichloride of platinum gives a crystalline yellow precipitate, which is a double salt of bichloride of platinum and chloride of potassium. If not previously acid, the mixture to be tested should be acidulated with hydrochloric acid. See PLATINUM. 3. The violet tint occurring in the presence of potassium in the outer flame of the blowpipe, or in the flame of spirit, has been already noticed. 4. The spectrum of a flame containing potassium exhibits a characteristic bright line at the extreme limit of the red, and another one at the opposite violet limit of the spectrum. See SPECTRUM ANALYSIS.

The British Pharmacopœia contains the following preparations of this metal. *Caustic Potash*, or *Hydrate of Potash* (KO,HO), which occurs in hard white pencils. From its being fused before being poured into the moulds which give it the form of pencils, it is often termed *Potassa fusa*. From its power of dissolving the animal tissues, it is sometimes used as a caustic, although its great deliquescence renders it somewhat difficult to localize its action to the desired spot. In bites of venomous serpents, mad dogs, &c., it may be applied with advantage, and it is useful in destroying warts and fungoid growths of various kinds. It can be employed with greater safety than the lancet in opening certain abscesses, especially those of the liver. *Solution of Potash*, commonly known as *Liquor potassæ*, is obtained by the process already given for the preparation of hydrate of potash—namely, by the action of slaked lime on a boiling solution of carbonate of potash. Its sp. gr. is 1·058, and hence the solution is somewhat weaker than that of the London Pharmacopœia, whose sp. gr. is 1·063, and which, according to the experiments of Mr. Phillips, contains 6·7 grains of potash in 100 grains of the solution. 'One fluid

ounce requires, for neutralization, 48·25 measures of the volumetric solution of oxalic acid.'

Liquor potassæ, in combination with a tonic infusion, is of service in cases of dyspepsia which are accompanied with excessive acidity of the stomach, such, for example, as often occur in habitual spirit-drinkers. It is also frequently given with a view of rendering the urine alkaline, or of diminishing its acidity in cases in which that secretion is too acid. In chronic skin-diseases, especially those of a scaly nature, it often gives relief, if given in full doses, and for a sufficient time; and in chronic bronchitis it is given with advantage for the purpose of diminishing the viscidity of the bronchial mucus. The usual dose is ten drops, gradually increased to as much as a fluid drachm. Infusion of orange peel and table-beer are fluids which conceal its unpleasant taste. Veal-broth has also been recommended as a medicine in which to present it. Its too prolonged use renders the urine alkaline and sedimentary (from the deposit of phosphate of lime), and tends to impoverish the blood. *Sulphurated Potash*, or *Potassa sulphurata* —which is the new name for the sulphuret of potassium, or liver of sulphur (*Hepar sulphuris*)—is obtained by fusing together carbonate of potash, and sublimed sulphur. It occurs in solid greenish masses, which are liver-brown when recently broken. It is alkaline and acrid to the taste, readily forming with water a yellow solution, which has the odor of sulphuretted hydrogen, and evolving that gas freely, on the addition of an excess of hydrochloric acid. It is sometimes given internally in doses of three grains (in the form of a pill made with soap), in obstinate skin-diseases, but is chiefly used as a lotion, bath, or ointment for these diseases. It must be recollected that this compound is an energetic narcotico-acrid poison, its action being very like that of sulphuretted hydrogen. *Acetate of Potash* ($KO,C_4H_3O_3$) is obtained by the action of acetic acid on carbonate of potash, and occurs in white foliaceous satiny masses. In its passage through the system, it is converted into carbonate, and thus renders the urine alkaline. In small doses, as from a scruple to a drachm, it acts as a diuretic, and is of service in some forms of dropsy. Combined with other potass-salts, it is much given in acute rheumatism.

Carbonate of Potash ($KO,CO_2 + 2Aq$) is employed in medicine in the same cases as those in which solution of potash is used. In large doses, it acts, like caustic potash, as an irritant poison. It is frequently employed in the preparation of effervescing draughts, 20 grains of this salt being neutralized by 17 grains of citric acid, or 18 grains of tartaric acid, or by half a fluid ounce of lemon-juice. *Bicarbonate of Potash* ($KO,HO,2CO_2$) may be used in the same cases as the carbonate or solution of potash. It is chiefly used for the manufacture of effervescing draughts, 20 grains of the crystallized salt being neutralized by 14 of citric acid, 15 of tartaric acid, and 3½ drachms of lemon-juice. *Chlorate of Potash* (KO,ClO_5) is prescribed with advantage in diseases of a low type, such as scarlatina maligna, cancrum oris, diphtheria, scurvy, &c. As it is eliminated unchanged by the kidneys, its *modus operandi* is unknown. It may be prescribed in doses of from ten to twenty grains three times a day in a solution. *Citrate of Potash* ($3KO, C_{12}H_5O_{11}$) is obtained by neutralizing a solution of citric acid with carbonate of potash, filtering and evaporating to dryness, when the salt is deposited as a white powder of a saline, feebly acid taste, deliquescent, and very soluble in water. It is procured *extempore* in a state of solution in the effervescing draughts for which we have given prescriptions in our remarks on the carbonates of potash. It acts mildly on the skin, bowels, and kidneys, whose secretions it promotes, and is an excellent cooling diaphoretic in fevers with a hot and dry skin, being less liable to act on the bowels than the tartrate or acetate of potash. In irritability of the stomach, it is an excellent remedy, when given as an effervescing draught. It may be taken in doses of a scruple or half a drachm in solution every few hours. The therapeutic uses of *nitrate of potash* are noticed in the article NITRE. *Sulphate of potash* (KO,SO_3) is useful as a mild laxative, a scruple of this salt, especially if combined with ten grains of rhubarb, usually acting mildly and efficiently. It has considerable power in repressing the secretion of milk, and has been much used for this purpose.

The uses of the *tartrates of potash* are noticed in the article TARTARIC ACID. *Bromide of Potassium* (KBr) occurs in white, transparent, cubical crystals, and is occasionally employed in enlargement of the spleen and in certain forms of epilepsy. The uses of *iodide of potassium* are described in the article IODINE.

POTASH-WATER. See AERATED WATERS.

POTA'TO (*Solanum tuberosum;* see SOLANUM), one of the most important of cultivated plants, and in universal cultivation in the temperate parts of the globe. It is a perennial, having herbaceous stems, 1—3 feet high, without thorns or prickles; pinnate leaves with two or more pair of leaflets and an odd one, the leaflets entire at the margin; flowers about an inch or an inch and a half in breadth, the wheel-shaped corolla being white or purple, and more or less veined; followed by globular, purplish fruit, of the size of ordinary gooseberries; the roots producing tubers. The herbage has a slightly narcotic smell, although cattle do not refuse to eat a little of it, and the tender tops are used in some countries like spinach. The tubers are, however, the only valuable part of the plant.

The P. is a native of mountainous districts of tropical and subtropical America, probably from Chili to Mexico; but there is difficulty in deciding where it is really indigenous, and where it has spread after being introduced by man. Humboldt doubted if it had ever been found truly wild; but subsequent travelers, of high scientific reputation, express themselves thoroughly satisfied on this point. Except that the tubers are smaller, the wild plant differs little from the cultivated. Maize and the P. are the two greatest gifts which America has given to the rest of the world.

The P. has been cultivated in America, and its tubers used for food, from times long anterior to the discovery of America by Europeans. It seems to have been first brought to Europe by the Spaniards, from the neighborhood of Quito, in the beginning of the 16th c., and spread from Spain into the Netherlands, Burgundy, and Italy, but only to be cultivated in a few gardens as a curiosity, and not for general use as an article of food. It long received throughout almost all European countries the same name with the Batatas (q. v.), or Sweet Potato, which is the plant or tuber meant by English writers down to the middle of the 17th c., in their use of the name potato. It appears to have been brought to Ireland from Virginia by Hawkins, a slave-trader, in 1565; and to England by Sir Francis Drake, in 1585, without attracting much notice, till it was a third time imported from America by Sir Walter Raleigh. It was still a long time before it began to be extensively cultivated. Gerard, in his *Herball*, published in 1597, gives a figure of it under the name of *Batata Virginiana;* but so little were its merits appreciated, that it is not even mentioned in the *Complete Gardener* of London and Wise, published more than a century later, in 1719; whilst another writer of the same time says it is inferior to skirret and radish! It began, however, to be imagined that it might be used with advantage for feeding 'swine or other cattle,' and by and by that it might be useful for poor people, and for the prevention of famine on failures of the grain-crops. The Royal Society took up this idea, and in 1663, adopted measures for extending the cultivation of the P., in order to the prevention of famines. To this the example of Ireland in some measure led, the P. having already come into cultivation there, to an extent far greater than in any other European country, and with evident advantage to the people.

From Ireland, the cultivation of the P. was introduced into Lancashire about the end of the 17th c., soon became general there, and thence spread over England; so that, before the middle of the 18th c., it had become important as a field-crop, which it became in the south of Scotland some 20 or 30 years later; about the same time, in Saxony and some other parts of Germany; but not until the latter part of the century, in some other parts of Germany and in France. In France, the extension of P. culture was very much due to the exertions of Parmentier. In some parts of Germany, the governments took an interest in it, and promoted it by compulsory regulations.

The P. is of great importance as affording food both for human beings and for cattle; and next to the principal cereals, is the most valuable of all plants for human food. It is also used for various purposes in the arts. No food-plant is more widely diffused; it is cultivated in subtropical countries; and struggles for existence in gardens, even within the arctic circle, yielding small and watery tubers; although the effects of late spring frosts, or early autumnal frosts, upon its foliage, often prove that it is a plant properly belonging to a climate milder than that of most parts of Britain. No more important event of its kind has ever taken place than the general introduction of P. culture into the husbandry of Britain and other European countries. It has exercised a most beneficial influence on the general welfare of the people, increasing national wealth, and preventing, as a few far-seeing thinkers had anticipated, the once-frequent returns of famine. That in 1846 and 1847, terrible famine resulted in Ireland and elsewhere from the failure of the P. crop itself, was owing only to the excess to which its cultivation had been carried. The results confirmed two great laws, that plants long very extensively or almost exclusively cultivated in any district, however successfully they may be cultivated for a time, are sure to fail at last; and that the exclusive, or almost exclusive dependence of a people on one source or means of support, is unfavorable to their welfare in respect to all their interests.

Humboldt calculates that the same extent of ground which would produce thirty pounds of wheat, would produce one thousand pounds of potatoes. But potatoes are not nearly so nutritious as wheat, and the constant employment of them as the chief article of food, is not favorable to the development of the physical powers, and is consequently in its protracted influence

unfavorable to mental energy. All this is too well illustrated in Ireland and the Highlands of Scotland, in a race capable of the highest development of both. It is calculated that 100 parts of good wheat-flour, or 107 parts of the grain, contain as much actual nutriment as 613 parts of potatoes. The inferiority of the P. in nutritious power is very much owing to the comparatively small quantity of nitrogenous substances which it contains, in consequence of which it is most advantageously used along with some very nitrogenous article of food, in Britain generally with animal food, in some parts of Europe with curds or with cheese. The P. tuber, in a fresh state, contains about 71—80 per cent. of water; 15—20 of starch, 3—7 of fibre or woody matter, 3—4 of gum, dextrine and sugar, and 2 of albumen, gluten, and casein. There are considerable differences, however, in different varieties, in different stages of maturity, and in different soils and seasons.

Potatoes are used, both raw and boiled, for the feeding of cattle. For human food, they are variously prepared by roasting or boiling, but now chiefly by boiling, a process by which they are freed from all that is narcotic and noxious in their juice. The water in which potatoes have been boiled is not wholesome, and those modes of preparing them for the table which do not admit of its complete rejection, ought to be avoided.

The herbage or haulm of the P. has been used for making paper, but the results were not encouraging. The berries are sweetish, but not pleasant; nauseous when fermented, but yield by distillation a tolerable spirit.

The varieties of the P. in cultivation are extremely numerous. Any enumeration or classification of them is impossible. New ones are continually appearing, and old ones passing away. Those most advantageously cultivated in particular soils and climates, are often found to degenerate when removed to a small distance. Many of the new varieties of P. are raised in Lancashire, but particularly of the garden kinds, which generally differ from those preferred for field-culture in their greater earliness, and not unfrequently in their inferior productiveness, and in their being less *mealy* and less nutritious. Potatoes differ considerably in the character of their herbage—which is sometimes erect, sometimes straggling—and in the size and color of their flowers; but are more generally distinguished by the size, form, and color of their tubers, which are round, long, or kidney-shaped, white, red, dark purple, variegated, &c.

New varieties of P. are produced from seed; but potatoes are ordinarily propagated by planting the tubers, or cuttings of the tubers, each containing an *eye* or bud. Late crops of early potatoes are sometimes procured by cuttings of the stalks or by layers; methods which might probably be pursued with more advantage where the summer is longer than in Britain. Much has been written by gardeners and agriculturists on the comparative advantages of planting whole tubers or cuttings; but the latter method generally prevails.

Potatoes are planted in drills, made either by the spade or plough; or in *lazy beds*, which are always made by the spade, and are beds in which the sets of potatoes are covered over with earth dug out of the alleys. The alleys serve, although imperfectly, for drains in undrained land. The cultivation of potatoes as a field-crop seems to have been first attempted in lazy beds. They are still common in many parts of Ireland, but are now rare in most parts of England and Scotland. They are very suitable for strong, heavy, and somewhat moist land, and are profitably used in reducing some kinds of soil to cultivation, but are generally unsuitable for field-culture, owing to the expense of labor required. In strong heavy land, potatoes are cultivated in raised drills; in lighter and drier soils, the raising of the drills is unnecessary. Manure is generally given, consisting generally of dung and well-rotted straw from the farm-yard. Guano and other strong artificial manures are apt to produce an excessive growth of stalks and leaves, which is to be guarded against by diminishing or even withholding manure in certain soils; potatoes of too luxuriant growth being always particularly liable to diseases. The cultivation of potatoes, after they are planted, whether in the field or garden, consists chiefly in keeping the ground clear of weeds, and in earthing up the plants, to promote the formation of tubers. Potatoes are taken up either by the fork or by turning over the drills with the plough. Garden potatoes are generally used long before they are really ripe, forming a favorite dish in a very unripe state, when they are far from being a safe article of food, and contribute not a little to the prevalence of cholera and kindred diseases in summer.

Field potatoes, unless when intended for the supply of the markets of towns, like garden potatoes, are allowed to ripen thoroughly, and are then capable of being stored for winter and spring use. Early potatoes are forced in hot-beds, and in the spare ground of hothouses, that they may be obtained very early; also, after being thus brought forward in some degree, they are planted out in gardens, for a succession of young tubers. The planting of potatoes in the open air cannot be successfully practiced in most parts of Britain before February or March, and in many seasons the later-planted are found as early as the earlier-planted, and more productive. The storing of potatoes is variously accomplished in dry lofts or sheds, in airy cellars or barns, and in *pits*, which are sometimes holes excavated to a small depth in the earth, and the potatoes piled up above the surface of the ground, in a conical, or in a roof-like form, sometimes mere heaps of one or other of these forms upon the surface of the ground, and covered with straw and earth to keep out light and frost. The access of light makes potatoes green, bitter, and unwholesome, as is often seen in those which, whilst growing, have been partially above ground. P. pits are often ventilated by means of pipes, as without ventilation the potatoes are apt to heat and sprout. Potatoes taken from the ground before they are quite ripe are extremely apt to heat and sprout.

The P. crop is now an important one in almost all the rotations practised in Britain, although its cultivation is in most districts not quite so extensive as before its failure from the *P. disease* in 1845 and subsequent years, and farmers are more careful not to depend too much upon it. It very commonly succeeds a grain-crop, but sometimes is advantageously planted on land newly broken up from grass.

The P. is subject to a number of diseases, of which the most important is the *P. Disease* (q. v.) or P. Murrain. Before it began to prevail, the chief diseases affecting the P. were those called *Curl*, *Scab*, *Dry Rot*, and *Wet Rot*. Of all these diseases, it would seem that one principal cause, however combined with other causes, is the exhaustion of the vegetative powers of the plant, from frequent propagation by tubers or cuttings of tubers. It is to be borne in mind that propagation by tubers is not properly reproduction, but one plant is divided into a multitude; and the whole analogy of nature seems to show, that although it may live longer in this way and more healthfully than if left to the spot where its seed first germinated, its existence will come to an end, and the species must be preserved by reproduction from seed. It was long since observed as to CURL, the dread of farmers and gardeners before the *P. disease* was known, that it most readily attacks potatoes which sprung from weak sets. Curl is a disease affecting the foliage and general health of the P. plant, and does not seem to be necessarily connected with the presence of any vegetable parasite or insect enemy.—SCAB is a disease of the tubers, which become covered with brown, oblong, and finally confluent and cup-shaped spots, whilst under the surface is a powdering of minute olive-yellow grains, a fungus called *Tubercinia Scabies*, of the division *Hyphomycetes*.—DRY ROT is also ascribed to the growth of a fungus of the same order, *Fusisporium Solani*, and attacks the tubers either when stored for winter or after being planted. It was very carefully investigated by Martius, and described in a memoir published in 1842. It was first observed in Germany in 1830, and caused great loss in that country throughout many years.

The tissues of the P. tuber become hardened and completely filled with the mycelium of the fungus, which at last bursts forth in little cushion-shaped tufts loaded with fructification.—WET ROT differs from Dry Rot in the tubers becoming soft and rotten instead of hard and dry, and is always characterized by the presence of a fungus referred by Fries to his genus *Periola*, but which Berkeley regards as another form or stage of the same fungus which causes or is inseparably connected with Dry Rot. Both Dry Rot and Wet Rot have often been observed along with the *P. disease*, which, however, is always characterized by the presence of another peculiar fungus.

But, besides its value as a culinary vegetable, the P. is important in other respects. Its starch is very easily separated, and is in large proportions; hence it is cheaper than any other kind. It is manufactured on a very large scale both in this country and on the continent. It is chiefly used in textile manufactories under the name of *farina*, which is converted into dextrine or British gum. See STARCH. In Holland and in Russia, where there is much difficulty in keeping potatoes through the winter, and there is consequently a necessity for using the crop quickly, large quantities of starch are made, and this is converted into sugar or syrup. See SUGAR. The refuse of the starch-manufactories is all economized; it is pressed out from the water, and either used for pig-feeding or for manure. In the north of Europe, much spirit for drinking is made from potatoes; it is called Potato Brandy.

POTA'TO-BEETLE. See COLORADO-BEETLE.

POTATO DISEASE, or POTATO MURRAIN. No subject connected with Agriculture or with Botany has given rise within so short a time to so extensive a literature as this. It has been treated in books and pamphlets, and in magazines and periodicals of every kind. The terrible famines caused by the failure of the potato crop in Ireland and other countries, particularly in 1846 and 1847, concentrated upon it the attention of the whole civilized world; and yet it remains very obscure.

The potato disease seems to have been at first confounded with Dry Rot and Wet Rot (see POTATO), which appeared a

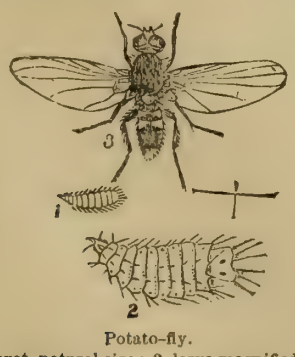
number of years before it to a formidable extent, although not to be compared with it in their ravages. This fact—and all the more if the potato disease is to be ascribed to the presence of a different and peculiar fungus—may perhaps be held as giving support to the opinion that its chief cause was really the weakening of the plant through too constant cultivation on the same land, and continued propagation by tubers alone.

The potato disease was first observed in Germany, and first assumed a very serious character near Liége in 1842. In 1844 it broke out in Canada, and all at once proved very destructive. In 1845, it was first noticed in England, and first in the Isle of Wight. But during that year, its ravages were considerable in the British Islands; much more so in the year following, when the Irish famine was the consequence, and in the same year it prevailed very extensively over almost all parts of Europe. The summer was unusually cloudy and moist, a circumstance probably not without its effect. In 1847, the disease was still prevalent but to a smaller extent; and since that time its prevalence has gradually diminished, although it occasionally breaks out in particular localities. Meanwhile, it is to be observed, that almost all the varieties of potato cultivated to any considerable extent before 1846, have disappeared, and been replaced by others. Lest too much, however, should be inferred from this in favor of a particular theory, it must also be stated, that potatoes newly raised from seed were sometimes severely attacked by the disease during the period of its greatest prevalence.

No fully satisfactory theory as to its cause or origin has been proposed. That it has long existed in the western parts of America, may probably be true, as has been alleged, although the distinction between it and other diseases of the potato might not perhaps be noted with sufficient care; but even this would not account for its sudden appearance and terrible devastations in other parts of the world. Many observers ascribed it to insects and *acari*, some even to infusoria in the tissues, but the presence of none of these was found to be constant, and they appeared therefore rather to be the consequences than the cause of the disease. It is otherwise with the fungus, *Botrytis infestans* (see BOTRYTIS), which is always present, although probably, like other parasites, it generally attacks an already weakened plant. The disease generally first appears in the leaves, and thence extends to the tubers, although it has been sometimes observed to appear in the tubers of some of the early kinds of which the leaves have perished before the season when it breaks out. It sometimes also lies dormant in the tubers for months, so that after being stored apparently sound in autumn, they become diseased in the following spring. When the disease appears in the growing plant, brown spots are first to be noticed on the margins of the leaves, corrugating the leaves as they spread. Very rapid extension of the disease, and decay of the leaves and stalks often ensue. It is on the under surface of the leaf that the *Botrytis* is found; it abounds also in the diseased tubers, which, when cut, produce an abundant crop of it from the fresh surface, and it sometimes vegetates even from the natural surface. The same fungus has been found in the berries of the Tomato (q.v.) when diseased, and on the leaves of other plants of the natural order *Solaneæ*, but never on any plant not of that order. See COLORADO BEETLE.

The starch granules which exist within the cells of potatoes seem not to be affected by the potato disease, but remain unaltered in quality, so that as good potato starch is made from unsound as from sound tubers. On occasion of the great ravages of the disease in 1846, however, advantage was but partially taken of this fact, partly from ignorance of it; partly from an apprehension, apparently quite unfounded, that the starch might prove unwholesome; and partly from the want of machinery to grate down the diseased potatoes before rottenness had involved the whole.

POTATO-FLY (*Anthonyia tuberosa*), a dipterous insect of the



Potato-fly.
1, Larva or maggot, natural size; 2, larva magnified; 3, Potato-fly.

same genus with the Beet-fly, Cabbage-fly, Turnip-fly, &c. In its perfect state, it is very like the House-fly. The male is about five lines long, grayish-black, bristly, with five indistinct broad stripes on the back, and four ochreous spots on the second and third segments; the female ashy-slate color, with two indistinct ochreous spots on the second abdominal segment. The maggots are very abundant in bad potatoes in autumn, and are very different from the maggots of the House-fly, being horny, spiny, bristly, and tawny; the long tail ending in six long bristles. The pupa is very like the larva.

POTCHEFSTROOM, or POTSCHERFSTROOM, a town in the Transvaal, South Africa, on the Mooi River, and about 25 miles north of the Vaal River. A British garrison at P. surrendered to the Boers in 1881. Pop. 3900.

POTCHI'NKY, a town of Russia, in the government of Nijni-Novgorod, 800 miles south-east from St. Petersburg. Pop. (1880) 7224.

POTEMKIN, GREGORY ALEXANDROVITCH, the most celebrated of the Czarina Catharine II.'s favorites, was born near Smolensk in September 1736. He was descended of a noble Polish family, and at an early age entered the Russian army, and rose to be ensign in the imperial horse-guards. Happening to attract the notice of the czarina by his noble appearance and handsome athletic figure, he was forthwith (1762) attached to her household, and appointed colonel and gentleman of the bed-chamber. After a time (1774), he superseded Gregory Orlov (q. v.) in the good graces of the czarina, and became her favorite and avowed lover. He played the part of lover for only two years, when he was superseded by a younger and more amiable successor; but the ascendency which he had acquired over the czarina was in nowise affected by this change. He knew well how to flatter her vanity, rouse her fears, and make her believe that he alone could protect her from the numerous conspiracies (some of which were real, and many mythical) which were being constantly formed against her. Catharine submitted to all his caprices, consulted him in everything, and was in almost all cases guided by his advice. P. was consequently, from 1770 till the year of his death, the true representative of the Russian policy in Europe; and Frederick the Great of Prussia, and even the haughty Hapsburgs, Maria Theresa and Joseph II., cringed at his feet, and, at the demand of the czarina, loaded him with titles and honors; though, much to his chagrin, he failed to obtain the English order of the Garter, and the French one of the Holy Spirit.

P. interfered little with the internal government of Russia, beyond offering many valuable suggestions for the development of manufactures and industry, which were carried out; his important achievements being connected with the foreign policy of Russia, especially as far as it related to Turkey. It was at his instigation that the Turks were forced into war, and robbed of their territories north and east of the Black Sea, in order that Russia might possess a southern sea-board; and after this had been done P. immediately ordered the creation of a Black Sea fleet, and the building of Kherson, Kertch, Nikolaiev, and Sebastapol. For his services, he was created governor of the Taurida (q. v.), and loaded with numerous honors and presents. In 1787, Catharine paid a visit to him at his government, and the 'hoax' which he played off on his sovereign is well described by De Segur. He caused an immense number of wooden painted houses to be constructed, and grouped into towns and villages along the route the czarina was to take, and hired people to act the part of villagers, merchants, tradesmen, and agriculturists, engaged in their various pursuits. The czarina's vanity was hugely gratified at the seeming improvements of the country under her rule, and P. was rewarded for his dexterity by further honors and emoluments. Almost immediately after this, a war broke out with the Turks, and P. was placed at the head of the army, with Suwarof and Repnin for his lieutenants. His career was one of uninterrupted victory. Bessarabia and the two principalities were conquered, and he was about to advance on Constantinople, when the empress commanded a cessation of hostilities; but before P. had time to bring her round to his own views, he was seized with sudden illness on the road between Jassy and Nikolaiev, and died there, October 15, 1791.

PO'TENT, CROSS, in Heraldry, a cross crutch-shaped at each extremity. It is also called a Jerusalem cross, from its occurrence in the insignia of the Christian kingdom of Jerusalem, which are, Argent, a cross potent between four crosslets or. This coat is remarkable as being a departure from the usual heraldic rule which prohibits the placing of metal upon metal.

POTENT COUNTER-POTENT, one of the heraldic furs, in which the field is filled with crutch-shaped figures alternately of metal and color, those of opposite tinctures being placed base against base, and point against point. The metal and color are understood to be argent and azure, unless they be specially blazoned otherwise. Potent counter-potent is sometimes blazoned Vairycuppy.

POTENTÉE, a heraldic line of division which takes the form of the outline of a succession of crutch shaped figures.

POTENTI'LLA, a genus of plants of the natural order *Rosaceæ*, suborder *Potentilleæ*, differing from *Fragaria* (Strawberry) in the fruit having a dry instead of a succulent receptacle. The species are very numerous, natives chiefly of northern temperate regions, and some of them of the coldest north; most of them perennial herbaceous plants, with yellow, white, red, or purple flowers, and pinnate, digitate, or ternate leaves. They are often called CINQUEFOIL (Fr. five-leaved); and some of the species are favorite garden flowers. A few are natives of Britain; one of the rarest of which is a shrubby species (*P. fruticosa*), forming a large bush, with pinnate leaves, and a profusion of yellow flowers, often planted in shrubberies.

P. reptans, a common British species, with creeping stems, digitate leaves, and yellow flowers, once had a high reputation as a remedy for diarrhœa, from the astringent property of its root, of which most of the species partake with it. But *P. anserina*, a very common British species, popularly known as SILVERWEED, having creeping stems, yellow flowers, and pinnate leaves, which are beautifully silky and silvery beneath, has an edible root, with a taste somewhat like that of the parsnip. Swine grub it up with avidity, and it was once much esteemed as an article of food in some parts of Scotland, particularly in the Hebrides, where it abounds and has been a resource in times of famine.—The name P. is said to be derived from the Latin *potens*, powerful, and to allude to medicinal virtues now known to merit little regard. Tormentil (q. v.) is sometimes referred to this genus.

POTE'NZA (anc. *Potentia*), in South Italy, the chief town of the province of Potenza, is situated on a hill of the Apennines, near the river Vasente or Basento, 54 miles east of Salerno. Pop. 18,500. It is surrounded by a wall, has a fine cathedral of the Doric order, and is the seat of an archbishop. P. was shaken by earthquakes in 1273, 1694, and 1812. The province of P., which as a *compartimento* of the kingdom, is called Basilicata, used to suffer severely from brigandage.

POT-HERBS are not, as might be supposed from the name, the vegetables chiefly used for culinary purposes as supplying articles of food, but rather those which are of secondary importance, and valuable chiefly for flavoring, as parsley, fennel, &c.

POT-METAL is an alloy of lead and copper, obtained by throwing lumps of copper into red-hot melted lead. It is of a gray color, brittle and granular.

POTO'MAC, a river of the United States, formed by two branches, which rise in the Alleghany Mountains, and unite 20 miles south-east of Cumberland, Maryland, from which point the river flows in a generally south-easterly course, 400 miles and falls into Chesapeake Bay, where it is 6 to 8 miles broad, 75 miles from the ocean. Line-of-battle ships ascend to Washington, 120 miles from its mouth, and the tide reaches Georgetown. Between Westport and Washington, 220 miles, it falls 1160 feet. The scenery in this portion of its course is wild and beautiful, especially where it breaks through the Blue Ridge at Harper's Ferry. Its principal affluents are the Shenandoah, Savage, Monacacy, and Acquia Creek. The P. forms the greater part of the boundary between Virginia and Maryland. During the war which began in 1861, both Federal and Confederate armies crossed several times the fords of the Upper Potomac, and severe actions were fought upon its banks.

PO''TOROO, or KANGAROO RAT (*Hypsiprimnus*), a genus of marsupial quadrupeds, of the family *Macropidæ* (see KANGAROO), differing from kangaroos chiefly in having distinct canine teeth in the upper jaw. The first pair of incisors in the upper jaw are also longer and larger than the others. The molars decrease in size backwards; and when not worn, present four blunt tubercles. The fore-limbs are proportionally longer, the hinder-limbs less powerful than in the kangaroos. The general form and habits are similar; there is the same sitting on the hind-feet with help of the tail for support, and a somewhat similar hopping, but not nearly an equal power of vigorous leaping. The stomach is large, and divided into two sacs, with several inflations; the food entirely vegetable. There are several species, all of small size, none of them larger than a rabbit, and all natives of Australia, timid and harmless creatures. They are generally clothed with a dense, and sometimes a beautiful fur; but the tail is nearly destitute of hairs, and scaly.

POTO'SI, one of the richest mining-towns of South America, the second town of Bolivia, and capital of a department of the same name, stands in a dreary and barren district, 13,330 feet above sea-level, in lat. 19° 35′ S., and long. 65° 25′ W., 70 miles south-west of Chuquisaca. It covers a large area, and in 1611, its population was 170,000, but in 1865 it was 25,774, and great part of the town was in ruins. In its center is a large square, around which are ranged the principal public edifices, as the government-house, town-house, cathedral, &c. The mint is a large building, in which the average amount now coined amounts to about 2,000,000 dollars annually. In the central square, an obelisk in honor of Bolivar was erected in 1825. English and French manufactures are imported; and as the country in the vicinity produces little or nothing, all supplies have to be brought from a distance. The Cerro (sierra) de Potosi, or Silver Mountain, is 15,200 feet high. Its summit is honey-combed with upwards of 5000 mines, and operations are now carried on at a lower level, where the inrush of water, however, often compels the miners to abandon the richest mines. The quantity of silver extracted from the mines of this mountain has amounted in one year to the sum of £330,544,311 sterling. In 1880 the population of P. was quoted at 22,580.

POT-POURRI, in French, the name of a mixture of sweet scented materials, chiefly flowers, dried, and usually placed in a vase with a perforated lid, in order that their perfume may be diffused through rooms in which it is placed. The principal ingredients are rose-petals, lavender flowers and stalks, violets, jessamine flowers, woodruff leaves, cloves, orris-root, pimento, musk, sandal-wood raspings, cedar-shavings, &c. But it also signifies a dish of different sorts of viands, and corresponds, in this sense to the *hotch-potch* of Scotland, and the *Olla Podrida* (q. v.) of Spain.

POT-POURRI, in Music, a selection of favorite pieces strung together without much arrangement, so as to form a sort of medley.

PO'TSDAM, a city in the Prussian province of Brandenburg, and, next to Berlin, the handsomest and best built town in Prussia, is situated on an island at the point of junction between the small stream of the Nuthe and the river Havel, 16 miles south-west of Berlin. Population in 1871, 43,784 (with 5475 soldiers); in 1880, 48,447. P. is the usual summer residence of the royal family of Prussia, and seat of the imperial court. The city is divided into old town and new town, and has four suburbs. The streets are broad and regularly built, and there are fine squares, some of which are planted with trees, forming pleasant public walks. Of the many large and handsome buildings, one of the most worthy of notice is the old royal palace, an oblong parallelogram, three stories high, with a magnificent colonnade facing the fine Havel Bridge. P. has several benevolent and educational institutions connected with the state, as, for instance, two asylums for the orphan children of military men, and one for those of persons belonging to the civil service; schools for cadets, subalterns, and privates; the Luisendenkmal, an institution for providing for indigent girls of irreproachable character; a gymnasium, a high-school, and various other training and special schools. Among the churches, the most noteworthy are the Garnisonskirche, with a tower 400 feet high, a fine chime of bells, and a noble marble pulpit, below which rests the remains of Friedrich-Wilhelm I. and Friedrich II., and St. Nicolai's, lately rebuilt after the model of the Pantheon at Paris.

The Brandenburger-Thor, which is the handsomest of the various gates, is a triumphal arch copied from Trajan's Arch at Rome; and this, like the other gates, opens upon a fine allée of trees. P. is surrounded with pleasant public walks and gardens, wooded heights, and vine-covered banks; while in the immediate neighborhood are numerous royal country palaces, as Sans-Souci, the favorite residence of Frederick the Great, surrounded by a fine park, pleasure-grounds, and choicely-stocked gardens, near which stands the Ruinenberg, with artificially constructed ruins, designed to conceal the water-works which supply the fountains of the palace. Near the park is the New Palace, begun in 1763, 680 feet in length, containing nearly 100 rooms, many of which are filled with costly works of art. Near Sans-Souci is Charlottenhof, built by the late king, a pleasant villa, with lovely gardens, in which stands a Pompeian house. The Russian colony of Alexandrowska, with its Russian houses and Greek church, lies near the Pfingstberg, which is surmounted with an unfinished palace, from whence a fine view is obtained of the numerous royal parks and gardens, and the surrounding country. In the New Garden stands the Marble Palace, with arcades adorned with frescoes of the *Nibelungen Lied*.

P. is the seat of the provincial government, and of several of the state manufactories. Of these, the most important is the manufactory of arms, at which the rifles for the army are made. There are also numerous private manufactories of machinery, chocolate, tobacco, cotton goods, silk, leather, wax-cloth, beer, &c.

P. owes its creation as a town to the great elector, Friedrich-Wilhelm, who built a royal palace here between 1660 and 1673, and laid out several good streets. Prior to that period, it was an insignificant fishing village, built on the site of an ancient Wendish settlement.

POTSDAM, a township and village in New York, U.S., on Racket River, St. Lawrence County, in the northern portion of the state, between Lakes Ontario and Champlain. There are quarries of sandstone, mills and factories on the falls of the river, a railway connecting it with Watertown, a bank, and six churches. Pop. (1870) 7774.

PO'TSTONE, *Lapis Ollaris* of the ancient Romans, a variety of Talc (q. v.), or rather a mineral formed by a mixture of talc with chlorite, &c. It is generally of a grayish-green color, sometimes dark green. It occurs massive, or in granular concretions. It is soft and easily cut when newly dug up; greasy to the touch, and infusible even before the blowpipe. It becomes hard after exposure to the air. It is made into pots and other household utensils, which communicate no bad taste to anything contained in them, and when greasy are cleaned by the fire. It was well-known to the ancients; and Pliny describes the manner of making vessels of it. It was anciently procured in abundance in the isle of Siphnos (now Siphanto), one of the Cyclades, and in Upper Egypt. Large quarries of it were wrought on the Lake of Como, from about the beginning of the Christian era, to 25th August 1618, when they fell in, causing the destruction of the neighboring town of Pleurs, in which it was wrought into culinary vessels, slabs for ovens, &c. It is quarried in the Valais, where it is called *Giltstein;* in Norway, Sweden, Greenland, and near Hudson's Bay, &c. 'Should you again visit Italy, and pass by the Great St. Bernard, if the cold of that frigid region should induce you to warm yourself in the refectory of the hospitable monks of the convent, you will there see a stove of poststone.'—*Jackson on Minerals and their Uses.*

POTT, Aug. Friedr., a distinguished philologist, was born at Nettelrede in 1802, attended school at Hanover, studied theology and philology at Göttingen (1821), and finally (1833) became professor of the science of language in the university of Halle. Next to W. Humboldt, Bopp, and Grimm, the name of P. stands prominent in the new science of comparative philology. The foundation of his reputation was laid by his *Etymologische Forschungen* (Etymological Researches, 2 vols., Lemgo, 1833—1836), a work second in importance only to Bopp's *Comparative Grammar.* In a well-known article in Ersch and Gruber's Encyclopædia, *Indogermanischer Sprachstamm* (2d sect. vol. 18), he gave a masterly sketch of the Aryan Languages (q. v.). In numerous articles in periodicals, and in separately published treatises (e. g., *De Borussico-Lithuanicæ tam in Slavicis quam in Letticis Linguis Principatu,* Halle, 1837—1841; and *Die Zigeuner in Europa und Asien,* 2 vols. Halle, 1844—1845), he carried his researches into special fields of this great province. *Die Quinare und Vigesimale Zählmethode* (The Quinary and Vigesimal Notation, Halle, 1847), and *Die Personennamen* (Proper Names, Leip. 1853), are admirable treatises, containing an overwhelming mass of information, and showing an astonishing knowledge, not only of the Aryan languages, but of other Asiatic, African, and American races. In 1856 he published a work on the *Difference of Races from a Philological Point of View,* and in 1868 one on the *Diversities of European Languages.*

POTTER, John, D.D., an English scholar and divine, the son of a linen-draper of Wakefield, in Yorkshire, was born in 1674, studied with great diligence and success at Oxford, where he took his degree of M.A. in 1694, and in the same year went into orders. He was appointed chaplain to Queen Anne in 1706, professor of divinity at Oxford in 1708, bishop of Oxford in 1715, and finally in 1737 attained the highest dignity in the English Church—the archbishopric of Canterbury. He died Oct. 21, 1747, and was buried at Croydon. P. was really a superior scholar, but of the dull and plodding sort. Nowhere does he flash a ray of clear searching intelligence on his subject; his habit of mind is quite uncritical, and consequently his learned labors, though creditable to his industry, have added nothing to our knowledge, and have now 'followed' their mediocre author into something very like oblivion. P.'s principal work is his *Archæologia Græca* ('Antiquities of Greece,' 2 vols. 1698), superseded for many years by Dr. W. Smith's *Dictionary of Greek and Roman Antiquities;* besides which, however, we may mention his edition of *Lycophron* (1697), and of *Clemens Alexandrinus* (1715). As a church dignitary, the linen-draper's son is said to have been haughty; he was likewise very 'zealous' in matters ecclesiastical, a vigilant guardian of clerical interests, and strictly, perhaps we may even say excessively, orthodox.

POTTER, Paul, one of the most distinguished masters of the Dutch school. He was born at Enkhuyzen in 1625, and was the pupil of his father, Pieter Potter, an obscure painter. His progress was so rapid, that by the time he had attained the age of 15, his reputation as an artist was high. He left Amsterdam, and established himself at the Hague, where, in 1650, he was married; in 1652, however, he returned to Amsterdam, at the solicitation of the burgomaster Tulp, who commissioned him to paint a great number of works; but his health, which was delicate, gave way under constant application at his easel, and he died before he had completed his 29th year. Paul P.'s cattle-pieces are perhaps more highly valued than like pictures by any other master.

POTTERIES, The, a district in Staffordshire nine miles long, including Hanley, Burslem, Fenton, and other places, now incorporated with the parliamentary borough of Stoke-upon-Trent. The inhabitants of the district are mostly connected with the manufacture of pottery.

POTTER'S CLAY or FIGULINE, a kind of Clay (q. v.); either slaty and massive, or more generally, earthy; yellow, yellowish-white, gray, or sometimes greenish; adhering strongly to the tongue, and forming a paste with water. The earthy variety is sometimes very loose, sometimes almost solid. P. C. is a mineral of very common occurrence in alluvial districts, and sometimes occurs in beds of considerable thickness. It occurs in many parts of Britain. It is used in potteries for the manufacture of earthenware; the different varieties of it being adapted to different kinds of earthenware. Houses are built in Egypt of pots of this material.—P. C. is also employed in agriculture for the improvement of light sandy and calcareous soils.

PO'TTERY. This term—derived, through the French *poterie,* from the Celtic word *pot,* which has passed into Teutonic and Romance tongues—is applied to all objects of baked clay. The invention of pottery dates from the most remote period, and its application is almost universal—objects of pottery being in use amongst races even semi-barbarous. The art of moulding or fashioning vessels of moist clay, and subsequently drying them in the sun, is so obvious, that it is not above the intelligence of the rudest savage. Hence, at the most remote antiquity, the Egyptians, to whom precedence must be assigned in this art, made bricks of unbaked or sun-dried clay, cemented with straw, which were quite sufficient for the purposes of construction in a country where little or no rain falls. These bricks, in shape resembling those in use at the present day, but of larger dimensions, were impressed, at the earliest period, with the marks of the brick-maker, and later, with the names and titles of the kings for whose constructions they were made. The oppression of the Hebrews chiefly consisted in compelling them to work in the brick-fields—a task imposed on captives taken in war and reduced to slavery;



Fig. 1.—Unglazed Egyptian Bottle in the British Museum.

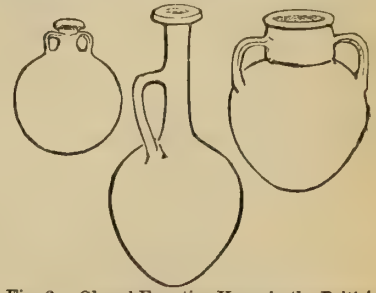


Fig. 2.—Glazed Egyptian Vases in the British Museum.

and the fortresses of Pithon and Rameses, on the Egyptian frontiers, were made of bricks by the Hebrews. Kiln-dried bricks, in fact, did not come into use in Egypt till the Roman dominion, although some exceptional objects of the class of bricks have been found, such as a kind of conical plug, stamped on the base with the names of the tenants of the tombs.

A few other objects were made in unbaked clay; but vases of baked earthenware were in use at the earliest period of Egyptian civilization, and are contemporary with the Pyramids themselves. The Egyptians made a red ware, pale-red or yellow ware, and a lustrous or polished red ware—the two first being used for vases destined for culinary and other purposes, the last for vases of more refined use, such as holding perfumes, wine, honey, and other delicacies. But the most remarkable Egyptian pottery was the so-called porcelain, made of a fine sand or frit loosely fused together, and covered with a thick silicious glaze of a blue, green, white, purple, or yellow color. This celebrated ware, the porcelain of the old world, sometimes exhibits the most beautiful tints of blue, a color which was produced by an oxide of copper, and which is still unrivalled. Objects were made of this material for the decoration of the dead and for the toilet. They were exported from Egypt to the neighboring countries, and are found alike in the tombs of the Greek isles, the sepulchres of Etruria, and the graves of Greece. Most of the figures of deities, the sepulchral ones deposited with the dead, a few elegant vases, portions of inlaying, objects of the toilet, and beads and other decorations, are made of this porcelain. Still finer work of this kind was produced by carving scarabæi and other small objects in steatite, and covering them with a blue glaze, so as to combine brilliancy of color with delicacy of execution. The Egyptians had at the earliest period the simpler manipulations and tools of pottery—the potter's lathe or wheel, moulds for stamping objects, and various other tools. On the decadence of the country under the Greeks and Romans, the pottery became assimilated to the Greek and Roman.

In the contemporary empires of Assyria and Babylon, pottery was also in use at an early period. Sun-dried and kiln-dried

bricks were made in the reigns of Urukh and other monarchs of the oldest Babylonian dynasties about 2000 B.C. Platforms for elevating the larger edifices were made of them; and the bricks, like the Egyptian, were stamped with the names and titles of the monarch, to which was added the locality for which they were destined. Glazed bricks of various colors, occasionally enriched with scenes and ornamental designs, were introduced into constructions; and Semiramis is said to have adorned with them the walls of Babylon. The Assyrians and Babylonians employed this material for historical and legal purposes, making cylinders, hexagonal prisms, and purse-shaped objects of it, on which were impressed extensive writings. One of these remarkable objects contains the account of the campaign of Sennacherib against Judea and the tributes of Hezekiah. The Assyrian and Babylonian pottery resembles, but is not entirely the same as the Egyptian, being of a pale red ware, of thinner substance, finer paste, and more refined shape. At a later period, figures of deities were modelled in terra cotta. The glazed ware of Babylon and Assyria is coarser than the finest Egyptian, and is the earliest example of the employment of materials for coloring like those now in use; the glaze, however, is silicious. The objects most remarkable for size are the large cofins found at Warka, supposed by some to be the Ur of the Chaldees, with oval covers, and ornaments of the Sassanian period. The potteries of Mesopotamia continued to flourish under the Parthian and Sassanian monarchs till the conquest of Asia by the Mohammedans.

The potter's art is mentioned in the Scriptures, but few specimens of Hebrew wares have been found. Some vases have been exhumed in Phœnicia. The most remarkable pottery of antiquity was the Greek, which seems to have had another origin than the oriental. The terms *keramos* and *ostrakon* were applied by them to this material, and they made objects and vases in sun-dried clay, terra cotta, and glazed ware. The use of bricks was by no means extensive in Greece, although some public edifices were made of them. Their first use is attributed to Hyperbius of Crete, and Euryalus or Agrolas. The bricks were made by a mould (*plaision*) and were called after the numbers of palms-length. Some were so light that they floated on water. Besides bricks, tiles, cornices, artificial ornaments, friezes, pipes for conducting water, and drains, were moulded in terra cotta. Statues and small figures, *pelinoi*, gaily and appropriately painted, covered



Fig. 3.—Greek Vases of various styles.
From the British Museum.

with a *leucoma*, or white ground, and occasionally partly gilded, were in common use for votive and other purposes, and sold at a cheap price by the figurist (*koroplathos*). Dolls, cones, and various smaller objects were made by the potters; they were sometimes modelled, but more generally moulded. The Greeks claimed the invention of the potter's wheel; and the principal cities contested the honor of the art, which is mentioned in Homer, and attributed to Corœbus of Athens, Hyberbius of Corinth, or Talos, the nephew of Dædalus. Numerous vases for all the ordinary purposes of life were made by it, and others of large form, decorated also by separate ornaments, *emblemata*, attached to them. Large casks or *pithoi* were modelled on a framework of wood.

Great quantities of amphoræ, manufactured on the wheel, and used to contain the choice wines of Greece, were exported from Rhodes and other cities; and their débris are found in the Crimea, Alexandria, Sicily, and other cities. Some of the earlier specimens of a glazed earthenware were painted with colors in fresco or encaustic, from which afterwards came the more elaborate pictures of the glazed vases of Greece. To these succeeded two or three classes of painted ware, consisting of rude representations of animals laid upon the pale red ground of the clay in brown outlines, a style prevalent at Athens and Asia Minor; which was followed by the potteries of Corinth, or the so-called Phœnician or Egyptian style. The paste of the vases is of a light red or yellow, the figures in a black or maroon color, with portions enriched with crimson or purple; the backgrounds of a pale straw or lemon color; the animals, of a larger size than those of the Athenian vases, intermingled with chimæras and other monsters; the backgrounds variegated with flowers—the whole derived from oriental art. Gradually, human figures, with all the characteristics of archaic Greek art, were introduced, with accompanying inscriptions, which cannot be later than the 6th or 5th c. B. C. The subjects of these vases were derived from the oldest Greek myths. The style of this pottery by degrees improved: the paste became pale red or salmon color; the human figures, which had been at first subordinate, replaced the friezes of animal and large ornaments. As the improvement went on, the backgrounds were made of a bright orange-red color, the figures of a deep black; while portions, as the hair, garments, and flesh of female figures, were colored white. The style of art became much freer, although still retaining the rigidity of the Æginean school.

Names of figures represented, of the artists who painted and the potters who made the wares, were added, with speeches, and the names of celebrated beauties and athletes of the day. In these styles, the vases made on the wheel appear, while yet soft, to have had the subjects traced upon them with a finely-pointed tool; the figures were then filled in with a lucid black pigment of manganese, and then returned to the furnace. The details of the muscles and other portions were incised through the black with a sharp tool, so as to show the lighter background, and the purples, crimsons, blues, and other colors were laid on. The subjects are chiefly derived from the war of Troy and the heroic age; and the shapes in use were oil-jars (*lecythoi*), water-pails (*hydriæ*), wine-vases (*crateres*), wine-jugs (*œnochoæ*), and *amphoræ*. They seem to have continued in use till about 450 or 420 B.C., when the red figures were substituted for black, by tracing, as before, the figures on the clay, then running round them a thick line of flock, and finally filling up the background entirely with black color—the muscles and inner marking not being incised, but traced in black and brown outlines. The earlier vases of this class, which are of the strong style, resemble those of the black figures; but the style gradually improved, and resembled the art of Phidias and Zeuxis; while the letters are those in use after the archonship of Euclid, 403 B.C. The style and form of these vases altered according to the art of the period, till the ultimate disuse of fictile or painted ware, about 300 B.C., when the conquests of Alexander the Great and the increase of luxury caused it to be superseded by vases in metals. In its last stage, the pottery became moulded, and was glazed entirely black, or else variegated with opaque white figures and ornaments.

The subjects of these later vases differ considerably from the earlier, being chiefly derived from the theater or myths of the later poets. Vases of this description are found in Greece, the isles of the Archipelago, and Italy; into which latter country they appear to have been imported from Greece.

In Italy, indeed, the Etruscans, at an early period, and perhaps some of the principal cities in Magna Græcia, manufactured their own pottery. That of the Etruscans consists principally of three kinds—an unglazed red ware; a lustrous brown ware, made also by the neighboring Sabines and Oscans; and a black ware, the paste or substance of which is black throughout, not superficial, as amongst the Greeks, and made by mixing some coloring material with the clay. The Etruscan pottery is rarely painted—the black ware never—but it is distinguished by having ornaments in salient and bas-relief modelled or moulded on it, and by the shapes of the vases apparently being derived from works in metal, and reproducing the fantastic combinations of oriental art. This ware, which was in use from 500 to 320 B.C., was the



Fig. 4.—Greek Vases of later style, found in Italy.

source from which subsequently arose the Aretine and Roman pottery. It was ornamented sometimes with incised ornaments; the subjects, however, are generally uninteresting, and it never attained a high position in art. The Etruscans, however, in later times imitated the painted vases of Greece, but their clay is much paler, the drawing coarser, and the shapes less elegant. In terra

cotta statues, they particularly excelled, and supplied the Romans with the figures of their divinites. Even sarcophagi were made of this material.

On the decline of the pottery of the Greeks and Etruscans, a new kind of ware was made at Arezzo, or Arretium, to which has been given the name of Aretine, and which resembled the later ware of the Greeks. It is evidently imitated from works in metal, in all probability from the chased cups of silver and gold which began to come into use in Italy, and was a continuation of the later moulded wares of Greece and Italy. The vases were of a bright red or black color; the paste, uniform in color throughout, but covered with a lustrous silicious glaze. The red color nearly resembles in color and texture a coarse sealing-wax, the



Fig. 5.—Anglo Roman Vase (Castor).

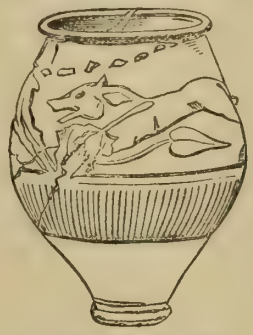


Fig. 6.—Roman Vase

paste is often remarkably fine. The vases, generally of small dimension, were turned on the lathe; the ornaments were moulded separately, and attached to the vase: patterns were produced by the repetition of the same mould, or by placing bas-reliefs from various moulds on the vases. This kind of pottery was first made at Arezzo, but subsequently, or nearly simultaneously, was produced at Capua and Cumæ in the 1st c. A.D. It afterwards extended over all the Roman world, and was made in Gaul and Germany. It was called Samian ware under the republic, and was at first extremely fine, but deteriorated under the last of the twelve Cæsars, and is no longer found under the Antonines; a red



Fig. 7.—Roman Amphoræ.

ware, glazed with red-lead and copper, having been substituted for it. The names of several hundred potters are found stamped upon extant specimens of this ware, and some of them are evidently of Gaulish or British origin. These names are followed by F., *fecit*, or made; M., *manu*, or by the hand of; and OF., *officina*, or establishment. The ware was extensively imported into Britain and the remoter provinces of the empire; and wherever found shows the influence of Roman civilization. Furnaces for it have been found in France and Germany, but not in England.

The other kinds of Roman ware were local, evidently made upon the spots where found, but with inferior ornamentation. Black-ware seems to have succeeded this, and to have been pro-



Fig. 8.—Roman Flange Tile.

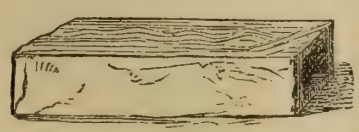


Fig. 9,—Roman Flue Tile.

duced by confining the smoke of the furnace, and throwing it down upon the heated ware. In Britain, varieties of this ware were made at Castor in Northamptonshire, ornamented with bas-relief, laid on by the process of depositing a fluid clay on the wet ware, and moulding it with a tool. The style of art is Gaulish. Other vases of glazed ware were manufactured at Upchurch near Rochester, and at Crockhill in the New Forest. They have only a few ornaments, either stamped or painted in a white pipeclay on the surface. These vases are probably as late as the 3d c. A.D. Later, arose a black-ware, generally bottles or jugs, glazed externally, and with single words, invitations to drinking, painted on them in a white pipeclay. Many varieties of unglazed ware, red, yellow, white, and gray, were extant in the 2d and 3d centuries. The large culinary and other vessels were made of these—such as casks (*dolia*), *amphoræ*, jugs (*lagenæ*), and mortars (*mortaria*)—the last at Lyon. The Romans made great use of brick-work terra cotta. All over the empire, bricks were made for public and private buildings, and stamped at Rome with the name of the proprietors of the land, the potters, and the consulate of the period, till the middle of the 3d c. A.D. Bricks were also extensively manufactured by the legionaries, and bear their names and titles. The graves of the soldiery were often constructed of them. At Rome, the last inscribed bricks are those of Theodoric; none so late have been found in Britain or Gaul. Tiles, cornices, roof-ornaments, and gutters were formed of terra cotta, so were the votive figures offered to the gods; but they all disappeared at the invasion of the northern barbarians, although they continued till then to be manufactured by local potteries.

Among the northern nations, especially the Celts and Scandinavians, long prior to the Roman conquests of Gaul and Britain, at the remote age of the Stone and Bronze Periods, large and small vases, perhaps originally employed for domestic, but subsequently for mortuary purposes, are found amongst the cromlechs, the tumuli, and graves of Northern Europe. They are formed of a coarse clay, mixed with small pebbles, and have been feebly baked by surrounding them with hay, dried ferns, or other combustible vegetable matters, which have been burned inside and around them. The interior of the walls are black; the exterior, of a pale brown color. Their mouths are large, the ornaments, hatchings, and rude line sometimes making an elaborate pattern or tattooing all over the vase. Those from Britain were called *bascaudæ*, or baskets, by the Romans. A modification of this class of ware was continued under the Saxons and Merovingians, and is distinct from the Gallo-Roman and Romano-British potteries: the clay being better baked, and the ornaments, stamped or impressed from a mould, more regular. The use of pottery among these races was to a great extent superseded by glass, metal, and other substances for drinking and culinary vessels, and few or no specimens of medieval unglazed vessels are known. Terra cotta, indeed, continued to be applied for making figures from the 14th to the 18th c. in Europe; but in England, even the use of bricks, a manufacture difficult to have been lost, was restored by Alfred.

Unglazed ware was, in fact, superseded or abandoned in Europe after the fall of the Roman empire; but in modern times, the use of terra cotta and such like ware is found extended all over Europe, Asia, and Africa, varying in texture and excellence from the coarse flower-pots to the thin and graceful water-bottles of the Arabs and modern Egyptians. Even the Nigritic races continue to manufacture a feebly baked earthenware, rudely colored with pigments not baked on the ware. In the New World, the existence of unglazed earthenware seems to date from the most remote antiquity. The vases and other objects found in the northern portions of America, indeed, are of the rudest kind, and bear a striking resemblance to those of the early Scandinavian, Celtic, and Teutonic graves, in paste, shape, and ornamentation. The Mexican and Peruvian potteries, however, evince a much greater mastery of the art, and both are modelled with great spirit, gaily colored, and profusely ornamented. Some of the oldest Peruvian wares, indeed, rival in their modelling European art; but they never attain to glazing. The other unglazed wares of the New World differ according to the localities where they have been manufactured, and in the most highly-civilized portions, reflect or rival the arts of the people by which it has been colonized. Those of the existing native races are very feeble, and the processes are sometimes accompanied by magic ceremonies. The pottery of the southern hemisphere is quite recent, as none of the races seem to have been acquainted with the art. The Fijis, indeed, have a ware glazed with the resin of a tree, but it appears to have been derived from Europe.

The knowledge of glazes originally acquired by the Egyptians and Assyrians, was continued under the Roman empire at Alexandria, and appears to have been transmitted to the Persians, Moors, and Arabs. Fayences, and enamelled bricks and plaques, were in use among them in the 12th c., and among the Hindus in the 14th c. A.D. The Moors introduced into Spain the use of glazed tiles about 711 A.D., examples of which, called *Azulejos*, as old as the 13th c., are found in the Alhambra. Besides these, the manufacture of glazed or enamelled fayences in Spain, distinguished by a metallic iridescence, came into use from the 13th c. in Spain. In Italy, they are supposed to have been introduced as early as the conquest of Majorca by the Pisans, 1115 A.D.; but

the first appearance of Italian enamelled fayence, the precursor of modern porcelain, does not date earlier than about 1420, when it was used for subjects in relief by Lucca della Robbia. About a century later, plates and other ware were manufactured at Pisaro and Gubbio, decorated with subjects derived from the compositions of Raphael and Marc Antonio, painted in gay and brilliant colors. But the establishment was abandoned in 1574, although pieces of *majolica* continued to be fabricated in various cities of Italy till the 18th century. From Italy, this enamelled ware passed into France in 1590 with Catharine de' Medici, where it was manufactured till the end of the 17th century.

In 1555, the celebrated Palissy discovered at Saintes the art of glazing or enamelling a gray paste, and introduced dishes and other objects with fruit, fish, and animals moulded from life, dis-

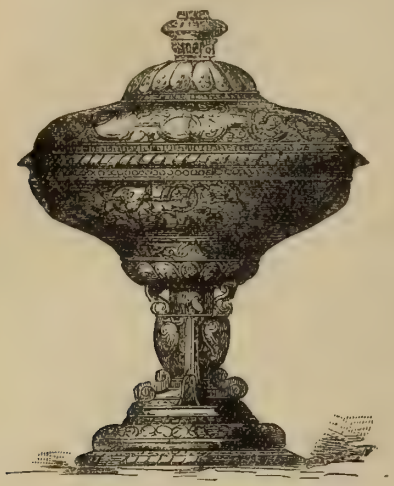


Fig. 10.—Vase of Henry II, ware.

tributed over the surface, as a kind of ornamental ware. At the same time, or earlier, was made what is called Henry II. ware, and which is now so precious, consisting of glazed white ornamental pieces. Glazed or Norman tiles, however, as they are called, date from two centuries before. At the close of the 13th c., glazed ware was made in Alsace; but it was not till two centuries later that majolica was fabricated at Nuremberg; and the manufacture was continued in various parts of Germany till the 18th century. Delft, which gave its name to its own fabric, is said to have produced a glazed ware as early as 1360, and continued to do so till the 19th century.

Holland was chiefly celebrated for its bottles of stoneware, glazed by salt, called Bellarmines, Graybeards, or Bonifaces, and for its tankards, which were imported all over Europe, in the 16th c., and are repeatedly found in London excavations. In England, glazed tiles for religious purposes were made by the monastic or-



Fig. 11.—Tyg with two handles, 14th century,



Fig. 12.—Tyg of Staffordshire ware.

ders from the 12th to the 16th centuries; and glazed bottles, jugs, and cups are found of the time of Henry II.; while Edward III. favored the establishment of potteries in England. The English wares, however, were superseded by Delft and Dutch stonewares till the close of the 17th c., when the coarse wares made at Burslem were improved by the discovery of salt and other glazes. Some Germans, named Elers, from Nuremberg, settled there, and produced an improved ware called the red Japanese; but finding that the secret was discovered by Astbury, left for Lambeth, where they established themselves in 1710.

From this period, various improvements were introduced by Astbury, Booth, and finally by Wedgwood, who discovered more suitable clays in 1759, and called to his assistance the arts of design, by the employment of Flaxman for bas-reliefs and figures. The applications of copper-plate printing and gilding were subsequently discovered. Still later, other materials, as felspar and bones, were used in the composition of this pottery. Delft-stone and other wares were made at different places, as Liverpool, Lowestoft, and elsewhere; but after different vicissitudes, most of the potteries have disappeared except those of the stoneware at Lambeth and Vauxhall.

None of this ware, however, was of the nature of the Chinese porcelain which had been imported by the Arabs in the 13th c., was known in Italy in 1330, and was imported into France as early as 1370, and into England much later. The name porcelain, from *porcellana*, an obscure Portuguese word, supposed to mean a shell, is applied to a mixture of alumina or *kaolin* and silex or *petuntse*, which, when baked, does not fuse at a temperature as high as 140° of Wedgewood's pyrometer, and the glaze of which is incapable of being scratched by a knife. This porcelain, called 'hard porcelain,' is said to have been invented at Sin-ping in China, about 185 B.C., and rose to great importance at King-te-chin, 557 A.D., where, in 1712, 3000 furnaces were in activity, and where the manufacture is still carried on. There are about 18 renowned potteries in the empire. The art of pottery in China is said to be as old as 2599 B.C. In Japan, hard porcelain dates from 27 B.C.; translucent porcelain was made about 672 A.D.; but between 1211 and 1221, Kotosiro, a Japanese potter, went to China to improve his process. There are 18 celebrated potteries in Japan; and in modern times, the pieces exported come chiefly from Imali, in the province of Fizen. In 1644, the Dutch exported 44,943 pieces from Japan. At the beginning of the 16th c., the porcelain of China began to be extensively imported into Europe, and various unsuccessful attempts were made to discover the secret of its manufacture, but without success, both as to the material and the process. The Persians, indeed, are said to have produced translucent pottery about the 15th c. A.D.

After some trials, which resulted either in the production of a kind of opaque glass or stoneware, Böttcher or Böttger, an alchemist (who had been seized by Frederick Augustus II. in 1701), after Schnorr, in 1709, had discovered white *kaolin* at Aue, produced from it a white hard porcelain at Meissen, near Dresden; and the porcelain establishment there was founded under royal auspices. Extraordinary precautions were taken to prevent the process being discovered, by imposing oaths upon the workmen, and the process there pursued was not communicated till 1812 to Brongniart. The secret, however, was betrayed by Stöfzel, a workman of Meissen, who fled to Vienna in 1720, where an imperial establishment was founded, which exists to this day. Other workmen carried the secret from these establishments all over Germany. Royal works were set up at Berlin in 1755, at St. Petersburg in 1744, and at Munich in 1758. From this period, two different kinds of porcelain were made in Europe, a soft and a hard. In France, soft porcelain was made at St. Cloud in 1695, and was not discontinued till 1804. The accidental discovery, by Madame Darnet, of *kaolin* at St. Yrieix la Perche, in 1765, led to the production of hard porcelain at Sèvres, where, after 1800, only this kind was made. Various places in France made both kinds; and in Italy, both were produced at La Doccia, near Florence, at Capo di Monte, near Naples, and at Venice. Other establishments flourished at Madrid and Oporto, established in the 18th century. The manufacture of soft porcelain appears to have been introduced in England, at Bow, as early as the 17th c., and the Chelsea works were set up still earlier, according to some, by Elers. Thence the art was transferred to Derby in 1748; and an establishment at Worcester, founded in 1751 by Dr. Wall, is said to have first printed on porcelain.



Fig. 13—Staffordshire Minton.

Hard porcelain was made by Cookworthy at Plymouth in 1705, and afterwards at Bristol, but was subsequently abandoned as unprofitable, although again made by Minton in Staffordshire in 1850. One of the last inventions in porcelain has been the introduction of Parian, or statuary, used for the production of small figures and statues, by Copeland and Minton. Amongst the oriental nations, the production of porcelain seems limited to China and Japan, although fayences and glazed wares are manufactured

all over the East. The production of a white porcelain, either soft or hard, capable of being moulded and painted with various colors, effected a revolution in the ceramic art: sculptors were employed to mould small figures and other objects by the different establishments, and the vases, which at first were decorated with rude copies or poor imitations of their Chinese originals, by degrees introduced on their surfaces the art of the country where they were made. The paintings on porcelain thus resembled those on enamel, and when the pieces were of considerable dimensions, and painted by distinguished artists, became of great value. Thus, copies of works of Raphael and of Tintoretto, in the Exhibition of 1851, were valued at £1000 and £880. Even ordinary cups, when painted with vignettes, have their value much augmented. So also the application of delicate colors, as blue, green, and rose-pink, added a charm not found in the monochrome glazed ware of the middle ages. For these, Dresden and Sèvres were formally unrivalled; but the colors of late years have been changed, and do not equal the old.

The style of art has varied in each century; the old rococo shapes having been superseded at the commencement of this century by classical shapes, and again by modified medieval forms. The present age has been distinguished by an attempt to reproduce *majolica palissy*, and other wares; by the improvement of printing in colors; by the invention of statuary porcelain, and an application of the material to other purposes, as buttons, stamped or pressed from a mould or die. Besides the ornamentation of vases, a trade-mark is often added, either stamped in or painted on the ware. This, on the early majolica, had the date, place, and name of the artist; but the Dresden, Sèvres, Chelsea, and other establishments introduced devices, monograms, arms, &c., as swords, anchors, crowns, and other devices. The Chinese has devices, mottoes, names of makers, and the date of the reign when made, commencing with the first monarch of the Ming dynasty about 1480, generally in red color, and imitating the seals or stamps used for sealing documents. These marks are continued to the present day (see below).

Brongniart, *Traité des Arts Ceramiques* (8 vo, Paris, 1844); Birch, *Ancient Pottery* (1858); Marryat, *Pottery* (2d ed. 1864); Jacquemart and Le Blant, *Histoire de la Porcelaine* (1862); Eliza Meteyard, *Wedgwood and his Works* (1873); the reports of the Exhibitions at London (1851, 1862); Paris (1855, 1867, 1878); and Philadelphia (1876).

Manufacture.—The dough-like condition into which clay can be worked with water, and the hardness it may be made to acquire by burning, are qualities which have been turned to account by man from the earliest times, and it is upon these that the potter's art essentially depends; but there is great variety in clay, and it is only by knowing something of its nature and constituents, that any real advance has been effected in pottery. If a piece of clay be examined, it will be found that it consists of exceedingly minute particles, held together by aggregation when moist; but if dried, it can be easily reduced to an impalpable powder by mere pressure; and if, instead of drying, we add an excess of water, it may be so mixed and held in suspension in the water that it appears almost to be dissolved. In time, however, it is deposited as a sediment, and when the excess of water is removed, it is a soft tenacious paste, which is so non-elastic that it will retain the smallest impression made in it without change. This minute division of its particles, and the absence of elasticity, are its most valuable qualities. But all clays are not of the same purity and quality; the commonest is that of brick-fields, which is one of the most abundant substances in nature; but it is so mixed up with iron and other foreign ingredients, that except for bricks, tiles, and the coarsest kinds of pottery, it is not used.

The purest kinds of potters' clay are called *kaolin*, and are believed to have been formed by the decomposition of rocks containing large proportions of felspar, a slightly variable compound substance, which, in general terms, may be said to be a combination of neutral silicate of alumina and the silicates of potash, soda, lime, or magnesia, together or singly. Certain kinds of granitic rocks, especially the whiter varieties, by their atmospheric decomposition, yield fine kaolin. Great experience is required in selecting and using the materials, because in nature the plastic materials are very irregularly mixed with other substances, which have a more or less deteriorating effect. Most of the best known clays contain a certain portion of free silica in addition to that in combination as natural silicate, which requires to be removed for very fine wares by boiling in caustic potash, otherwise, it proves injurious. The finest china-clay of Great Britain is obtained from Cornwall, where the decomposed granite is washed by streams of water, which carry it away into ponds called *catch-pools*. The discovery of this source of china-clay was made by Mr. Cookworthy about the middle of last century, and alone afforded means for improving our native pottery, which were most admirably turned to account by Mr. Josiah Wedgwood, and after him, by Mr. Herbert Minton, Mr. Copeland, and others. Previous to this, although, as before noticed, fine pottery was made in Britain in two or three places, yet the general character of our pottery, which was chiefly manufactured in the neighborhood of Burslem, in Staffordshire, was most miserable both in material and in design. The clay was inferior in color, prepared with very little care, and covered with a coarse white or yellow lead glaze; but the discovery of the Cornish clay, by affording a material of excellent quality, stimulated the manufacturers to improve the general style of their manufacture.

Scarcely second in importance to this discovery was Wedgwood's good taste and untiring zeal in working out that revolution in the art of the British potter, that has led to its present enormous development. In 1730, when Wedgwood was born at Burslem, in Staffordshire, that place supplied the greater part of the common household pottery of Great Britain; but so small was the trade, that it was but little more than a village encumbered with heaps of broken crockery, and its environs disfigured with clay-pits and piles of refuse; now it is the center of a populous district called 'The Potteries,' comprising about 48 square miles. In this limited space there are now nearly 280 kilns at work, employing more than 100,000 operatives.

The method pursued in making pottery and porcelain is the same in principal everywhere; we shall therefore give the general outline of the process without entering into the minute differences which distinguish the variations produced by different manufacturers in this and other countries. Pottery and porcelain differ chiefly in this, that the superior quality of the materials used in making the latter, gives it a peculiar translucency. For pottery, inferior materials are used, and a considerable admixture of calcined flint, bone-ashes, or native phosphate of lime, are added to the clay. The use of the calcined flint was said to have been first adopted by a Burslem potter named Astbury, who, whilst traveling to London on horseback, in the year 1720, had occasion, in passing through Dunstable, to seek the assistance of an hostler,

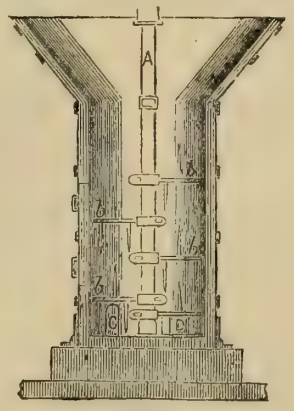


Fig. 14.

in consequence of some disease in his horse's eyes. He noticed that the man took a piece of flint, burned it, and then reduced it to a fine powder, which he blew into the horse's eyes. Astbury noticing the beautiful whiteness of the powder, conceived the idea of using it in his pottery; and did so with great success.

The ingredients, such as the clay and calcined flints, are ground by separate means; the former in the pug-mill, which is represented in fig. 14. This is an upright, iron-bound, wooden cylinder, with an axis A turned by machinery; projecting from A are seven arms, *b*, each of which has three knives fixed in it, with the points outward, and so arranged that they spread over the largest amount of space in the interior; and altogether they are placed in a spiral manner, so that when in motion, the clay, which is thrown in lumps into the hopper-shaped upper part of

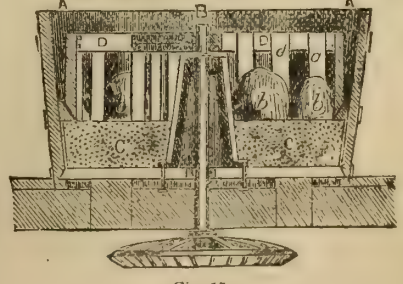


Fig. 15.

the vat, is worked down, and is so cut and kneaded by the knives, that it is forced out at an opening at C, in the state of soft pap. This is aided by the knives on the lower part of the lowest arm being connected together by a plate D, which pre-

vents all settlement at the bottom. This pap-like clay passes into a large wooden tank, in which it is agitated with water until quite incorporated, so as to resemble milk in color and consistency. In another mill (fig. 15), of a different construction, the Cornish granite and calcined flints are being reduced to a somewhat similar state. This mill is very strongly constructed, and consists of a tub-like vat A, in the center of which turns an axle B, moved by machinery; in the bottom of the vat is a thick stone-bed C, consisting either of chert or horn stone.

From the upper part of the axis, three strong arms, D, D, D, project like the spokes of a wheel; and strongly attached to these are stout beams, *a*, pointing downward, and nearly touching the stone-bed C. As the axis, with its arms and beams, turns round, the beams push some large masses of the Cornish granite or of chert stone round with them, and these triturate the calcined flints and other hard materials, and stir up the water with which the vat is kept constantly supplied, whilst it overflows in a milky state, charged with the finely-divided materials, into a cistern, where it is kept stirred until it is sufficiently supplied with the solid materials, and the thickened milky liquid is then drawn off, in proper proportions, into a vat to which the prepared clay is also passed. The mixture of the two is then allowed to subside until the water is nearly clear, when it is drawn off; and the sediment is deprived of its surplus moisture, either by evaporation, or, in the best works, by a pneumatic-exhausting apparatus, which does it very quickly. The composition is then a fine plastic material of the consistency of tough dough, and is ready for the potter's use. In preparing the finer materials for porcelain, many other operations are required, all, however, having the same object, viz., the extremely minute division of the substances used.

The prepared clay is taken to the *throwing-machiae*, or *potter's lathe*, which is represented in fig. 16. This consists of a fixed table A, through which passes the axle B. and rises a little above

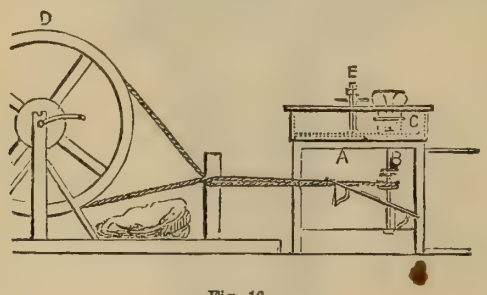


Fig. 16.

its surface. and having on its upper end a disc C, which revolves with it. The axle is put into rapid motion by turning the fly-wheel D, either by hand or machinery; and this causes a rapid revolution of the disc C, upon which is placed the soft mass of clay to be moulded. At E is seen an upright, with a small sliding-bar regulated by a screw; this is the guide for the potter to regulate the height of the vessel he is making. When the lump of clay is revolving, the potter, with his hands or with proper

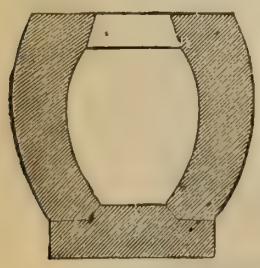


Fig. 17.

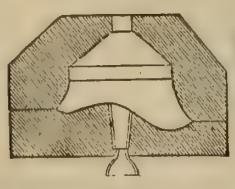


Fig. 18.

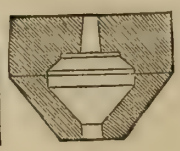


Fig. 19.

tools, fashions it into any shape he pleases; his management of this requires considerable skill, as nearly every article requires a different configuration. But some articles are formed in moulds, the moulds being made of plaster of Paris. This answers well for fine porcelain intended to be very thin, because the plaster-mould absorbs much of the moisture in the paste, and thus partially dries it, so that it admits of handling, which in a softer state would be very difficult. The paste is used so liquid that it can be poured into the moulds. It is usual, in casting, to have a mould for each part, as seen in figs. 17, 18, 19, which represent the body, neck and lip, and foot of the cream-ewer, fig. 20.

For nearly flat articles, such as dinner-plates, a plan is adopted which combines both processes: a mould, usually of plaster, fig. 21, *a*, is placed on the disc of the throwing-wheel, *b*, and a thin layer of the paste is pressed on to it, so as completely to take its form; then to the guide-post, *c*, is attached an arm, *d*, with a small brass plate, *e*, on its lower side. This plate is cut to the outline of half the plate, or dish; as it revolves, this pares down



Fig. 20.

and shapes the clay to its own outline, and to the thickness to which it is set, there being an arrangement on the arm of the guide-post by which this can be effected. Sometimes, as in the case of deep vessels, moulds are used for the exterior, and the interior is formed by the hand. This process (fig. 22) insures certainty of size and shape, which is important in making large numbers of similar articles, as tea-cups, &c. The mould is lined with a thin cake of clay, and when placed on the revolving disc, it is fashioned inside by hand, and finished off with a wet sponge.

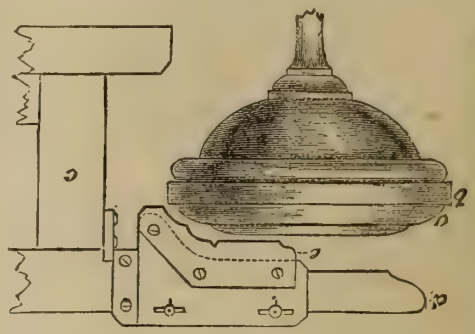


Fig. 21.



Fig. 22.

Sometimes metal or horn tools are used for producing mouldings and other raised ornaments, or for grooves, when the turning or throwing wheel is used. If the articles made require handles or other similar accessory parts, they are always moulded, unless of very simple forms, and are attached whilst they and the body are still soft enough. They are joined by a thin fluid paste called a *slip*, and the junction is smoothed over with the wet sponge, which is one of the most useful of the potter's tools.

Being formed, the articles, of whatever kind, are now taken to the drying-stove, where they are placed on shelves, and remain there some time, exposed to a heat of about 85° Fahr. When quite dry, they are next taken to a workshop near the kiln, and they are here carefully packed in coarse earthenware vessels,

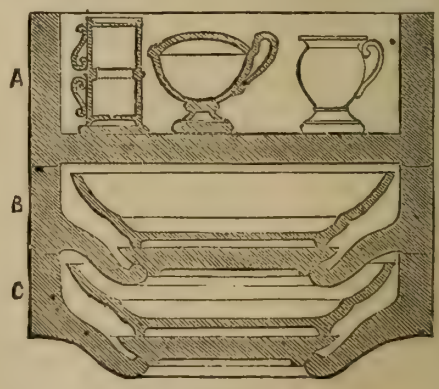


Fig. 23.

called *seggars* (fig. 23), which are so made that they can be piled upon one another to a great height in the kiln, as seen in fig. 24, in which some of the seggars are seen in section, for the purpose of making the arrangement more intelligible. As the seggars are generally made large enough to hold a number of articles, which would, when highly heated, adhere if they touched, a number of curiously shaped pieces of burned clay are used for placing between them, so as to make them rest on points; these are called

watches, *cockspurs*, *triangles*, *stilts*, &c., fig. 25. In the seggar, filled with plates (fig. 26), the plates are seen each resting on *cockspurs*, which prevent them touching. Another object is gained by this, in burning flat articles such as plates; these, if placed one upon another, would not be fired equally, but when they are held apart, the heat affects all parts alike. The seggars are so piled in the kiln that the center is hollow, and there are free spaces between them through which the fire can ascend; props, *a*, *a*, *a*, fig. 24, being so placed as to keep them from immediate contact with the sides all round. Thus, each seggar forms a small oven, in which one or more pieces of pottery or porcelain are baked, and the seggars prevent any unequal heating of the pieces, and also protect them from smoke.

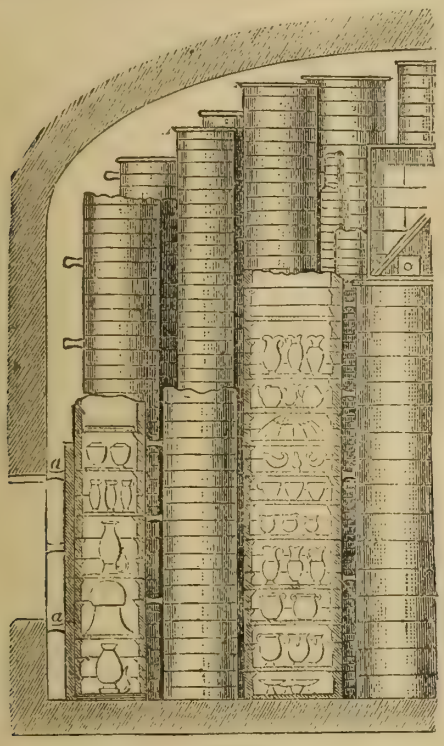


Fig. 24.

A kiln has generally eight furnaces, and it is usual to raise six piles of seggars between every two furnaces, or rather between their flues, which rise to a considerable height in the kilns. Each pile of seggars is technically called a *bung*, so that there are generally 48 or 50 bungs to the charge of a kiln. When all this is arranged, the furnaces are lighted, and great care is taken to have the best coal, as it enables the manufacturer to make a more certain calculation as to its effects, and is less liable to smoke and sulphureous vapors, which might injuriously affect the contents of the kiln. The baking or firing requires great care and attention, and there are many nice regulations connected with it to guide the workman. It usually lasts from 40 to 42 hours. The fire is then allowed to go out, and the kiln to cool very gradually, after which it is opened, and the seggars removed, to be unpacked in a separate workshop. The articles are now in the state called

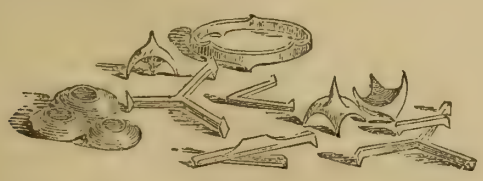


Fig. 25.

biscuit-ware, and require both the glaze and any patterns they may be intended to bear. Common pottery is often figured by printing the design in enamel colors on paper, and whilst the printing is still wet, applying it to the biscuit-ware; the ware absorbs the enamel ink, and the paper is removed by water, leaving the pattern on the ware. It is then fired in seggars, or a muffle, to fix the color, and is then dipped into composition called *glaze*, of which three kinds are used in the Staffordshire potteries. The first, for common pipeclay ware, is composed of Cornish granite, 16 parts; flint, 36 parts; white-lead, 53 parts; and cullet, or broken flint-glass, 4 parts. These materials are triturated with water, with the same care and by similar means to those employed in forming paste, and are reduced with water to the same milk-like liquidity.

Each workman has a tub of the glaze before him; and as the articles of biscuit-ware, either with or without decorations, are brought to him, he dips them in the glaze, so as to insure a uniform coating over them; and by nice management, he prevents any large drops or accumulations on one part more than another. The porous biscuit-ware rapidly absorbs the moisture, and dries up the thin film of glaze on the surface of the articles, which are again placed in seggars, and carried to the glaze-kiln, where they undergo another firing, which melts the glaze, and converts it into a perfectly transparent glass, like water, all over the surface, and renders any pattern previously printed upon it very plain. The temperature in the glaze or enamel kiln is only increased very gradually, and is kept up for about 14 hours, after which it is allowed to cool slowly, and the articles are taken out completed. So far, this description has applied to the manufacture of pottery and porcelain on a large scale, for general purposes;

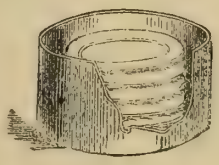


Fig. 26.

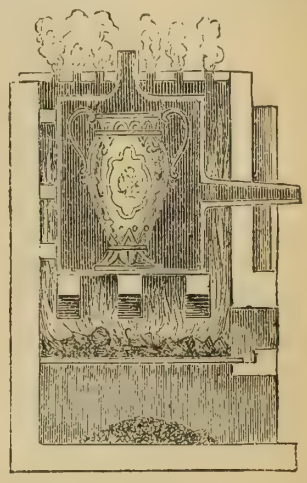


Fig. 27.

but when it is applied to more costly and artistic works, very special arrangements are required; and in the case of remarkably fine pieces, instead of the huge kilns, which hold frequently many thousand pieces, muffle furnaces (fig. 27) are both used for the biscuit, the glaze, and the colored and gilded decorations, which, in porcelain, are applied on the glaze, and not on the biscuit.

The decoration of porcelain has long held a high rank as a fine art; and the exquisite skill shown in some of the finest works of the continental manufactures, and lately in those of Britain, has fairly entitled it to that rank. The colors employed are all colored glasses ground to impalpable powders, and mixed with borax or some other fluxing material; for use, they are generally made liquid with oil of spike, and they are laid on with hair-pencils, in the same way as oil-colors. The whole process is exactly the same as in painting or staining glass; the glaze on the biscuit-porcelain being true glass, and the enamel colors being exactly the same as those used by the glass decorator. The colors may be made by mixing the materials of which glass is made with the coloring material and the flux, or simply with the already colored glass and the flux. When the former plan is employed, the following are the coloring materials employed: oxide of chromium for green; oxide of iron for red, brown, violet, gray, and yellow; oxide of uranium for orange, yellow, black; oxide of manganese for violet, brown, black, and purple; oxide of cobalt for blue, gray, and black; oxide of antimony for yellow; oxide of titanium for yellow; oxide of copper for green; suboxide of copper for red; sesquioxide of iridium for fine black; protochromate of iron for brown; chromate of lead for yellow; chromate of barytes for yellow; chloride of silver for deepening reds and purples; purple of cassius for ruby and purple. Several of these colors are much increased in brilliancy by the addition of oxide of zinc, which of itself gives no color; and the transparent ones are rendered opaque by the addition of tin.

Other fluxes besides borax, or borate of soda, are used—as sand, felspar, boracic acid, minium or litharge, salt, saltpetre, potash, and soda. Nothing enriches the appearance of porcelain more than good gilding; for this purpose, gold-leaf is rubbed down with oil of turpentine; or pulverulent gold is produced by precipitating a solution of gold in aquaregia, by the addition of a solution of sulphate of iron. The gold is precipitated as a brown powder, which is washed and dried, and then worked up with one-sixteenth of its weight of oxide of bismuth and oil of turpentine. It is painted on, then fired, and afterwards burnished. Peculiar and beautiful metallic lustres are produced upon pottery by precipitated plantinum and other means; but it is not within

the scope of this article to enter into all the details by which the almost numberless variations are produced in the manufacture and decoration of this material. The literature relating to its history is rich in treatises for the guidance of those engaged in the art.

The following are the chief varieties of ceramic materials and their usual composition: 1. *Porcelain.*—At Sèvres, kaolin, 48 parts; sand (pure white), 48 parts; chalk, 4 parts. At Dresden, kaolin, 62 parts; felspar, 26 parts; broken biscuit-porcelain, 2 parts. At Berlin, kaolin, 76 parts; felspar, 24 parts. In England, three mixtures are used—For common china, ground flints, 75 parts; calcined bones, 180 parts; china-clay, 40 parts; clay, 70 parts. For fine china, ground flints, 66 parts; calcined bones, 100 parts; china-clay, 96 parts; Cornish granite, 80 parts Fine, for modelling figures, &c., Lynn sand, 150 parts; calcined bones, 300 parts; china-clay, 100 parts; potash, 107 parts. The glazes require to be varied for nearly all, so that their fusibility may be greater or less, according to the more or less fusible character of the biscuit ingredients. 2. *Parian.*—The composition for this is the same as that for the fine English china, but it is used in a liquid state, so as to be poured into the plaster of Paris moulds. It requires very great care in the firing. 3. *Earthenware* (Fr. *Faïence* from Fayenza, the name of a place in Italy where it was made; Dutch, *Delft*, from its having been chiefly made at Delft, in Holland).—



1, Pennington, Liverpool, 1760—1780; 2, Plymouth, about 1760; 3, Richard Champion, Bristol, 1772—1790; 4, Charles Green, Leeds, 1790; 5, Bow, 1730—1790; 6, Absolon, Yarmouth, about 1790; 7, Chelsea, 1730—1784; 8, Swansea, Wales, 1790; 9, Worcester, 1760—1780; 10, Yarmouth, about 1790; 11, Derby, 1751—1769; 12, Crown, Derby, 1780—1830; 13, Shropshire, 1772—1799; 14, Cookworthy, Plymouth, 1760; 15, Derby—Chelsea, 1770.

Made of various kinds of clay, varying in color from yellow to white, according to the quality required; and more or less of powdered calcined flints, are mixed with it, to give it body and hardness. Sometimes, as in porous vessels, only clay is used. 4. *Stoneware*, such as is used for jars, bottles, drain-pipes, &c., is made of several kinds of plastic clay, mixed with felspar and sand, and occasionally a little lime, but the materials vary much in different localities.

In Great Britain, the potteries not only supply the home demand, but also export to a greater extent than any others in Europe; and so rapid and extensive have been the improvements effected in the last ten years by British potters, that, both as a manufacturing and as an artistic country, Great Britain now stands foremost. In 1880 the exports of earthen and china ware, parian and porcelain (except red pottery and brown stone-ware), amounted in value to £1,978,445. The largest quantities are sent to India, North America, and Australia. In North America, however, the manufacture of pottery is carried on with great activity in Jersey, Philadelphia, Liverpool (in Ohio), and other places.

Most of the celebrated manufacturers of pottery and porcelain, both at home and abroad, have employed a special mark to distinguish their works, and these are now of considerable importance in enabling us to ascertain the origin of choice specimens. The above illustration give some of the more important marks and monograms, so used by the earlier English makers, when their names in full were not imprinted, as was often the case.

PO'TTO. See KINKAJOU.

PO'TTSVILLE, a city of Pennsylvania, on the Schuylkill River, at the entrance of Norwegian Creek, 93 miles north-west of Philadelphia, with which it is connected by railway. It is in the midst of a rich anthracite coal and iron region, and has several iron foundries, a brass foundry; manufactures of iron safes, sashes, and wood-work; county buildings; 10 banks; 3 English, 3 German, and 1 Welsh paper; and 19 churches, 3 of which are Welsh. Pop. (1870) 12,384; (1880) 13,253.

POTY, a district town, and rising seaport of Russia, in the Caucasian government of Kutais, stands at the mouth of the river Rion, on the eastern shore of the Black Sea. The Rion connects the port with the interior, and since the establishment of regular steam communication by the Russian Trade and Navigation Company in this quarter, the commerce and especially the transit-trade of this town has greatly increased. It is connected by railway with Tiflis. Pop. (1867) 1309.

POUCH, MILITARY, a stout leather box, black or brown, lined with tin, covered with a stong flap, and ornamented with the device of the regiment, serves to carry the cartridges required by a soldier for immediate use. When cartridges are supplied for a whole day's service, two pouches are worn, one on the front point of the hip, and a larger one on a belt suspended over the left shoulder.

POUCHED RAT (*Pseudostoma*), a genus of *Muridæ*, of which there are several species, natives of parts of North America west of the Mississippi, and some of them very troublesome from the ravages they commit in fields and gardens. They have four molars on each side in each jaw. The tail is short. The cheeks are furnished with pouches, to which the name refers, the openings of which are from the outside, and not from the mouth. The pouched rats burrow in the ground, and do great mischief to root-crops.

POUGHKEE'PSIE, a city of New York, U.S., on the east bank of the Hudson River, 75 miles north of New York, finely situated on a table-land, about 200 feet above the river. The city has broad and handsome streets, with fine public and private edifices. The collegiate school is situated on an eminence which rises 500 feet above the river, and from which a magnificent prospect, embracing an area 2500 square miles in extent, may be obtained. P. contains a city-hall, academy, law-school, lyceum, orphan asylum, 6 public schools, an endowed female college, a rural cemetery, 6 banks, extensive iron-works; carriage, chair, and carpet factories;

breweries, 21 churches, and has railway and steamboat communication with New York and Albany. P. was settled by the Dutch in 1690; during the Revolution, it was the state capital, and the Convention met here, 1788, to ratify the constitution of the United States. Pop. (1870) 20,080; (1880) 20,607.

POULPE (*Octopus*), a genus of *Cephalopoda* (q. v.), of the order *Dibranchiata;* having eight *feet* or *arms*, nearly equal, united at the base by a membrane, and very long in proportion to the body. There is no shell, but it is represented by two small grains of horny substance imbedded in the back, one on each side. The arms are used for swimming in water, creeping on land, and seizing prey. Poulpes swim by contractions of the muscular web of the body, which extends upon the arms. They creep on shore in a spider-like manner, with sprawling arms. Like other cephalopods, when alarmed or annoyed, they discharge an inky fluid. One species (*O. vulgaris*) is occasionally found on the British shores, and is more common on the southern shores of Europe, and elsewhere in the Mediterranean. It is the *Polypus* of the ancients. Its arms are six times as long as its body, and each furnished with 120 pairs of suckers, (See CEPHALOPODA.)—In warmer seas, very large species occur; and although the stories related of their laying hold of and swamping boats, seizing and killing swimmers, &c., may probably be fabulous, yet it is certain that some of them have arms at least two feet long, and there is probable reason to suppose that much larger species exist, which must be powerful and dangerous creatures. A P., with its eyes fixed on its adversary, and its beak threatening to approach, must have a sufficiently formidable aspect. It was no doubt a P. which Mr. Beale encountered on the shore of the Bonin Islands, which he attempted to intercept in its retreat towards the sea, and which turned and fastened upon him, laying hold of him with its arms, and trying to bite him with its parrot-like beak.—See *The Ootopus*, by Henry Lee (1875).

POU'LTICE. See CATAPLASM.

POU'LTRY (Fr. *poule*, a hen), a collective name for useful domesticated birds. It is sometimes limited to the domesticated gallinaceous birds, but its ordinary use includes all the birds reared for economical purposes. These belong exclusively to two orders of birds, the *Gallinaceous* and *Palmiped;* the common fowl, pea-fowl, Guinea-fowl, turkey, guan, and pigeon belonging to the former; and the different kinds of duck and goose, as well as the swan, to the latter. For what relates to the different species and their varieties, we refer to these heads; devoting this article to some general remarks as to the management of poultry.

In general, the rearing of poultry is regarded as a very subordinate branch of rural economy, and it is pursued chiefly where agriculture is in a somewhat primitive state, the skilful and enterprising farmer deeming it beneath his attention, or finding that he has not time to attend to it, and often looking on the feathered inmates of his farm-yard almost as a nuisance because of their invasions of his fields. It may pretty safely be asserted that there is no good reason for this, and that poultry properly cared for would always be found a source of profit. The farm-yard affords great advantages for the keeping of poultry, and the increasing demand of the market promises a sure return. In some parts of Britain and in Ireland, where the farms are small, poultry are very extensively kept by farmers and cottagers; but the north of France and Pomerania exceed all other parts of Europe in poultry-keeping, which there is not unfrequently the leading object of husbandry, and the traffic in the products of the poultry-yard is on a truly great scale.

There is very commonly no building erected for the special accommodation of poultry; but perches and places for nests are provided for them in a cow-house or some other farm-building; or, in very many cases, when kept by cottagers, they roost on joists of the roof, within the door of the cottage itself. In such cases, they roam at liberty during the whole day, and find much of their food in the fields and on the road sides, although the feeding of them with corn and other food is not neglected by the careful housewife. But it is often undesirable, for the sake of fields or gardens, that so much liberty should be allowed to poultry, and they may be very advantageously kept either wholly or mostly in confinement. If circumstances permit, it is good for them to be let out for an hour or two daily into a grass field, but it is not necessary, if they are provided with a warm, clean, and well-ventilated house, to which a spacious open court is attached, and are regularly supplied with abundance of food, water, sand, or fine ashes, lime, and small stones, all requisites to their healthful existence. The food must also be of various kinds. Poultry must have supplies of grain or pulse, and of soft food made of grain or pulse; the kind may depend upon convenience and cheapness; and instead of such food, boiled potatoes may to some extent be used. *Bran* is a very good article of food for poultry. But the same food, without variation, should not be given for any considerable time. And it is indispensable that all kinds of poultry be frequently, if not even daily, supplied with green food, as blades of kale, cabbage, cauliflower, turnips, &c., or lettuces, cresses, chickweed, sow-thistle, &c. It is pretty safe to observe the kinds which they like, and to allow them to choose for themselves. When they have no opportunity of seeking worms, snails, slugs, and insects for themselves, animal food must be given, and the refuse of the kitchen cannot be more profitably employed.

It is possible at some seasons to give too much food, making the poultry too fat, and diminishing the production of eggs; but at other times, as during the season of moulting, food cannot be given too plentifully. Water must at all times be abundantly supplied.

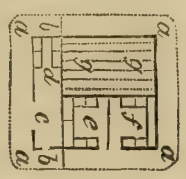


Fig. 1.—Plan of Poultry-House: *aa*, the court-yard; *bb*, for ducks and geese; the apartment for which is at *c*, with laying and hatching-nests, *d*; *g*, the roosting-house for hens and turkeys; *e*, the hatching-house; and *f*, the apartment for laying.

Poultry-houses may be built of any material that is most convenient; but warmth cannot be too much regarded. A poultry-house of four feet square, should have a yard at least eight feet by four. The yard is enclosed by wire netting. The floor of the house made of clay or other material, ought to be so firm and hard as to admit of its being easily swept, and this should be often done. The house is provided with roosting places on the ground or above it, according to the kind of poultry, and with nests for laying in. Hatching ought to be conducted in a separate place. The court should be furnished with a 'lean to' shed on one side, under which the birds may find shelter from sun or rain, and here they should find sand or fine ashes to fling over themselves, according to their manner, to rid themselves of insect tormentors. Lime is also necessary for them, large quantities of it being used to make egg-shells, besides what the animal system otherwise requires. It may be very conveniently supplied in the form of lime rubbish from old walls, in which also occur in abundance such small stones as birds need in order to the trituration of the food in their gizzard.

In the places appropriated to hatching, it is good to have a fresh turf deposited, to prevent the eggs from becoming too dry, and it is even recommended that the eggs should be slightly moistened every day. It is said that the inner membrane of the egg is otherwise apt to become hard, so that the young chick cannot break through it.

Where purity of breed is of importance, as when fowls are to be exhibited in prize competitions, great care must be taken to

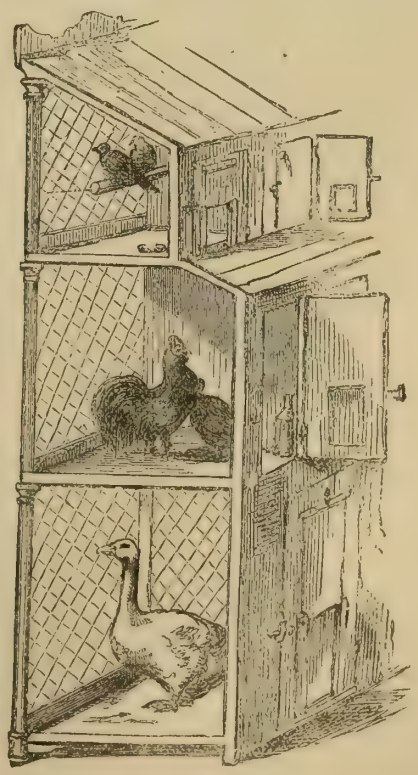


Fig. 2.—Poultry-pen.

keep the different kinds perfectly separate; otherwise, intermixture to a certain extent is not undesirable. It is always, indeed,

to be desired that each good kind be kept pure and in as great perfection as possible, for improvement of the stock. But even in a small poultry-house, it is desirable to have different kinds, some being particularly estimable for their flesh, some for the abundance and quality of their eggs, some for their disposition to incubate, &c. For web-footed birds, free access to water is required; but some of the kinds are well enough provided for by a pretty capacious trough.

Among the diseases of poultry, *Gapes* (q. v.) is one which very frequently demands attention, particularly in young chickens. *Pip* or *Roup* is another. Some of the maladies which cut off great numbers of young chickens, and still more of turkey-poults, may be in a great measure prevented by supplying abundance of nourishing and sufficiently varied food, with water and lime; and by preventing the young birds, particularly turkeys, from getting among wet grass.

It is sometimes taken for granted by writers on this subject, that all the birds which can be domesticated with advantage, have already been domesticated. The assumption is quite gratuitous, and it might as well be asserted that improvement has reached its utmost in any other direction. The concurrent supposition that the common domesticated kinds were given to man at first as domestic, is likewise unsupported by evidence, although the domestication of some of our poultry birds must be referred to a very early date. Among the *Anatidæ*, some progress has recently been made in the domestication of new kinds; and a beginning may even be said to have been made as to some additional gallinaceous birds.

Much valuable information on the management of poultry will be found in *The Henwife, Her own Experience in her own Poultry-yard*, by Mrs. Fergusson Blair of Balthayock (Edin. 2d ed. 1861).

POUNCE, powdered rosin, or some gum resin such as mastic, sandarach, or copal, and also the powder of cuttle-fish bones. It is used for sprinkling over freshly-written writing, to prevent blotting; fine sand is often substituted for pounce. Blotting-paper has almost superseded the use of pounce in Great Britain.

POUND, in English Law, means an enclosure, of which there was generally one in every parish, or at least every manor, in which stray cattle were put and detained until the damage done by them was paid for. Whenever a stranger's or neighbor's cattle trespass on another's lands, the latter can seize them, and take them to the pound, or impound them, as it is called, *damage feasant*, and can keep them there till the expenses are repaid. There was a distinction between pound overt, or common pound, and pound covert, or close pound; in the former case, the owner of the beasts could go and feed and water his cattle while impounded, and it was his duty to do so; but not in the latter case. Now, it is compulsory for the impounder, in all cases, to supply the cattle with food, otherwise he incurs a penalty; and if impounded cattle are not sufficiently fed, a stranger who feeds them may not only trespass on lands to do so, but can recover the costs from the owner of the beasts. This was formerly an important head of law, and it is not obsolete, for the power to impound stray cattle still exists, though common pounds are disappearing, for, in point of law, they are not necessary, since the impounder can put the cattle in his own stable or field.

POUND (Sax. *pund*, Ger. *pfund*, Lat. *pondus*, 'weight') the unit of weight in the western and central states of Europe, differing, however, in value in all of them. The symbol (*lb.*), for it is equally general, and is derived from the Latin word *libra*. The old English pound, which is said to have been the standard of weight from the time of William the Conqueror till that of Henry VII., was derived from the weight of 7680 grains of wheat, all taken from the middle of the ear, and well dried. After this time, the *troy* pound, which was heavier by $\frac{1}{16}$th than the old English pound, became the standard, but it was divided into only 5760 grains. Henry VIII. introduced the *avoirdupois* pound for weighing butcher meat in the market, and it gradually came to be used for all coarse goods in frequent demand; it contained 7000 troy grains. The troy and avoirdupois pounds, both legal measures, continued in regular use from this period—the former being gradually appropriated by jewelers and apothecaries; and, to prevent variation, a brass weight of one pound troy was constructed in 1758, and placed in charge of the clerk of the House of Commons. This weight, in 1824, was declared by act of parliament to be 'the original and genuine standard measure of weight,' and that from which the value of the ounce, grain, pound avoirdupois, &c. were to be deduced, but being, along with the standards of measure, destroyed in 1834, a commission was appointed to consider the best means of replacing them.

After long deliberation, hearing of evidence, and sifting of suggestions, it was agreed, *inter alia*, that the standard of weight should be a piece of platinum, weighing 7000 grains (an avoirdupois pound), but that this piece should not be defined with reference to any natural standard. The troy pound thus ceased to be the standard, but its use was allowed to jewelers and (differently divided and subdivided) to apothecaries. In the British Pharmacopœia of 1864, the troy ounce of 480 grains was given up, and the pound avoirdupois of 7000 grains, and the ounce avoirdupois of 437½ grains, were adopted. The Weights and Measures Consolidation Act of 1878 adhered to the platinum standard pound.

The pound-weight of silver, a common money standard among the ancient Romans, was introduced by them into the countries they conquered, and thus the term 'pound' became a designation of a certain amount of coined money. Thus, now-a-days, the English pound is considered as something (a coin or otherwise) equivalent to 20 shillings, but originally it denoted the pound of silver which was coined into 20 shillings. From Edward II.'s time, the coins were more and more diminished in size, that monarch coining 25 shillings from a pound of silver; while from the same weight of bullion his various successors coined 30, 45, 48, 96, 144, 288, in the time of Elizabeth 60, and (during the reigns of her successors) 62 shillings. George I. coined 66 shillings to the pound of silver, and this rate still continues, the term 'pound' having been completely severed from its original meaning, and appropriated to signify 20 shillings of the present coinage.

POUSSIN, NICOLAS, a painter of great celebrity, born near Le Grand-Andely, in Normandy, in 1593 or 1594, was first a pupil of Quintin Varin, then painting pictures for the church of Grand-Andely, but at the age of 18 went to Paris, studied under Ferdinand Elle, the Fleming, Lallemand, and others; but chiefly improved himself by drawing from casts, and drawings and prints after Raphael and Julio Romano, in the collection of M. Courtois, who accorded him access to them. After a long and hard struggle, he attained the object of his desire—namely, the means of visiting Rome. He was 30 years of age when he arrived there, and a considerable period elapsed after that before he obtained much employment. At length, however, he received several important commissions from the Cardinal Barberini, which he executed so successfully, that he afterwards rapidly acquired fame and fortune. After an absence of sixteen years, he returned to Paris with M. de Chantelou, and was introduced by Cardinal Richelieu to Louis XIII., who appointed him his painter in ordinary, with apartments in the Tuileries, and a salary of £120 a year. P. returned to Rome for the purpose of giving up his establishment there, and taking his wife to Paris; but, while he was occupied with these arrangements, Louis XIII. having died, he gave up all thoughts of returning to his native country, remained in Rome, and after a very successful career, died in 1665. His reputation mainly rests on his success in aiming at the classic style. Sir Joshua Reynolds says: 'No works of any modern have so much the air of antique painting as those of Poussin.' Many prefer his landscapes, or those pictures of his in which the landscape predominates, to his compositions in which his attention has been bestowed chiefly on the figures. Upwards of 200 prints have been engraved from his works. The National Gallery has several of P.'s pictures, two of which are particularly praised, 'A Bacchanalian Dance,' and 'A Bacchanalian Festival.'

POUSSIN, GASPAR, a celebrated landscape painter, was the son of a Frenchman, settled in Rome, and was born there in 1613, He was the pupil of Nicolas Poussin, who had married his sister, and from respect to that great artist, adopted his name in place of his own, which was Dughet. He was called by the Italians Gaspara Duche, and he inscribed his etchings, eight in number, in that way. His landscapes are composed in general from studies in the Campagna of Rome and surrounding country, worked out with the feeling of a mind deeply imbued with classical associations, and tending towards melancholy reflection, by contrasting the glory of the past with the decadence of the present—ideas entirely the opposite of those of Claude, who, trusting to the never-fading beauty of nature, endeavored, from the scenery and architectural remains in Italy, to realize the classic age in all its glory. The National Gallery possesses six specimens of P., some of them being reckoned masterpieces, as the 'Sacrifice of Isaac,' a 'Land Storm,' and an 'Italian Landscape with a View of a Town.' P. died in Rome 1675.

POW'AN (*Coregonus* [q. v.] *Cepedei*), a fish found in Loch Lomond, Scotland, and often called *Freshwater Herring*. It is not found in any other British lake or river, and has not yet been identified with any fish of the continent of Europe, although probably it is to be found in some of the Scandinavian lakes. It resembles the Pollan (q. v.) of the Irish lakes, but is readily distinguished. The P. sometimes attains the length of sixteen inches. Great shoals are seen in Loch Lomond, rippling the surface of the water, and approaching the shores in the mornings and evenings. They are never seen in the middle of the day. The P. is highly esteemed for the table; and is in best condition in August and September. It is generally caught by nets.

POWDERED, or SEMÉE, in Heraldry, strewn with an indefinite number of small charges.

POWELL, The Rev. Baden, an eminent English savant, son of a London merchant, was born at Stamford Hill, near London, 22d August 1796, and studied at Oriel College, Oxford, where he graduated M.A., with first-class mathematical honors in 1817. P. took holy orders in 1820, and was appointed vicar of Plumstead, in Kent, in 1821. In 1824, he was elected a Fellow of the Royal Society; and three years later, was appointed Savilian Professor of Geometry, a chair which he held till his death, which took place in London, June 11, 1860. As a professor, his great aim was to bring about a larger recognition of the importance of physical and mathematical science, in the curriculum of learned study at Oxford, and his efforts have not been altogether in vain. To the 'Philosophical Transactions,' the 'Reports' of the British Association, and other vehicles of scientific instruction, he contributed numerous valuable papers; but is perhaps best known by his strenuous exertions to obtain for modern science the right of modifying the views of nature and the origin of the world, expounded or thought to be expounded in the Jewish Scriptures. In this perilous department of controversy P. displayed great learning, logical power, moderation of tone, and philosophic urbanity; but his conclusions were too unmistakably rationalistic to be palatable to the orthodox.

Among his works may be mentioned *A Short Elementary Treatise on Experimental and Mathematical Optics, Designed for the Use of Students* (Oxford, 1833); *Revelation and Science* (Oxford, 1833); *A Historical View of the Progress of the Physical and Mathematical Sciences* (Lond. 1834); *The Connection of Natural and Divine Truth* (Lond. 1838); *Tradition Unveiled; a Candid Inquiry into the Tendency of the Doctrines advocated in the Oxford Tracts; A General and Elementary View of the Undulatory Theory as applied to the Dispersion of Light*, &c. (Lond. 1841); *Essays on the Spirit of the Inductive Philosophy*, &c. (Lond. 1855); *Christianity without Judaism* (1857); *The Order of Nature considered with Reference to the Claims of Revelation* (1859); and *On the Study and Evidences of Christianity* in *Essays and Reviews* (1860).

POWER, in point of law, means an authority given to some person who would otherwise not be entitled to do the specific thing empowered. Thus an authority given to an agent to act for another is called a power of attorney; and there are numerous examples of powers contained in marriage settlements, wills, and miscellaneous deeds, which authorize one of the parties to do something in certain contingencies. Thus a power of revocation is often reserved to a party to revoke a will or deed. There is a power of appointment given to a married woman or widow to bequeath or divide certain property in certain events among her children. So a power to charge or jointure an estate, and to secure the portions of children. There are many nice and difficult rules of law applicable to matters connected with and arising out of powers. A power is created by a deed or will: and it is said to be executed when it is carried out. In Scotland, powers are generally called Faculties (q. v.).

POWERS, Hiram, American sculptor, son of a farmer, and the eighth of nine children, was born at Woodstock, Vermont, July 29, 1805, and acquired the rudiments of education at a free district-school. While still a boy, he went to Cincinnati, Ohio, where he became an apprentice to a clockmaker, and about the same time formed the acquaintance of a German sculptor, who taught him to model in plaster. Subsequently, he was employed for several years making wax-figures and fitting them with machinery, for the Cincinnati museum, where his 'Infernal Regions' horrified thousands of visitors. In 1835, he went to Washington, where he executed the busts of several distinguished persons; and, with the aid of Mr. Nicholas Longworth, in 1837 went to Italy to study his art, residing in Florence till his death. In 1838, he produced his statue of 'Eve,' which excited the admiration of Thorwaldson; and in 1839, the still more popular 'Greek Slave,' of which six copies in marble, with cast copies innumerable, were produced. Of his 'Fisher Boy,' three copies were ordered. Among his other works the chief were 'Proserpine,' 'Il Penseroso,' 'California,' 'America' (the last for the Crystal Palace, Sydenham); statues of Washington for the state of Louisiana, of Calhoun for South Carolina, and Webster for Boston; and busts of Adams, Jackson, Marshall, Van Buren, and other distinguished Americans. He died June 27, 1873.

POY'NTELL, pavement or tiles laid in small lozenge form.

POZZO DI BORGO, Carlo Andrea, a celebrated Russian diplomatist, was born at Alala in Corsica, March 8th, 1768, and was educated at the university of Pisa. Returning to Corsica, he adopted the profession of advocate, in which he soon became distinguished for his activeness, ingenuity, and brilliant eloquence; and about this time an intimacy sprung up between him and the two young Bonapartes, Napoleon (I.) and Joseph. P.'s great ability soon gained for him the esteem of Paoli (q. v.), who made him the confidant of his plans, to the intense disgust of the Bonaparte family, who considered themselves slighted. A coolness in consequence sprung up between P. and young Napoleon, which, as their paths in life diverged more and more, passed through the various grades of antagonism, dislike, distrust, and hatred, till, when the latter swayed the sceptre of France, and the former became the supreme trusted adviser of Russia and Austria, it culminated in a deadly struggle for victory between the diplomatist and the warrior, to be ended only by the death of one or the destruction of his power. P. represented Corsica in the French National Assembly (1791—1792); but his party, that which wished to unite liberty and hereditary rule, being overpowered by their 'radical' opponents, he was compelled to return to Corsica, where he again attached himself to Paoli's party; and on the failure of that chief's plans, retired to London. Here he became the agent of the French refugees; and in 1798, having now thoroughly broken with the Bonapartes, he went to Vienna to promote an alliance of Austria and Russia against France, and accompanied the Russian army in the subsequent campaign of 1799.

In 1803, he entered the Russian service as a councillor of state, from this time devoting his whole attention to diplomacy. He was at the bottom of the Russo-Austrian alliance, which was dissolved by the battle of Austerlitz (1805); but after the treaty of Tilsit, fearing lest Napoleon might insist upon his surrender, he retired to Austria, from which country Napoleon, in 1809, demanded his extradition. The Emperor Francis refused, but P., to save trouble, retired to England (1810), where he staid for some time; and then returned to Russia. He soon after induced the Emperor Alexander to make certain custom-house regulations which offended Napoleon, and were a chief cause of the rupture which resulted in the campaign of 1812; he also suggested to the emperor, and effected the seduction of Murat, Bernadotte, and Moreau from the Napoleonic cause; and after the victorious allies had driven Napoleon across the Rhine, P., at the congress of Frankfurt-on-the-Main, drew up his famous declaration, 'that the allies made war not on France, but on Napoleon.' From this time, his whole energies were devoted to the task of keeping Alexander inflexible with regard to Napoleon's seductive offers of accommodation; but after his old antagonist's downfall, he exerted himself with equal vigor at Paris (where he signed the treaty of 1815 as Russian ambassador) and Aix-la-Chapelle (1818) to ameliorate, as much as possible, the hard conditions imposed upon France. After the accession of the Emperor Nicholas, he was, though highly esteemed, less confided in, and accordingly accepted the post of Russian ambassador in London; but retired from public life in 1839, and settled in Paris, where he died 15th February 1842.

POZZUO'LI, a city of Southern Italy, at the east of the bay of Naples, in the province of Naples, with 16,752 inhabitants; has manufactures of soap. But the interest which attaches to it is drawn from its numerous memorials of classic ages. Its cathedral was the Temple of Augustus. There is the Temple of Serapis, an Egyptian god, who was invoked by the priests to render the mineral waters of the place efficacious as remedies. The interior of the temple had a portico of 24 pillars, surrounded by 70 chambers for the sick and for the priests. In the harbor there may still be seen 13 pillars, which formerly supported as many arcades, under which the inhabitants used to congregate to watch for the vessels coming from Africa. There is an arch erected to Antoninus Pius, for having restored 20 of those pillars. There are the remains of an amphitheater which might have contained 25,000 spectators. The Solfatara (*Forum Vulcani*) is a half-extinct volcano near P., from which springs saline water, used as a remedy for cutaneous diseases. Near the Montenuovo there is the famous Lago d'Averno, enclosed among hills; and at a short distance from it there is the Sibyl's Cave (*La Grotta della Sibilla*), which, however, is nothing more than the remains of a subterranean passage leading, perhaps, to Baja. On a plain there is an extinct volcano; there Cumæ once stood, now all in ruins. In the environs of P. are to be seen the promontory of Posilipo, the Elysian Fields (*Campi Elisi*) near the harbor of Miseno, and the Lake of Agnano, formerly the crater of a volcano.

P. was probably built by the Cumani (Greek colonists of Cumæ), who gave to its gulf the name of *Cumanus*. They called the new port *De Cœarchia*, a name which was afterwards changed to *Puteoli*, in allusion perhaps to the sulphur wells or springs (*putei*) with which it abounded. Puteoli is first mentioned in history during the Second Punic War, when, by order of the senate, it was surrounded by strong walls. In 214 B. C. it repulsed Hannibal, and from this period rose in importance until, towards the close of the republic, it became virtually the port of Rome, and during the empire was really the first emporium of commerce in Italy. Puteoli was destroyed by Alaric, Genseric, and Totila, and though rebuilt by the Byzantine Greeks, it was exposed to new devastations, to earthquakes, and volcanic eruptions, and soon sank into the decay which continues to mark it.

PRA'CTICE, in Arithmetic, is the name given to a method, or rather a system of expedients, for shortening or avoiding the

operation of compound multiplication. The nature of the expedients will be best understood by an example: Suppose that the price of 64,875 articles at £2, 17*s.* 6*d.* is required. It is obvious that the price, at £1, would be £64,875; therefore, at £2, it is £129,750; at 10*s.*, it is the half of that at £1, viz., £32,437, 10*s.*; at 5*s.*, the half of this last sum, or £16,218, 15*s.*; and at 2*s.* 6*d.*, the half of this, or £8109, 7*s.* 6*d.* The sum of these partial prices gives the whole price—thus

	£	*s.*	*d.*		£	*s.*	*d.*
Price at	2	0	0		129750	0	0
" "	0	10	0	(= ½ of £1),	32437	10	0
" "	0	5	0	(= ¼ of 10*s.*),	16218	15	0
" "	0	2	6	(= ¼ of 5*s.*),	8109	7	6
" "	2	17	6		186515	12	6

The general principle of the method is to decompose the lower denominations of the compound factor into *aliquot parts* of the higher unit. A still simpler way with the above example is the following:

	£	*s.*	*d.*		£	*s.*	*d.*
Price at	3	0	0		194625	0	0
" "	0	2	6	(= ¼ of £1)	8109	7	6
" "	2	17	6		186515	12	6

PRÆ'FECT, a common name applicable to various Roman functionaries. The most important was the *Præfectus urbi*, or warden of the city, whose office existed at an early period of Roman history, but was revived under Augustus, with new and greatly altered and extended authority, including the whole powers necessary for the maintenance of peace and order in the city, and an extensive jurisdiction civil and criminal. The *Præfectus prætorio* was the commander of the troops that guarded the emperor's person.

PRÆMUNI'RÉ, the name given in English Law, to a species of offence of the nature of a contempt against the sovereign and his government, and punishable with forfeiture and imprisonment. The name is derived from the first words (*præmunire* or *præmonere facias*) of a writ originally introduced for the purpose of repressing papal encroachments on the power of the crown. The first statute of præmunire was passed in the reign of Edward I. The attacks of the popes on the rights of private patrons, by bestowing bishoprics, abbacies, &c., on favorites before they were void, were the immediate cause of various subsequent statutes of præmunire, which made it penal to endeavor to enforce the authority of papal bulls and provisions in England. By later statutes, a number of offences of a miscellaneous description have been rendered liable to the penalties of a præmunire, as (by 6 Anne c. 7) the asserting by preaching, teaching or advisedly speaking, that any person, other than according to the Acts of Settlement and Union, has any right to the throne of these kingdoms, or that the sovereign and parliament cannot make laws to limit the descent of the crown. The knowingly and wilfully solemnizing, assisting, or being present at any marriage forbidden by the Royal Marriage Act, is declared by 12 Geo. III. c. 11 to infer a præmunire.

PRÆNE'STÉ. See PALESTRINA.

PRÆ'TOR (probably a contraction for *præitor*, from *præ-eo*, to precede, also to order) was, among the ancient Romans, the title given to the consuls as leaders of the armies of the state; but it was specially employed to designate a magistrate whose powers were scarcely inferior to those of a consul. The prætorship, in this specific sense of the term, was first instituted in 366 B.C., as a compensation to the patricians for being obliged to share with the plebeians the honors of consulship. It was virtually a third consulship; the prætor was entitled *collega consulibus;* he was elected by the same auspices and at the same comitia. For nearly 30 years, patricians alone were were eligible for the office; but, in 337 B.C., the plebeians made good their right to it also. The prætor's functions were chiefly judicial. Though he sometimes commanded armies, and, in the absence of the consuls, exercised consular authority within the city, yet his principal business was the administration of justice both in matters civil and criminal; and 'to the edicts of successive prætors,' says Mr. G. Long, 'the Roman law owes, in a great degree, its development and improvement.' Originally, there was only one prætor; but as the city and state increased, and their relations with other nations became more complicated, others were added. In 246 B.C., a second prætor was appointed, to settle disputes that might arise between Romans and foreigners temporarily resident in Rome, for trading or other purposes, hence called *prætor peregrinus* (foreign prætor), to distinguish him from the original *prætor urbanus* (city prætor). In 227 B.C., two new prætors were appointed, to administrate affairs in Sicily and Sardinia; and in 197 B.C., two more for the Spanish provinces, or six in all. Sulla increased the number to eight, and Julius Cæsar to sixteen. Augustus reduced the number to twelve; but at a later period we read of eighteen, if not more. The city-prætorships were reckoned the highest; and after a person had filled these offices, he sometimes received the administration of a province with the title of *proprætor* or *proconsul*.

PRÆTO'RIAN BANDS (Lat. *Prætoriæ Cohortes*, and *Prætoriani*) the name given, more particularly during the period of the Roman empire, to a body of soldiers, organized for the purpose of protecting the person and maintaining the power of the emperors. We indeed read of a *prætoria cohors*, or select guard of the most valiant soldiers attached to the person of Scipio Africanus, who, according to Festus, received six-fold pay, and the exigencies of the civil wars naturally increased their number, but it was to Augustus that the institution of them as a separate force is owing. He formed nine or ten cohorts, each consisting of a thousand men (horse and foot), but kept only three of them in Rome, the rest being dispersed in cities not far off. Tiberius, however, assembled the nine cohorts at the capital in a permanent camp, and Vitellius increased their number to sixteen. The Prætorians served at first for twelve, and afterwards for sixteen years; they received double pay; the privates were held equal in rank to the centurions in the regular army, and on their retirement each received 20,000 sesterces. They soon acquired a dangerous power, which they exercised in the most unscrupulous manner, deposing and elevating emperors at their pleasure. Aspirants for the imperial dignity found it advisable, and even necessary, to bribe them largely; while those who acquired that dignity without their assistance were accustomed on their accession to purchase their favor by liberal donations. The Prætorians, however, had no political or ambitious views; they were simply an insolent and rapacious soldiery, fond of substantial gratifications, and careless how they got them.

After the death of Pertinax (193 A.D.), they actually sold 'the purple' for a sum of money to Didius Julianus; but in the same year their peculiar organization was entirely broken up by Severus, who formed new cohorts altogether out of the best legions serving on the frontiers, which he increased to four times the number of the old. After several other changes, they were entirely abolished by Constantine (312 A.D.), who dispersed them among his regular legions.

PRA'GA. See WARSAW.

PRAGMA'TIC SANCTION, or RESCRIPT, a solemn ordinance or decree of the head of a legislature relating either to church or state affairs. The term originated in the Byzantine empire, and signified a public and solemn decree by a prince, as distinguished from the simple rescript, which was a declaration of law in answer to a question propounded by an individual. This name is given to several important treaties, of which the principal are: 1. An ordinance of Charles VII. of France, in which the rights of the Gallican Church were asserted in opposition to the ursurpation of the pope in the appointment of bishops. Twenty years later, Louis XI., in order to please Pope Pius II., was induced to give up this P. S., which was ignominiously dragged through the streets of Rome; but at a subsequent date, a quarrel having arisen between Louis and the Pope, the P. S. was re-enacted. 2. The instrument which settled the empire of Germany in the House of Austria (1439 A.D.). 3. The ordinance by which Charles VI., Emperor of Germany, having no male issue, settled his dominions on his daughter, the Archduchess Maria Theresa, which was confirmed by the diet of the empire, and guaranteed by Great Britain, France, the States General, and most of the European powers. 4. The settlement of the succession of the kingdom of Naples, which was ceded by Charles II. of Spain, in 1759, to his third son and his descendants.

PRAGUE (Ger. *Prag*, Slav. *Praha*), capital of the kingdom of Bohemia, is situated in 50° 5′ N. lat., and 14° 30′ E. long., on the slope of the hills which skirt both sides of the river Moldau, 251 miles north-east of Vienna by railway. Pop. in 1880, 218,077. P., which ranks as the third city of Austria, presents a highly picturesque appearance from the beauty of its site, and the numerous lofty towers (upwards of 70 in number) which rise above the many noble palaces, public buildings, and bridges of the city. It consists of four principal parts: 1. The Kleinseite, chiefly occupied by the public offices, and the residences of the officials; 2. The Hradschin (or palace district), surmounted by the vast imperial castle, and containing some of the most ancient and interesting churches and palaces of P.; 3. The Jews' Quarter, now known as the Josephstadt, which forms the chief business-quarter and contains numerous churches, ecclesiastical and educational establishments; 4. The 'New Town,' containing the largest number of streets and open squares, with many modern palaces, charitable institutions, and places of public resort. P. is surrounded by walls and bastions, and has eight gates. The citadel, the ancient residence of the old dukes of Bohemia, is well fortified, and from its elevated position above the Moldau, thoroughly

commands the city. P. has 55 Catholic, and 3 Protestant churches, 15 monasteries, and 10 synagogues.

Among the most noteworthy of these are the Metropolitan, or St. Veits, with its lofty tower, a fine but unfinished specimen of the Gothic of the 14th c., containing the remains of St. Ludmilla, first duchess of Bohemia, and of seven kings and emperors of Germany, with the grave of St. Wenzelaus, and the silver sarcophagus of St. Nepomuk (see ST. JOHN OF NEPOMUK), a popular saint of Bohemia; St. Nicolas, or the church of the Jesuits, with its many towers and costly decorations; the Thein Church, built in 1407; the old Hussite church, with the grave of Tycho Brahe, and its marble monuments of the Slavonic martyrs, Cyril and Methodius. Among the numerous public and other buildings of note in P., the following are some of the more interesting: the Royal Palace, the Cathedral, the Theresa Institution for Ladies, the ancient Byzantine church of St. George, the Hradschin Square, with the imposing palaces of the primate, the ex-emperor, and Prince Schwarzenberg; the Loretto Chapel, with its gorgeously bejewelled church vessels; the vast Czerni Palace, now used as an institution of charity; the Picture Gallery; the Præmonstratentian monastery of Strahow; the royal library; and at the summit of the Laurenzberg, the restored Church of St. Lawrence. P. has, however, numerous public gardens and walks in the suburbs, which, with the several royal and noble parks open to the public in the vicinity of the city, afford varied resources for health and open air recreations.

The suburb of Karolinenthal, which is traversed by the great viaduct of the railway, and is of modern growth, has some fine buildings, numerous gardens, barracks, and manufacturing establishments; and somewhat further north is the great botanical garden, with the neighboring public walks on the Moldau. The university, one of the most ancient in Europe, having been founded in 1348, enjoyed the greatest celebrity in the 15th c., when many thousand scholars came from foreign countries to study in its halls; but subsequently it had a long period of decay. It received a new constitution in 1881, having now two co-ordinate sides or sections, one German and one Czech; a library of 142,000 volumes, and 7762 manuscripts; a fine observatory; museums of zoology and anatomy; a botanical garden, &c. P. has also 1 Polytechnic, 3 gymnasia, Bohemian and German training schools, and about 20 parish schools. The manufactures include leather, cotton, and linen goods, stockings, printed cottons, machinery of various kinds, beet-root sugar, &c. P. is the great center of the commerce of Bohemia, and the seat of an important transit trade.

History.—According to popular tradition, P. was founded in 722 by the Duchess Libussa. In the 13th c., its importance was fully recognized; in the 14th and 15th centuries, its munificently endowed university brought foreigners to it from every part, until the decision of the Emperor Wenzelaus to favor Bohemian students more than others drove thousands of the scholars with their professors to other spots, and led to the foundation of universities at Leipsig, Ingolstadt, Rostock, and Cracow. In 1424, P. was conquered, and almost destroyed by the Hussites, who had made a successful stand against the emperor Sigismund's army; but after the subsequent defeat and submission of the insurgents, the city was rebuilt. In the Thirty Years' War, it suffered severely, and in 1620 the battle was fought at the White Mountain, near the city, in which the Elector-Palatine, Frederick V., known as the Winter King, and son-in-law of James I. of England, was completely defeated, and compelled to renounce his assumed crown, and to give up the town into the power of the emperor. Swedes and Imperialists successively gained possession of it during the war; and a century later, during the Seven Years' War, it again fell into the hands of different victors, having been compelled, in 1744, to capitulate to Frederick the Great of Prussia; and until the war of deliverance in Germany, and the downfall of Napoleon, the city continued to suffer more or less directly from the troubles in which the house of Austria had been involved. During the last sixty years, it has, however, made rapid strides, and enjoyed prosperity and quiet, except in 1848, when the meeting of the Slavonic Congress within its walls called forth such strongly marked democratic demonstrations on the part of the supporters of Panslavism (q. v.), that the Austrian government dissolved the conclave, and restored quiet by the summary method of causing the old and new town to be bombarded for two days.

PRAIA GRANDE. See RIO DE JANEIRO, PROVINCE.

PRAI'RIE (Fr. meadow) was the name given by the early French explorers of the northern portion of the Mississippi Valley, North America, to the vast fertile plains which extend from Western Ohio and Southern Michigan, across the states of Indiana, Illinois, Missouri, Arkansas, Iowa, Kansas, and Nebraska and Dakota Territories, including the southern portions of Wisconsin and Minnesota. These great plains or savannas are sometimes flat, but oftener rolling like the long swells of the ocean, and rise in gradual elevation from 300 to 1500 feet above the level of the sea. They are drained by numerous rivers, branches of the Ohio, Mississippi, and Missouri, or emptying into Lake Michigan, whose channels seem to have been worn to the depth of 50 to 300 feet, with vertical walls or bluffs of limestone, sandstone, displaying in some places banks of clay, sand, and loam, 200 feet in thickness. Beneath the prairies north-west of the Ohio are extensive coal-fields, with deposits of iron, lead, &c. The soil is finely comminuted, rich, and extremely fertile, varying in thickness from one or two feet, to the bottom-lands on the borders of the rivers, which are of great depth and inexhaustible fertility. These plains are destitute of trees, except in isolated groves, a few rocky ridges, and the borders of streams. They are covered with fine grasses, and brilliant flowers of various species of the helianthoid *Compositæ*. Water is found from 15 to 30 feet below the surface. These great prairies, covering an area of about 400,000 square miles, formerly fed vast herds of buffalo, deer, wild turkeys, prairie-hens or grouse, prairie-dog, squirrel, &c. In the autumn, the dried grasses, fired by the Indians, converted them into seas of flame. The lack of timber is attributed by some to the fineness of the soil.

Remains of ancient mounds, fortifications, and cities show that they were, at some distant period, inhabited by a more civilized race than the Indians found by European discoverers. These great rolling plains, or natural pastures, with only the labor of ploughing, produce large crops of wheat and maize, and, penetrated by navigable rivers, and crossed by cheaply built railways, they form one of the most easily cultivated and prolific regions of the world, and are capable of sustaining immense populations.

PRAIRIE DOG (*Arctomys Ludovicianus*), a very interesting species of Marmot (q. v.), an inhabitant of some of the western Prairies (q. v.) of North America. It is about the size of a squirrel or large rat; and has soft, reddish-gray fur, each hair being red, with a white tip. The name P. D. seems to have been given



Prairie Dog (*Arctomys Ludovicianus*).

to it from its frequent utterance of a sound somewhat like the bark of a very young puppy. For the same reason, it is also called the Barking Squirrel. A more correct name would be Barking Marmot, or Prairie Marmot. The P. D. does not inhabit the rich grass-covered prairies where the buffalo (bison) abounds; but those which, from want of water, exhibit a comparatively scanty vegetation; and in these it is to be found in vast numbers, being gregarious in its habits, burrowing in the ground, and throwing up mounds of earth, on the summit of which the little creature often sits as if on watch. The whole extent of a great level prairie is often covered with these hillocks. 'Their number is incredible,' says the Honorable C. A. Murray, in his *Travels in North America*, 'and their cities, for they deserve no less a name, full of activity and bustle.'

As soon as the hand is raised to a weapon or missile, they pop into their holes with amazing rapidity, and then wheel round and look out at the enemy. Still more interesting is the frequent association of the P. D. with the burrowing owl and the rattlesnake in the same burrow; an association which has been variously described as one of strange friendship among very different creatures, in a state of nature; and as of the most opposite character, the owl and the rattlesnake being supposed to prey upon the P. D. and its young. But in so far as the owl is concerned, this is rendered very doubtful by the fact, that its *casts* seems to show its food to consist entirely of insects. It probably finds the burrows of the marmot its only convenient retreat, and their proper inmates harmless neighbors.

PRAIRIE-DU-CHIEN, a town of the state of Wisconsin, U. S. on the right bank of the Mississippi, three miles above the mouth of the Wisconsin, and 165 miles west from Milwaukee. It is a prosperous and rapidly-increasing town, and in its neighborhood are rich copper-mines. Pop. (1870) 2700.

PRAIRIE HEN. See GROUSE.

PRAJAPATI (from *prâja*, creation, created beings; and *pati*, lord) is, in Hindu Mythology, a name of the god Brahmâ, but also a name of those divine personages who, produced by Brahmâ, created all existing beings, inclusive of gods, demons, and natural phenomena. Manu knows of ten such *Prajapatis* engendered, through pure meditation, by the god Brahmâ—viz., Marîchi, Atri, Angiras, Pulastya, Pulaha, Kratu, Parchetas or Daksha, Vasisht'ha, Bhr'igu, and Nârada. The Mahâbhârata, however, leaves out Daksha, Bhr'igu, and Nârada; and other varieties occur in the different Purân'as. Whereas, also, these 'lords of creation,' in conformity with Manu, are in some of these works looked upon as the mind-born sons of Brâhma, some Purân'as derive them from different parts of Brahmâ's body. The only interesting point in this theory of the Prajâpatis is the assumption, that the world did not immediately proceed from Brahmâ, the highest god, but through the intermediate agency of beings which thus stand between him and creation.

PRAJNA PARAMITA (literally, the wisdom which has gone to the other shore, viz., of its object; i. e., absolute or transcendental wisdom, from the Sanscrit *prajnâ*, wisdom, *pâram*, to the other shore, and *ita*, gone) is the title of the principal Sûtra (q. v.) of the Mahâyâna school of the Buddhists (see BUDDHISM). Its main object is metaphysical; but the commencement of the work is merely a eulogy of Buddha, and of the Bodhisattwas, who form his retinue. Other parts of it contain incidental narratives of wonderful phenomena connected with the apparition of Buddhist saints, or a description of the benefits arising from an observance of the Buddhistic doctrine, or verses in which the Buddha is praised by his disciples, and similar irrelevant matter. It is probably on account of the extent which could easily be imparted to such episodical topics, but also by amplifying the real substance of the work, that several recensions of the P. are in existance, both with the Buddhists and Tibetans (see LAMAISM); some of these do not contain more than 7000 or 8000 or 10,000 s'lokas, or paragraphs; but others amount to 18,000, 25,000, or 100,000 s'lokas. The following may serve as a specimen of the abstruse ideas treated of in this great work of the Buddhistic doctrine. No object has existence or non-existence; nothing belongs to eternity or non-eternity, to pain or pleasure, to vacuity or non-vacuity.

All objects are without attributes and with attributes, with and without characteristic marks. Bodhisattwa (the name for a deified saint) and Prajnâ (wisdom) are synonymous terms; such a term neither rises nor perishes; it exists neither inwardly nor outwardly, because it cannot be seized; but the Bodhisattwa must accomplish his career under this fallacious name; it is his duty, however, to look neither upon form nor anything else as an eternal or non-eternal, as a pure or impure matter, &c. Then only when he is in a condition of complete indifference regarding everything, is he capable of encompassing the whole wisdom. . . . . The absence of nature is the nature of everything; all objects are separated from their characteristics. All objects neither appear nor are born, nor disappear, nor cease to be, nor are they pure nor impure, nor are they acquirable nor non-acquirable. Want of understanding is the not understanding that objects are nonentities. From the want of understanding proceed all subjective notions; and through the latter one becomes incapacitated from fulfilling the behests of the sacred doctrine, and from entering the path which leads to wisdom. . . . . Everything is like the echo, or a shadow, or anything else without substance. In short, the doctrine of the P. is the entire negation of the subject as well as the object; and whatever be the difference in detail between the points of view from which it looks upon subject or subject, or between its comparisons and circumlocutions, the result is always the same: that the object of ascertainment, or the highest wisdom, has no more real existence than the subject striving to attain to it, or the Bodhisattwa.—See E. Burnouf, *Introduction à l'Histoire du Buddhisme Indien* (Paris, 1844); W. Wassiljew, *Der Buddhismus, seine Dogmen, Geschichte und Literatur* (St. Petersburg, 1860).

PRAKR'IT (from the Sanscrit *prakr'iti*, nature; hence, natural, not accomplished, vulgar) is the collective name of those languages or dialects which are immediately derived from, or stand in an immediate relation to Sanscrit, or 'the accomplished' Language (q. v.) of the Hindus. These languages, however, must not be confounded with those modern languages of India which also have an affinity with the Sanscrit language; for, in the Prâkr'it languages, however much they may differ from Sanscrit in their phonetic laws, the words and grammatical forms are immediately derived from that language; whereas, in the modern tongues of India, there is not only no connection between their phonetic laws and those of Sanscrit, but their grammatical forms also are wholly different from those of the ancient language; and while many of their words have no Sanscritic origin, even those which have, show that they are not immediately drawn from that source. The Prâkr'it languages comprise, besides the *Pali* (q. v.), which generally, however, is not included amongst them, those dialects which are found in the dramas and in the oldest inscriptions. In the dramas, it is women, except female religious characters, and subordinate male personages, who are made to speak in these languages—the use of Sanscrit being reserved for the higher characters of the play—and amongst the former, again, the choice of the special Prâkr'it dialect is adapted by the poet to the rank which such a subordinate personage holds, the more refined dialect being appropriated, for instance, to the wives of the king or hero of the play; an inferior Prâkr'it to his ministers; others less in degree to the sons of the ministers, soldiers, townpeople, and the like; down to the lowest Prâkr'it, which is spoken only by servants, or the lowest classes.

A work on the poetical art, the *Sâhityadarpan'a*, enumerates 14 such Prâkr'it dialects—viz., the *S'auraseni*. *Mâhârâshtrî*, *Mâgadhi*, *Ardhamâgadhî*, *Prâchyâ*, *Avantikâ*, *Dâkshin'âtyâ*, *S'âkvarî*, *Bâhlikâ*, *Drâvid'i*, *Abhîrî*, *Chân'd'âli*, *S'âbarî*, and *Pais'âchî*; but Vâraruchi, the oldest known grammarian of the Prâkr'it dialects, knows but four—viz., the *Mâhârâsht'rî*, *S'auraseni*, *Mâgadhi*, and *Paisichi*; and Lassen, in the *Indische Alterthumskunde*, holds that, of those, only the *S'auraseni* and the *Mâgadhî* have a really local character—the former, as he assumes, having been the vernacular of a large district of Western, and the latter—which is also the Prâkr'it in the inscriptions of King As'oka—of Eastern India; whereas the Mahârâsht'rî, or the language of the Mahrattas, does not seem to have been the language of the country the name of which it bears; and the Pais'âchî, or the language of the Pis'âcha, is obviously merely a fancy name. The principal Prâkr'it dialect is the Mahârâsht'rî; the lowest, according to some, the Pais'âchî, of which two varieties are mentioned; but according to others, the *Apabhramo'a*—which word originally means 'a falling off'—i. e., a dialect which completely deviates from the grammatical laws of Sanscrit, but in this special application would designate a dialect even inferior to the Pais'âchî, and is compared by a grammarian to the language of the reptiles.

On the grammar of the Prâkr'it languages, see Chr. Lassen, *Institutiones Linguæ Pracriticæ* (Bonn, 1837). The Sûtras, or grammatical rules of Pâraruchi, have been edited in the same work; but more elaborately, with a commentary, copious notes, an English translation, appendices, and an index, by Edward Byles Cowell, who has also added to this excellent edition, *An Easy Introduction to Prâkr'it Grammar* (Hertford, 1854).

PRASE, a green variety of Quartz (q. v.), sometimes found crystallized in the same forms as common quartz, but more generally massive, or in prismatic and granular concretions. It is rather a rare mineral. It is sometimes cut as an ornamental stone, but is not highly esteemed.

PRATIQUE is, strictly, a limited quarantine. A ship is said to have performed pratique when her captain has convinced the authorities of a port that his ship is free from contagious disease; and he is thereupon permitted to open trade and communication with the shore.

PRA'TO—often, for distinction, called PRATO IN TOSCANA—a town of Italy, in the province of Florence (*Firenze*), 10 miles north-west of Florence, in a fertile plain, on the right bank of the Bisenzio, a feeder of the Arno, and on the railway between Florence and Pistoja. There are manufactures of straw-plait, woollen cloth, cotton goods, silk thread, &c.; also soap-works, tanneries, and copper-works. Copper-mines of considerable productiveness exist in the neighborhood. Pop. (1881) 13,410.

PRAWN (*polæmon*) a genus of crustaceans, of the order *Decapoda*, and sub-order *Macroura*, in general form resembling lobsters, crayfish, and shrimps, but belonging to a family *Palæmonidæ*) remarkable for a long serrated beak projecting from the carapace. The upper antennæ are terminated by three filaments. There are many species of P., and some of those which inhabit the seas of warm climates attain a large size. Many of them are semi-transparent, and exhibit very fine colors; they are also very active creatures, and most interesting inmates of an aquarium, but are excessively voracious, and apt to make great havoc among its other inhabitants. The COMMON P. (*P. serratus*) attains a length of three or four inches. It is common on the British coasts, although not so abundant as the shrimp, and is generally taken in the vicinity of rocks at a little distance from the shore, and not in rock-pools. It is more esteemed for the table than even the shrimp. Osier-baskets, similar to those employed for catching lobsters, are employed for the capture of prawns; also nets about five or six feet wide, which are pushed along by means of poles, and are called *Putting Nets*. One side of the thorax of a P. is often found remarkably distended. This is owing to a parasitic crustacean, *Bopyrus crangorum*, one of the *Isopoda*, lodged under the carapace.

PRAXI'TELÉS, a celebrated sculptor of ancient Greece, of whose life nothing is known, except that he was a citizen of Athens, and lived in the 4th c. B.C. Pliny gives the date 364 B.C.

apparently as that in which P. began to flourish. His principal works—all of which have now perished—were: 1. Statues of Aphrodite (at Cos, Cnidus, Thespiæ, Latmian Alexandria, and Rome), of which that of Cnidus was the most famous; 2. Statues of Eros (at Thespiæ, and Parium on the Propontis); 3. Statues, single and in groups, from the mythology of Dionysus (at Elis, Athens, Megara, and other places); 4. Statues of Apollo, the best of which was that representing Apollo as the Lizard-slayer. So far as we are entitled to form an opinion of the works of P. from the descriptions and criticisms of ancient writers, it would seem that they marked an epoch in the history of Greece—viz., the transition from the earnest, heroic, and reverential age preceding the Peloponnesian war, to the more corrupt and sensual times that followed it. The sculpture of Pheidias is inspired by a profound veneration for the majesty of the gods; that of P. sought to give expression to the looser and less divine conceptions of the national religion. The bewitching beauty of woman, and the intoxication of Bacchic pleasures, were his favorite subjects; but in his treatment of these, he displayed unrivalled sweetness, grace, and naturalness. His gods and goddesses were not very divine, but they were ideal figures of the fairest earthly loveliness.

PRAYER is a universally acknowledged part of the worship due to God; a simple and natural expression of dependence, which seems almost necessarily to follow from a belief in the existence of a god. Accordingly, we find it both where the object of worship is one Supreme Being and in systems of polytheism. It is also combined with every other part of worship. According to the Christian system, however, prayer is not the mere spontaneous approach of man to God, in the endeavor to appease his wrath, to win his favor, or to obtain from him any blessing; but the right to approach him in prayer, and the warrant to expect advantage in doing so, rest on the revelation of his own will. Nor is any truth more indisputably taught in the Bible, or more frequently brought into view, both in the Old and in the New Testament, than that God is the *hearer* of prayer.

But a difficulty presents itself, in respect to what may be called the theory of prayer. How can prayer be supposed to influence the divine mind or will? How can a belief in its power be reconciled with any view of the divine decrees, from the most absolute doctrine of predestination to the most modified scheme which recognizes the Creator as supreme in the universe? Such questions bring up the same difficulty which attends all other questions of the relations between the human will and the divine, the freedom of man and the sovereignty of God. But whatever seeming inconsistencies may be implied in speculation concerning them, the necessity of prayer and the power of prayer are acknowledged equally by men of the most opposite views; and generally with an acknowledgment of the inability of the human mind to solve some of the problems which are thus presented to it. The extreme predestinarian includes prayer among the means decreed of God along with the end to which it contributes. And whilst prayer is regarded by all Christians as of great value in its reflex influence on the feelings of the worshiper, this is scarcely ever stated as its whole value; however important this view of it may be deemed as illustrating the divine wisdom in making it one of the chief 'means of grace.'

Prayer being regarded by Christians as an *ordinance* of God, it follows that they must seek to be guided in prayer by the rules of his revealed will, in so far as his will has been revealed. It is therefore held by Christians in general, in accordance with their doctrine of the Atonement (q. v.) and of the Intercession (q. v.) of Jesus Christ, that the only true way of access to God is through the mediation of Jesus Christ, and that prayer must be made in the exercise of faith in him; the worshiper taking his stand upon the ground of the obedience or 'finished work and accepted sacrifice' of Christ, and looking up to Christ as now interceding in Heaven. It is also held, in accordance with the doctrine of man's corruption, that prayer can be truly made, in faith, and for things agreeable to God's will, only by the help of the Holy Spirit. Prayer, to be acceptable, must be for things agreeable to God's will, as that will is revealed in his Word; and therefore prayer for mere temporal or earthly good must be made in entire submission to his will; but prayer may be thus made for temporal or earthly good, the will of God having been revealed to that effect—an admirable instance of the grace of God.

Adoration, thanksgiving, and confession of sins, the accompaniments or adjuncts of prayer, are very generally regarded as parts of prayer; and prayer, which is strictly mere *petition*, is defined accordingly.

The Protestant churches all hold that prayer is to be made to God alone; the mediation of Jesus Christ and the help of the Holy Ghost being duly acknowledged. But in the Roman Catholic Church, and to some extent in the oriental churches, prayer of a kind is made also to saints, the Virgin Mary, and angels. See INVOCATION.

Prayer, according to Christians in general, must be made not merely in form or words, but with the heart. Accordingly, Protestants hold that prayer ought to be conducted in a language known to the worshipers. The Church of Rome has, on the contrary, maintained the general use of the Latin language, where that language is unknown to most of the worshipers.

Prayer for the dead (see following article) is rejected by Protestants, as having no warrant in the Word of God. But according to the Protestant creed, prayer is to be made for all the living—not only for believers but for unbelievers.

PRAYER FOR THE DEAD, the practice which prevails in the Roman Catholic, Greek, and other oriental churches, of praying for the souls of the deceased, with the intention and expectation of obtaining for them an alleviation of their supposed sufferings after death, on account of venial sins, or of the penalty of mortal sins, remitted but not fully atoned for during life. The practice of praying for the dead supposes the doctrine of PURGATORY (q. v.), although perhaps the converse is not necessarily true. Practically, however, the two may be regarded as forming part of one and the same theory, and especially if taken in connection with the doctrine of the Communion of Saints. It being once supposed, as the Roman Catholic system supposes, that relations subsist between the two worlds, that their members may mutually assist each other, it is almost a necessary consequence of the doctrine of purgatory, that the living ought to pray for the relief of their suffering brethren beyond the grave. We can but present an outline of this doctrine and of its history. It seems certain that some such doctrine existed in most of the ancient religions, and especially in those of Egypt, India, and China. It gives significance to many of the practices of the Greeks and Romans in reference to their dead. Its existence among the Jews is attested by the well-known assurance in 2d Maccabees, chap. xii., that 'it is a holy and wholesome thought to pray for the dead, that they may be loosed from their sins.'

The continued maintenance of the practice among the Jewish race, is plain from their sacred books; and a still more interesting evidence of its use has recently been discovered in the inscriptions disinterred in several Jewish catacombs of the first three centuries, at Rome and in Southern Italy, which abound with supplications: 'May thy sleep be in peace!' 'Mayest thou sleep in peace!' 'Thy sleep be with the good!' or 'with the just!' &c. Roman Catholics contend that the doctrine, as well as the practice, is equally recognizable in the early Christian Church. They rely on the parable of Lazarus and the rich man (Luke xvi. 19—31) as establishing the intercommunion of this earth with the world beyond the grave; and on Matt. xii. 32, as proving the remissibility of sin or of punishment after death; as well as on 1st Cor. xv. 29, as attesting the actual practice, among the first Christians, of performing or undergoing certain ministrations in behalf of the dead. The fathers of the 2d, 3d, and still more of the 4th and following centuries, frequently allude to such prayers as Clement of Alexandria, Tertullian, St. Cyprian, and especially St. John Chrysostom, Cyril of Jerusalem, and St. Augustine. The liturgies, too, of all the rites without exception contain prayers for the dead; and the sepulchral inscriptions from the catacombs, which reach in their range from the 1st till the 5th c., contain frequent prayers in even greater variety, and more directly intercessory, or rather more directly implying release from suffering than those of the contemporary Jews. In the services of the medieval and later church, prayers for the dead form a prominent and striking element. See REQUIEM.

The Abyssinians have separate services for the dead of all the several conditions and degrees in life, and continue to offer the mass daily for forty days after the death. The Protestant churches without exception have repudiated the practice. In the Burial Service of the first Book of Common Prayer authorized in the Church of England, some prayers for the deceased were retained; but they were expunged from the second Book; and no trace is to be found in that sanctioned under Elizabeth.

PRE-A'DAMITES, supposed inhabitants of the earth anterior to Adam. The author of the opinion, or at least the writer in whose hands it first took a scientific form, was Isaac de la Peyrere, better known by his Latinized name *Pererius*. He was born of a Calvinist family of Bordeaux in 1594, and was attached to the service of the Prince of Condé. His theory was first made public in 1655, in the form of a commentary on the 12th, 13th, and 14th verses of the 5th chapter of St. Paul's Epistle to the Romans, which was followed, in the same year, by the first part of a formal treatise on the Pre-adamite hypothesis, and the theological consequences to be derived therefrom. According to his hypothesis, Adam was the progenitor of the Jewish race only, and it is only of him and his race that the Bible is designed to supply the history. Other races existed on earth before that of Adam; but of them the Bible contains no record, nor did the Mosaic law regard them or impose any obligation upon them. It was only under the gospel that they began to be comprehended

in the law, which through Christ was given to all the human races of the earth; and it is in this sense that, according to Peyrere, sin is said (Rom v. 13), to 'have been in the world until the law,' but not to have been 'imputed when the law was not.' For the Pre-adamite race, as the law was not, there was no *legal* offence. The only evil which Peyrere recognized was natural evil.

The same limited interpretation he extended to most other details of the Mosaic history. Thus, he regarded the deluge as partial, being confined only to the Adamite race. Other miraculous narratives of the Pentateuch and even of other books he restricted similarly. As his book was published in the Low Countries, he fell under the animadversion of the Inquisition, and eventually was arrested in the diocese of Mechlin, but was released at the instance of the Prince of Condé. He afterwards went to Rome, where he conformed to the Catholic religion, and made a full retractation of his erroneous opinions. He was offered preferment by the pope, Alexander VII., but returned in preference to Paris, where he entered the seminary ot Notre Dame des Vertus, in which he resided till his death in 1676. The discussion has acquired new interest by recent discoveries of supposed evidences of human art and industry, in positions which, considered geologically, appear to their discoverers to be of an age beyond those limits which the Mosaic chronology assigns to the creation of Adam.

PRE'BEND (Lat. *præbenda*, from *præbere*, to furnish), the income or other provision assigned for the maintenance of a so-called prebendary, out of the revenue of a cathedral or collegiate church. After the definite constitution of chapters for the maintenance of the daily religious services in the bishop's church, or in other churches similarly established, endowments were assigned to them, which were to be distributed (*præbendæ*) in fixed proportions among the members. These portions were called *portiones cononicæ* or *præbendæ*. To the prebend was commonly attached a residence. The person enjoying a prebend is called a prebendary. —The name prebend is also given to an endowment assigned to a cathedral church for the maintenance of a secular priest.

PRECE'DENCE, the order in which individuals are entitled to follow one another in a state procession or on other public occasions. We find questions of precedence arising in very early ages both in Europe and in the East. Where such questions have arisen among ambassadors, as the representatives of different countries, great tenacity has often been shown in supporting the claims to rank of the states represented. In England, the order of precedence depends partly on the statute 31 Henry VIII. c. 10, partly on subsequent statutes, royal letters patent, and ancient usages. Among questions of precedence depending on usage, there are some which can hardly be considered so settled as to be matter of right, and are in a great degree left to the discretion of the officers of the crown. Formerly, they were adjudicated on by the Constable and Marshal in the Court of Chivalry; and since that tribunal has fallen into abeyance, the practice of persons aggrieved in these matters is to petition the crown, which generally refers the disputed question to the officers of arms. In Scotland, the Lyon Court has the direct jurisdiction in all questions of precedence.

It is a general rule of precedence, that persons of the same rank follow according to the order of the creation of that rank; and in the precedence of the English peerage, it has been fixed that the younger sons of each preceding rank take place immediately after the eldest son of the next succeeding rank. Married women and widows take the same rank among each other as their husbands, except such rank be professional or official, and it is an invariable rule that no office gives rank to the wife or children of the holder of it. Unmarried women take the same rank with their eldest brother; the wife of the eldest son, of any degree, however, preceding the sisters of her husband and all other ladies in the same degree with them. Marriage with an inferior does not take away the precedence which a woman enjoys by birth or creation; with this exception, that the wife of a peer always takes her rank from her husband. The following tables exhibit the precedence of different ranks as recognized by law in England.

TABLE OF PRECEDENCE AMONG MEN.

The Sovereign.
The Prince of Wales.
Sons of the Sovereign.
Grandsons of the Sovereign.
Brothers of the Sovereign.
Uncles of the Sovereign.
The Sovereign's Brothers' or Sisters' Sons.
The Archbishop of Canterbury, Primate of all England.
The Lord High Chancellor, or Lord Keeper, being a Baron.
The Archbishop of York, Primate of England.
The present Archbishop of Armagh, by the Irish Church Act (1869).
The Archbishop of Dublin.

The Lord High Treasurer.	Being of the degree of Barons.
The Lord President of the Privy Council.	
The Lord Privy Seal.	
The Lord Great Chamberlain.	
The Lord High Constable.	Above all of their degree; if Dukes, above all Dukes, &c.
The Earl Marshal.	
The Lord High Admiral.	
The Lord Steward of Her Majesty's Household.	
The Lord Chamberlain of Her Majesty's Household.	

Dukes.
Eldest Sons of Dukes of the Blood Royal.
Marquises.
Dukes' Eldest Sons.
Earls.
Younger Sons of Dukes of the Blood Royal.
Marquises' Eldest Sons.
Dukes' Younger Sons.
Viscounts.
Earls' Eldest Sons.
Marquises' Younger Sons.
Bishops of London, Durham, and Winchester.
All other English Bishops according to seniority of Consecration.
The present Bishop of Meath, and then the other Irish Bishops existing in 1869, according to seniority of consecration.
Secretaries of State, if of degree of a Baron.
Barons.
The Speaker of the House of Commons.
Commissioners of the Great Seal.
Treasurer of Her Majesty's Household.
Comptroller of Her Majesty's Household.
Master of the Horse.
Vice Chamberlain of Her Majesty's Household.
Secretaries of State, under the degree of Baron.
Viscounts' Eldest Sons.
Earls' Younger Sons.
Barons' Eldest Sons.
Knights of the Garter.
Privy Councillors.
The Chancellor of the Order of the Garter.
The Chancellor of the Exchequer.
The Chancellor of the Duchy of Lancaster.
The Lord Chief Justice of the Queen's Bench.
The Master of the Rolls.
Lord Chief Justice of the Common Pleas.
Lord Chief Baron of the Exchequer.
Lords Justices of the Court of Appeal in Chancery.
Vice-chancellors.
Judges and Barons of the degree of the Coif of the said Courts, and Judge of the Court of Probate.
Bannerets made by the Sovereign under the Royal Standard in open war.
Viscounts' Younger Sons.
Barons' Younger Sons.
Baronets.
Bannerets not made by the Sovereign in person.
Knights Grand Crosses of the Bath.
Knights Grand Crosses of the Star of India.
Knights of St. Patrick.
Knights Grand Crosses of St. Michael and St. George.
Knights Commanders of the Bath.
Knights Commanders of the Star of India.
Knights Commanders of St. Michael and St. George.
Knights Bachelors.
Companions of the Bath.
Companions of the Star of India.
Cavalieri and Companions of St. Michael and St. George.
Eldest Sons of the Younger Sons of Peers.
Baronets' Eldest Sons.
Eldest Sons of Knights of the Garter.
Bannerets' Eldest Sons.
Eldest Sons of Knights of the Bath, and of St. Michael, and St. George.
Eldest Sons of Knights Bachelors.
Baronets' Younger Sons.
Younger Sons of Knights of the Garter.
Younger Sons of Bannerets.
Younger Sons of Knights of the Bath.
Younger Sons of Knights Bachelors.
Esquires.
Gentlemen entitled to bear arms.
Clergymen, Barristers-at-law, Officers in the Army and Navy, who are all gentlemen, and have their precedency in their respective professions.
Citizens.
Burgesses.

TABLE OF PRECEDENCE AMONG WOMEN.

The Queen.
The Princess of Wales.
Princesses, Daughters of the Sovereign.
Princesses and Duchesses, Wives of the Sovereign's Sons.
Grand-daughters of the Sovereign.
Wives of the Sovereign's Grandsons.
The Sovereign's Sisters.
Wives of the Sovereign's Brothers.
The Sovereign's Aunts.
Wives of the Sovereign's Uncles.
Duchesses.
Wives of the Eldest Sons of Dukes of the Blood Royal.
Daughters of Dukes of the Blood Royal.
Marchionesses.
Wives of the Eldest Sons of Dukes.
Daughters of Dukes.
Countesses.
Wives of the Younger Sons of Dukes of the Blood Royal.
Wives of the Eldest Sons of Marquises.
Daughters of Marquises.
Wives of the Younger Sons of Dukes.
Viscountesses.
Wives of the Eldest Sons of Earls.
Daughters of Earls.
Wives of the Younger Sons of Marquises.
Baronesses.
Wives of the Eldest Sons of Viscounts.
Daughters of Viscounts.
Wives of the Younger Sons of Earls.
Wives of the Eldest Sons of Barons.
Daughters of Barons.
Maids of Honor.
Wives of Knights of the Garter.
Wives of Bannerets.
Wives of the Younger Sons of Viscounts.
Wives of the Younger Sons of Barons.
Wives of Baronets.
Wives of Knights Grand Crosses of the Order of the Bath.
Wives of Knights Grand Crosses of St. Michael and St. George.
Wives of Knights Commanders of the Order of the Bath.
Wives of Knights Commanders of St. Michael and St. George.
Wives of Knights Bachelors.
Wives of Companions of the Bath.
Wives of Cavalieri and Companions of St. Michael and St. George.
Wives of the Eldest Sons of the Younger Sons of Peers.
Daughters of the Younger Sons of Peers.
Wives of the Eldest Sons of Baronets.
Daughters of Baronets.
Wives of the Eldest Sons of Knights of the Garter.
Daughters of Knights of the Garter.
Wives of the Eldest Sons of Bannerets.
Daughters of Bannerets.
Wives of the Eldest Sons of Knights of the Bath.
Daughters of Knights of the Bath.
Wives of the Eldest Sons of Knights Bachelors.
Daughters of Knights Bachelors.
Wives of the Younger Sons of Baronets.
Wives of Esquires and Gentlemen.
Wives of Citizens.
Wives of Burgesses.

At the coronation of Charles I., the rule of precedency of the nobility of England was introduced into Scotland; and it was arranged that peers of England (or their sons, &c.), of a given degree, should within England take precedence of peers of Scotland of the same degree; and that this precedence should be reversed in Scotland. But by the acts of Union of Scotland and Ireland, the precedence in any given degree of the peerage has been established as follows: 1. Peers of England; 2. Peers of Scotland; 3. Peers of Great Britain; 4. Peers of Ireland; 5. Peers of the United Kingdom, and Peers of Ireland created subsequently to the Irish Union. A similar order is understood to obtain in regard to baronets, though in Ireland it seems lately to have become the practice to allow all baronets to rank according to the respective dates of their patents. The relative ranking of the great officers of the crown of Scotland was thus settled by statute in 1623 and 1661.

Lord Chancellor.
Lord Treasurer.
Archbishop of St. Andrews.
Archbishop of Glasgow.
Earls and Viscounts according to their ranks.
Bishops according to their ranks.
Lord Privy Seal, Lord Secretary, } first of their rank.
Lord President of the Court of Session.
Lord Register.
Lord Advocate.
Lord Justice Clerk.
Lord Treasurer Depute.
Lords of Session, according to their admission.
Barons and Gentlemen, being Councillors, according to their admission.

The right of the judges of the Court of Session, in Scotland, to precede baronets, has generally been admitted. Lyon King of Arms has precedency 'before all knights and gentlemen within the kingdom, not being officers of state, or senators of the College of Justice.' It seems to be held in England that the precedence of Scotch officers of state, judges, &c., as recognized before the Union, does not now extend beyond Scotland.

There are rules for precedence for the members of different professions, recognized among themselves, but which do not confer general social precedence. Doctors in the universities rank thus: 1. Of Divinity; 2. of Law; 3. of Medicine.

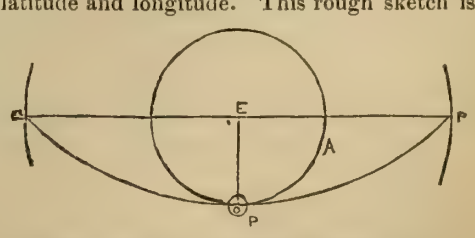
PRECE'NTOR (Lat. *præ*, before; and *cantor*, a singer), the official in a chapter, whether cathedral or collegiate, whose duty it was to lead the singing. He commenced the psalm or hymn, which was taken up, and repeated either by the celebrant or another of the body, or by the rest of the choir. In modern chapters, the precentor ranks next in dignity to the provost or dean. Among the Presbyterian bodies, the precentor is the official who raises and conducts the psalmody, and is generally provided with a desk immediately beneath the pulpit.

PRE'CEPT, a legal term, used in Scotch Law in certain departments, generally signifies an order to do something. Thus, a precept of sasine is an order by the superior of lands to his bailie to infeft the vassal. A precept of *clare constat* is an order by a superior to infeft the vassal's heir, so called because the superior is quite satisfied of the propinquity.

PRECE'PTORY, the name given to certain houses of the Knights Templar, the superiors of which were called Knights Preceptor. All the preceptories of a province were subject to a provincial superior, called Grand Preceptor; and there were three of these who held rank above all the rest, the grand preceptors of Jerusalem, Tripolis, and Antioch. Other houses of the order were called 'commanderies.'

PRECE'SSION. If the earth were truly spherical and homogenous; or if it were composed of spherical layers each of uniform density; or, more generally, if it were such that the resultant of the attractions exerted on all its parts by any other body should always pass through a definite point in its mass, its diurnal rotation would not be affected by the attraction of any other bodies. If originally rotating about a principal axis of Inertia (q. v.), it would for ever revolve about it, and the direction of the axis would remain fixed in space. To put this in more popular language, the Pole-star (q. v.) would always be the same star. But, although the earth rotates about an axis almost exactly coinciding with its axis of figure, the attraction of various bodies, especially the sun and moon, on the oblate portion at the equator, tends to give a rotation about an axis *in* the plane of the equator; and the combination of these two rotations gives rise to a shifting of the instantaneous axis of rotation in the earth and also in space. As already mentioned (see NUTATION), the earth's axis of revolution describes a waved curve (very nearly circular) about the pole of the ecliptic, and in a direction contrary to that of the order of the signs of the Zodiac (q. v.). This waved curved may be conceived to be described as follows.

The pole of the earth, P, revolves in about 19 years in a little ellipse, whose center, O, travels uniformly in a small circle of the sphere, AO; the center E, of the latter is the pole of the ecliptic. The precession is the portion AO of this circle measured from any assumed point, A; and the small arc, OP, by which the true place of the earth's pole differs from its mean place, is the nutation. The nutation is generally resolved along, and perpendicular to, EO; and the components so found are the nutation in ecliptical latitude and longitude. This rough sketch is intended



merely to shew the *nature* of the phenomenon, for the curb described by P about O is only approximately elliptic. Its greatest radius-vector, however, is exceedingly small, amounting only to about eighteen *seconds* of arc. AO, also, is not exactly circular,

but very nearly so, as its radius, EO, is the *obliquity of the Ecliptic* (q. v.), which we know varies very little from the angle 23° 28′. The equinoxes, being 90° distant from E, and also from O, which may be taken as the mean place of P, are at ♎ and ♈ in the diagram. And as O moves round E in the reverse order of the signs, so do the equinoxes, and in the same period—viz., 25,868 years. The effect is, of course, that while the earth's pole describes the small circle, AO, in the heavens, about the pole of the ecliptic, the equinoxes make one complete revolution in the ecliptic against the order of the signs. Thus, in turn, all stars lying near the circle AO, become, each for a time, the *Pole-star* (q. v.). It may seem strange that the term precession should be applied to a retrograde motion; but, from the point of view of the observer, it is evident that the equinox, if on one day it arrive at the meridian of a place simultaneously with a fixed star, will next day arrive at the meridian *sooner* than the star, or will precede it in time of transit; and this is the origin of the term.

The physical explanation of the cause of precession is almost identical with that of the conical motion of the axis of a top about the vertical; the difference between the two being that, in the case of the top, the conical rotation of the axis takes place in the *same* direction as the rotation of the top about the axis, while in the case of the earth, the pole of the axis turns about the pole of the ecliptic in the *opposite* direction to that in which the earth revolves about its axis. But the circumstances of the earth's motion are easily procured by a modification of the spinning-top, such as that of Troughton (used for the determination of latitudes at sea), if the center of the gravity of the whole mass be depressed *below* the point of suspension. If the axis of a top be vertical, there is no precession; similarly, when the sun or moon is in the plane of the equator, no effect is produced by them on the position of the earth's axis. When the axis of the common top is inclined, gravity tends to make it fall over; in similar circumstances, it tends to restore the axis of Troughton's top to the vertical; in either case tending to give the top a rotation about a horizontal axis perpendicular to that about which it is at the instant rotating; and the effect on the top is to cause a slow conical motion of its axis about the vertical. The sun or moon, in like manner, when not in the plane of the equator, tend to make, by their attraction, the earth turn about an axis perpendicular to that about which it is actually rotating. It is the composition of these rotations which gives rise to precession; but, though it would not be difficult to give a satisfactory investigation of the question without using formidable mathematical methods, the length of such an investigation prevents our giving it here.

The simplest approximation we can give to the physical explanation, that originally given by Newton, must therefor suffice. We have seen (see PERTURBATIONS) that the node of a satellite's orbit tends always to *regrede* on the plane of relative motion of the primary and the disturbing body. Suppose, for an instant, the protuberant parts of the earth at the equator to be satellites, revolving about a *spherical* earth. The effect of the sun's or moon's disturbing force upon these satellites would be to make the nodes of their orbits regrede. And exactly the same result will follow if they be attached to the earth, only that the rate of regression will now be much slower, as the whole mass of the earth will share in the motion. This is one of the most ingenious of the wonderful series of explanations of celestial phenomena which were given in the *Principia*.

PRECIOUS STONES, a name almost synonymous with Gems (q. v.) in its widest sense, and partially extended to stones of larger size employed for ornamental purposes, but not to those which are used in architecture.

PRECIPITA'TION, in Chemistry, is an operation in which decomposition occurs in a fluid, either through the action of the air, or of a gas, or of a chemical agent in solution; and is accompanied by the deposition of a solid substance that was previously held in solution. The substance employed to produce the precipitation is called the *precipitant*, and the substance which is separated by its action, the *precipitate*. For example, if a solution of carbonate of protoxide of iron be exposed to the air, a precipitate of hydrated sesquioxide or peroxide of iron speedily falls; if a current of sulphuretted hydrogen gas be passed through a solution of acetate of lead, a black precipitate of sulphide of lead is thrown down from the clear and colorless solution; and if a solution of corrosive sublimate (bichloride of mercury) be added to a solution of iodide of potassium, a yellow precipitate of biniodide of mercury is thrown down. The precipitant must be added with caution, as, in many cases, an excess of it re-dissolves the precipitate.

In qualitative analysis—that is to say, in determining the presence of substances without reference to their quantity—the color, solubility, &c., of the precipitate thrown down by numerous tests, as sulphuretted hydrogen, solutions of nitrate of silver, iodide of potassium, ferrocyanide of potassium, &c., afford the most useful information; and in quantitative analysis, the amount of precipitate thrown down from a given quantity of a solution, is often employed to determine the strength of the latter. For example, if a solution of nitrate of silver is added to an ounce of a solution of hydrocyanic acid of unknown strength, till no further precipitation ensues, we may readily calculate, from the weight of the white precipitate of cyanide of silver, how much anhydrous hydrocyanic acid was present.

PRECO'CITY has been regarded as an indication of cerebral disease; and American physicians have not hesitated to identify this manifestation with chronic inflammation of the membranes of the brain. If it is not always, it is often associated with such intense activity of the whole system, and with morbid conditions, such as the scrofulous diathesis, as to usher in actual disease, premature decay, and early death. The decay often consists in mental feebleness and fatuity; or where no such formidable issue follows, in the reduction of what promised to be transcendent genius to commonplace mediocrity. The closing chapters of the history of many wonderful calculators—Infant Rosciuses, Infant Lyras, &c.—illustrate this. It is hence no mere poetic figure to say that the lamp of the mind lives upon and burns itself out. Yet there are numerous exceptions, such as Johnson, Mozart, Fergusson, Davy, where early genius grew into great and masculine powers.

This rapid development in infancy or youth of faculties which are generally the result of protracted growth; and the intuitive acquisition of knowledge, which, under ordinary circumstances, is attained by laborious effort and cultivation, are most frequently witnessed in those of feeble and delicate constitution and of stunted frame. It is often seen as a concomitant of rickets, as in Pascal, Pope, &c.; and the dux of the school may often be pointed out from the disproportionate size of his head. While this development includes marvelous exercise of memory, of imagination, of constructive talent, of artistic genius, it rarely extends to judgment, reasoning, and sagacity. There appears to be evidence that this quality is not merely morbid, but that it exercises, reflexly, a detrimental influence upon healthy assimilation and growth, and arrests or retards that building up of the organization, upon which the ultimate capacity and usefulness of the individual depend. Education sometimes produces such prematurity, or fosters it where it has previously existed; so that the modern form of mental exhaustion, 'the overworked brain,' may be said to originate in the school-room. It is certainly illogical to employ this fact, as has been done, against infant schools; but it is incumbent to keep such a relation in view in all educational efforts; to avoid high pressure and stimulation, to adapt the kind of instruction to the age, and, so far as may be practicable, to the strength and tendencies of the pupils; and to combine systematic physical with all intellectual training.—Brigham, *Remarks on the Influence of Mental Cultivation and Mental Excitement upon Health;* Combe, *On the Management of Infancy;* Caldwell, *Thoughts on Physical Education.*

PRECOGNI'TION, a Scotch legal term, which denotes the heads or substance of the evidence which a witness in a criminal cause proposes to give at the trial. In all cases, before a trial, it is necessary for the solicitor to see the witnesses, and elicit from them the nature of the testimony they can give; and the heads of this testimony are called the precognitions, when written out. But the word has a technical meaning when applied to the examination of the witnesses before a justice of the peace or the judge-ordinary by the procurator-fiscal, previous to, and by way of enabling him to know how to frame, the charge. On such an occasion, the witnesses are examined or precognosced, a proceeding which corresponds to the evidence given in England before a magistrate or justices of the peace, and called there the depositions.

PREDESTINA'TION, a theological word, used to denote the eternal decree of God, whereby 'the elect' are foreordained to salvation. The correlative decree, whereby others are held to be foreordained to perdition (though it might with perfect correctness of language be included under the same term), is commonly distinguished by the other term—Reprobation.

The theory of Predestination had, like the doctrine of Election (q. v.), its origin in the attempts of theological system to define the relations of the human and the divine will, and to reconcile the phenomena of human freedom with the belief in divine omnipotence. God's absolute will is represented by it as determining the eternal destiny of man, not according to the foreknown character of those whose fate is so determined, but according to God's own mere choice. They who are thus foreordained to eternal life are led to believe and live by the 'irresistible grace' of the Holy Spirit. In human salvation, therefore, *God's* will is everything; *man's*, nothing.

It was in the discussions between Pelagius and Augustine that the Predestinarian view of the divine 'decree' was first fully evolved; and since their time, opinion in the church has run in two great currents—the one perpetuating the influence of Pela-

gius, who regarded that decree as subordinated to the divine foreknowledge of human character; the other, that of Augustine, who maintained the absolutism of that decree, and its independence of all prior human conditions. Pelagius recognized a possibility of good in human nature; Augustine denied any such possibility, apart from the influences of divine grace. The one held that the choice of salvation lay in man's will; the other, that man's will had no active freedom or power of choice since the fall. In 529, the system of Augustine was established by the Council of Arausio (Orange) as the rule of orthodoxy in the Western Church; but the reaction against the strictly logical yet essentially *un*moral nature of his dogma has been perpetually manifested by representatives of the more humane, though perhaps less logical doctrine of Pelagius, in every period of the church. In the days of the schoolmen, the discussions of the Scotists and Thomists—after the Reformation, the contests leading to the condemnation of Arminius in the Council of Dort, and the widening separation that now divides the disciples of Calvin from those theologians who hold broader and freer views on the subject of the *atonement*—indicate the impossibility of the human reason and conscience ever resting satisfied with a merely and absolutely logical theory of the relations between the will of God and the moral responsibility of man. The tendency of modern inquiry seems to be to abandon the discussion of a point so obviously incapable of being determined by human intelligence, and to pursue, instead, examination into the moral and practical bearing upon our human conditions of that which we are able to learn concerning God and His will. The moral meaning of that will is of vital moment to men; the extent of its power over their own wills, they apparently cannot determine.

PRE'DICABLES. This is a term in the scholastic logic connected with the scheme of classification. There were five designations employed in classifying objects on a systematic plan; *genus*, *species*, *difference* (differentia), *property* (proprium), and *accident* (accidens). The first two—Genus and Species—name the higher and lower classes of the things classified; a Genus comprehends several Species. The other three designations—Difference, Property, Accident—express the attributes that the classification turns upon. The Difference is what distinguishes one species from the other species of the same genus; as, for example, the peculiarities wherein the cat differs from the tiger, lion, and other species of the genus *felis*. The Property expresses a distinction that is not ultimate, but a consequence of some other peculiarity. Thus, 'the use of tools' is a property of man, and not a difference, for it flows from other assignable attributes of his bodily and mental organization, or from the specific differences that characterize him. The Accident is something not bound up with the nature of the species, but chancing to be present in it. For instance, the high value of gold is an Accident; gold would still be gold though it were plenty and cheap.

It was by an arbitrary and confusing employment of the notion of Predication, that these various items of the first attempt at a process of systematic classification, were called Predicables, or attributes that might be 'predicated,' that is, affirmed, of things. All that is needful to affirm is that a certain thing belongs to a given species or genus; and that to belong to the species is to possess the specific differences; and to belong to the genus is to possess the generic differences. We may also, if we please, *affirm* (or predicate) that the thing does belong to the species, or does possess the specific difference; but this power of affirming has no need to be formally proclaimed, or made the basis of the whole scheme.

The allied term 'Predicament' is another case where an abusive prominence is given to the idea of predication. The Predicaments, or Categories, were the most comprehensive classes of all existing things—under such heads as substance, attribute, quantity, quality, &c.; and it could be predicated of anything falling under any one head that it does so fall under. Thus, 'virtue' is an attribute; and therefore we might say that 'attribute' can be *predicated* of 'virtue.' But the notion of predicating does not indicate the main fact of the process in this case, any more than 'predicable' in the foregoing. *Classification*, and not predication, is the ruling idea in each.

PRE'DICATE. See PROPOSITION.

PRE-ESTA'BLISHED HARMONY. See LEIBNITZ.

PRE-EXI'STENCE, DOCTRINE OF. The notion that human souls were in existence before the generation of the bodies with which they are united in this world, was anciently, and is still, widely spread throughout the East. The Greek philosophers too, especially those who held the doctrine of Transmigration (q. v.), as the Pythagoreans, Empedocles, and even Plato—if with him pre-existence is not simply a symbolical myth—were familiar with the conception. Among the early Christians, the assumption of such pre-existence was connected with the belief, that God had created the souls of men before the world, and that these were united with human bodies at generation or at birth. Subsequently, the followers of this opinion were termed *Pre-existencists*, to distinguish them from the *Traducianists*, who held that children received soul as well as body from their parents. Direct intellectual interest in this doctrine has nearly altogether ceased in modern times, yet the dream—for whether true or false, it is and can be nothing but a dream in our present state, and with our present capabilities of knowledge—has again and again haunted individual thinkers. Wordsworth has given poetical expression to it in his famous ode—*Intimations of Immortality from Recollections of Early Childhood*:

> Our birth is but a sleep and a forgetting.
> The soul that rises with us—our life's star,
> Hath had elsewhere its setting,
> And cometh from afar,
> Not in entire forgetfulness,
> And not in utter nakedness,
> But trailing clouds of glory do we come
> From God, who is our home.

Nor must we overlook the fact, that the latest philosophy of Germany—that of the younger Fichte, has revived the doctrine; while it forms the basis of one of the deepest works in modern theology, that of Julius Müller, *Die Christliche Lehre von der Sünde* (The Christian Doctrine of Sin. English, Edin. 1856).

PRÉFET, the name of an important magistrate in modern France, so called from his exercising functions somewhat similar to those of the *Præfectus urbi* at Rome. See PRÆFECT. In old times, the officers whose duty it was to superintend the details of administration in the provinces were called *Maitres des Requêtes*. Under Henry II., their office was rendered permanent; and at a later period, their powers were much extended, and they were known by the designation of *Intendants*. The intendants were abolished at the Revolution; and a law of 1800 first appointed préfets for the departments, with powers greatly similar to those of the intendants. The office, as it now exists, includes the superintendence of the police establishment, the enforcement of the laws, and the entire control of the administration of the departments. The préfet is the head of the executive, exercises most of the government patronage, including the appointment of a *sous-préfet* for each *arrondissement*, and in time of tumult may call out the military, or provisionally declare a state of siege. The chief check on these extensive powers is to be found in the *Conseil de la Préfecture*, which acts in some measure as a court of appeal from the decisions of the préfet.

PRE'GEL, a river of Prussia, rises in the province of East Prussia, where it is formed by the union of the Pissa and the Angerap near Insterburg. It flows almost due west past Welhau and Königsberg, and after a course of more than 90 miles, enters the Frisches Haff, about six miles below the latter town. The P. is navigable even at Insterburg; and at Königsberg, is 720 feet broad. Its principal tributaries are the Alle from the south, and the Inster from the north. The canal of Deine connects it with the Kurisches Haff.

PREGNANCY, CONCEALMENT OF, is a criminal offence, or rather it is taken to be the main proof of the offence of concealing the birth of a child in certain circumstances. It is only where the child is dead, and has been secretly disposed of under suspicious circumstances, that the mother is punishable. Hence, the offence consists in endeavoring to conceal the birth, and as part of such concealment, to conceal the pregnancy, the child having already died. If the woman failed to give publicity of her situation beforehand, it is presumed that this was done from the improper motive, viz., to murder or destroy the child. To complete the offence, it is not necessary that the child should have been born alive; but if the child can be shown never to have lived, the prisoner must be acquitted. A usual test of concealment is, that the mother made no preparations for her delivery, nor provided child's clothes.

PRE'HNITE, a mineral, composed chiefly of silica, alumina, and lime, the silica sometimes about 50 per cent. of the whole; but with small and variable proportions of peroxide of iron, peroxide of manganese, potash, soda, and water. It is a widely-diffused mineral, and although first discovered at the Cape of Good Hope, has been found in great beauty in some places on the continent of Europe and in Scotland. P. exhibits a great variety of forms, with considerable variety of color; being found in crystals in fan-shaped and cockscomb-like groups, granular, reniform, fibrous, &c. It is colorless, or more generally greenish, and sometimes yellowish. See JADE.

PRE'LATE (Lat. *prælatus*, one set over), in Church Law, is the name given to the holders of those higher dignities in the church, to which, of their own right, is attached a proper jurisdiction, not derived by delegation from any superior official. In this sense, the name comprises not only prelates of the first class, as bishops, but also the heads of religious orders, abbots or priors of religious houses, and other similar ecclesiastical dignitaries. These, for the most part, are privileged to wear the insignia of

the episcopal rank. In the Roman court, many of the officials, although not possessing episcopal or quasi-episcopal jurisdiction, have the insignia and the title of prelate. They are of two classes —the higher, called *del mantelletto* ('of the little mantle'), and the secondary, called *del mantellone* ('of the great mantle'), from the robe which they respectively bear.

PRE'LUDE (Lat. *præ*, before, and *ludo*, I play), in Music, a short preface or introduction to a piece, intended to awaken the attention of the audience, generally smooth and flowing, and consisting of a short motivo which is kept throughout; or it may be composed of a succession of harmonies uninterrupted or connected by passages. It is in the same key with the piece which it is to introduce, and to which it is intended as a preparation.

PRE'MISES is a common legal term to signify a house or building, and the outhouses and places belonging to it, all of which are treated as one thing. It is also used to denote a certain part of an English deed, which is further subdivided into the form, date, parties, recitals, testatum, and parcels. The use of the word in this sense is derived from the subject-matter of a conveyance or deed being first stated or described in full, and afterwards referred to collectively as the premises (Lat., *premissa*, things spoken of or rehearsed before).

PRE'MISS. See SYLLOGISM.

PREMONSTRATE'NSIAN (called also NORBERTINE) ORDER, a religious order, which at one time was among the most numerous and powerful of the monastic bodies of Germany, in which country its most important houses were established. It was founded in the early part of the 12th c. by St. Norbert, a native of Xanten, in the diocese of Cleves, of which church he was a canon. Struck by the prevailing irregularities and carelessness, not only of secular, but also of conventual life among the clergy and the monks, he resolved on attempting a reform of both, and obtained permission, in 1120, to found a cloister in the diocese of Laon, in France. The place selected by him was a spot in the forest of Coucy, pointed out, as he believed, in a vision, and thence called *Pré Montré*, or in Latin, *Pratum Monstratum*, 'the indicated meadow,' from which the name of the order was taken. In accordance with the double object which he sought to attain, Norbert organized his new order, which was substantially that of the Canons Regular of St. Augustine, as well with a view to the sanctification of the members, as to their usefulness in effecting the reformation of the age. Himself a man of remarkable piety and austerity of life, his rule is a return to the primitive fervor of the monastic institute; and the great work which he proposed for his brotherhood, in addition to the daily choral services of the church, was the practical instruction of the people, and the direction of consciences in the confessional. It was taken up with ardor, and spread rapidly in France and the Low Countries, and afterwards—on Norbert's being chosen, in 1127, Archbishop of Magdeburg—in Germany; the abbot of the mother-house at Coucy, however, retaining the rank of general and of superior of the entire order. It does not seem at any time to have made much progress, or at least to have established many houses, in Italy or Spain.

In the same spirit of reformation, Norbert established an order of nuns, which attained to equal success. In the end of the 15th c., the P. O. had no fewer than 1500 convents of men, and 500 of women, nearly all in France, Germany, and the northern kingdoms. A relaxation of the institute having taken place, in the progress of time there was a movement in the order, towards the close of the 16th c. (1573), similar to that which, in the Franciscan Order (q. v.), led to the reform of the so-called conventual Franciscans; but the reformed communities in the Premonstratensian institute remained united with the older body; and in 1630, the reformed rule was accepted by all in common. The order, however, has gradually fallen in popularity. In France, its numbers had declined very much even before the Revolution. Since that event, it may be said to have disappeared, except in Germany, where (in Austria) some magnificent, though thinly peopled houses of the order are still maintained.

PRE'NZLAU, or PRENZLOW, a town of Prussia, in the province of Brandenburg, stands on the northern shore of the lower Lake Ucker, 71 miles north-north-east of Berlin. It contains a mineral spring, several baths, and among its churches, the beautiful Gothic *Marienkirche*, one of the most remarkable brick buildings in the country; date 1325—1340. Pop. (1880) 16,933, who carry on several manufactures, but are chiefly engaged in growing tobacco and corn, and in breeding and trading in cattle. Here, in October 1806, a body of Prussian troops, 16,000 strong, under the Prince of Hohenlohe, surrendered, after the defeat of Jena, to the French under Murat.

PREPOSI'TIONS are words that express certain relations between ideas—between the idea of an action and the idea of a thing, or between the idea of one thing and the idea of another thing. 'The river runs *to* the sea. The glass stands *on* the table. The dog lies *under* the table. He runs *round* me. She runs *from* me. The house *by* the wood. The house *in* the wood.' In all the instances just given, the relation is of one kind—that of place or direction. And this was the original signification of all prepositions. They gradually, however, came to express other relations. Thus: 'That depends *on* you. Subjects are *under* the sovereign. She got *round* her father. Vice springs *from* idleness. Wood is consumed *by* fire. Your enemy is *in* your power.' The transition from the palpable, physical relation to the more abstruse mental relation, is, in most cases, obvious.

A preposition is distinguished from an adverb by its always requiring an object (a noun or pronoun) after it. In the sentence, 'He runs *about*,' *about* is an adverb describing the mode of running; in 'He runs *about* the house,' it is a preposition referring the direction of the running to a particular object.

Many relations are expressed by *prepositional phrases*; as, *instead of*, *with regard to*, *apart from*. The preposition *beside* is evidently an abbreviation of such a phrase—*by the side of*. This tendency in phrases to become simple prepositions, is manifest in other cases. Instead of the full expression, 'on this side of the river,' we often hear, 'this side the river,' where *this-side* has the force of a preposition, and may yet come to be written *thisside*.

Of the relations expressed in the modern forms of the Aryan tongues by prepositions, a great many were formerly expressed by cases. See DECLENSION, INFLECTION, PHILOLOGY.

Along with prepositions are classed certain particles, which, although they may not stand by themselves and govern a case, are yet used in composition with verbs in the same way as the prepositions proper; as in *out*run, *re*place.

The simple prepositions (Eng. *in*, Dan. *i*, Lat. *in*, Gr. *en;* Eng. *on*, Gr. and Goth. *ana*, Ger. *an*, Slav. *na;* Eng. *of*, Goth. *af*, O. H. Ger. *aba* or *apa*, Ger. *ab*, Sans. *apa*, Gr. *apo*, Lat. *a*, *ab;* Eng. *by* [be], Goth. *bi*, Ger. *bei*, Gr. *epi*, Sans. *abhi;* &c.) belong to the primary or radical words of language. They are often identical with the pronominal roots (see PRONOUNS), and along with them form a class of roots whose primary signification is position or relation in space. All attempts, like those of Tooke, to make them derivatives from verbs, are futile. On the contrary, verbs and other parts of speech are often derived from prepositions, as *utter* from *out;* *open* and *upper* from *up*. Some prepositions have a derivative form, as *after* (from the root of *of*), Lat. *inter* (*in*); others are compounded of two prepositions, or a preposition and prepositional particle, as *upon*, *but* (i. e., by out, or be out), *before*, *within*, *into*. Other prepositions, again, contain a noun, as *against* (A. S. *ongegen*, or *tó gegnes;* where, from the forms in the allied languages, the element *gegen* is clearly a substantive, the primary meaning of which, however, has not been made out); *among* (A. S. *gemang* or *ongemang*, *gemang* meaning primarily mixture); *between* (i. e., by or be, two or twain). Such prepositions as *during*, *except*, were originally participles used absolutely; thus, 'during the war' = the war during or lasting, i. e., while the war dured or lasted; 'except this' = this excepted (*hoc excepto*).

The study of the etymological relations of prepositions is instructive, as showing how near to one another often lie the most opposed meanings. They are, as it were, the opposite poles of one and the same conception—correlatives depending on a common ground relation, and are thus naturally expressed by words that are radically the same. Thus, Eng. *up* corresponds to Goth. *uf*, Sans. *upa*, Gr. *hypo*, Lat. *sub*. The meaning of *up* is motion from below to above, leaving, however, the idea of the upper terminus the more prominent; *uf*, *hypo*, *sub*, on the contrary, are used to express *under;* but that the notion of upward motion lurked in these roots, is clear from such Latin compounds as *suspicio*, to look up at a thing; *sustineo*, to hold up; and it only required a slight modification—a kind of comparison—to convert them into *ufar*, *hyper*, *super*, meaning 'above'—a result which the English attains by adding the preposition *on* (upon). The same principle is copiously exemplified in the numerous forms and derivatives of the prepositional root FR, in Sans., Gr., Lat., and Sl., PR, in which motion or removal from the speaker in the front direction seems to be the ground idea. Thus, when in reference to any epoch, we speak of the events that have *preceded*, and those that are *predicted* as to come, the same particle *pre* points in two opposite directions.

PRE-RAPHAELITE. See HUNT (W. H.).

PRERO'GATIVE COURT, in England, was the court wherein all wills were proved, and administrations taken out. It was so called because it belonged to the prerogative of the archbishop to take charge of these matters, which formerly fell under ecclesiastical superintendence. Hence there was a Prerogative Court for the province of Canterbury, and another for the province of York. This jurisdiction was entirely taken away in 1858 from the ecclesiastics, and transferred to a new court called the Probate Court (q. v.).

PRE'SBURG (Lat. *Posonium;* Magyar, *Pozsony;* Slav. *Pressburek*), a town in the extreme west of Hungary, close upon the

frontier of Lower Austria, is built on the left or northern bank of the Danube, 41 miles by railway east of Vienna. The neighboring hills are clothed with vineyards. It was long the principal city of Hungary, having been made the capital in 1541, when the Turks seized possession of Buda; and even as late as the last quarter of the 18th c., it was the most beautiful, and the most populous town in the kingdom; but when Joseph II., in 1784, restored to Buda its ancient dignity of being the capital of Hungary, and the scene of the coronation of its kings, the sources of the prosperity of P. began to be dried up. Its population, in 1880, was 48,006, of whom more than two-thirds were Roman Catholics, about 10,000 Lutherans, and 7000 Jews. Fully one-half of the inhabitants are German, and German is the prevalent language. The most notable buildings in the town are the (Gothic) cathedral, in which the kings of Hungary were crowned; the royal palace, a vast square structure overlooking the town, accidentally burned in 1811, and not since repaired; the Capuchin, Franciscan, and Ursuline monasteries, with beautiful churches attached to them; the Land-Haus (Hall of the Hungarian Diet), &c. The transit-trade by steam-boat and railway, especially in corn, is very great, and gives considerable animation to an otherwise quiet place. P. carries on manufactures of silks, woollens, leather, paper, tobacco, glass, and chemical products. Outside the town lies the 'King's Hill' (*Königshügel*), to which the sovereigns of Hungary were wont to ride after their coronation, and brandish their swords towards the four quarters of the heavens, signifying by that symbolic act that they would defend Hungary from danger—come whence it might. A treaty was concluded here between Napoleon and the Austrian emperor—known as the 'Treaty of Presburg'—December 27, 1805, in virtue of which Austria ceded Venice to France, and the Tyrol to Bavaria.—P. gives name to a 'county.'

PRE'SBYTER, PRESBYTE'RIANISM. Presbyter (Gr. *presbyteros*, elder) is the title of an office or dignity in the Jewish synagogue, and also of one of the grades in the Christian hierarchy. In the latter sense, the title has been the occasion of a protracted controversy as to the respective claims of the Bishop (q. v.) and the Presbyter, which, except historically, would be out of place in these pages. The word presbyter not unfrequently occurs in the Epistles and the Acts of the Apostles, and in more than one of these passages, it is certainly applied to persons whose office would seem to be in all respects the same as that which is claimed for the 'bishop' in the episcopalian theory. From this identity of name, the identity of office has been inferred, and it has been hence concluded, that the distinction of bishops and presbyters is a human and post-apostolic ordinance. Advocates of the episcopal theory admit that the name presbyter is occasionally given, both in Scripture and in the early church writers, to persons who bore the office of bishop (*episcopos*), and that the latter certainly was in all cases a presbyter; but they contend that besides being a presbyter, he was also something more and something higher. That the office of Timothy, for example, was superior to that of a presbyter, is conceived to be plain from St. Paul's instruction to him (1st Timothy v. 19) as to how he should receive testimony against a presbyter. The same is inferred from Titus i. 5. On the other hand, no example, it is affirmed, appears of a presbyter sitting in judgment on a bishop, or 'appointing bishops in every city.' But the Presbyterians do not admit the validity of these arguments, inasmuch as they assert the identity of presbyter and bishop, and the right of co-presbyters both to judge a brother, and also to ordain to the office of the ministry. Episcopalians rely still more however, on the apostolic Fathers, and those of the 3d and 4th centuries.

Among the Fathers of the former period, Clement of Rome, and even more plainly, Ignatius of Antioch, point to the bishop's superiority as already established, and they are followed by Tertullian, Irenæus, Clement of Alexandria and Cyprian. On the Presbyterian side, a remarkable passage is quoted from Jerome, in which, while repressing the pretensions of deacons to equality with presbyters, he appears to place the presbyter on the same level with the bishop in all the functions of the ministry except the power of ordination. The explanation of this passage, according to the Episcopalian view, is found in what has been already indicated by the community of name which existed even in the primitive times; while they also rely on the difference implied in the very important exception which even Jerome admits, in this very passage—viz., the power of ordaining. The offices of presbyter and bishop, according to the Roman Catholic theory, both, although in different degrees, belong to what Roman Catholics regard as the priesthood of the New Law. This priesthood the bishop possesses in its fulness, the presbyter only in part, but the functions which belong to that part are discharged alike by the presbyter and the bishop, although by the former only in subordination to the latter. What these functions are, will be detailed under the head Priest (q. v.); but the principle of a certain distinction of functions, and the limitation of the power of the presbyter as to one at least—that of ordination—is expressly recognized by Jerome in the passage alluded to. The name presbyter has been retained even in the Roman Catholic theory of a priesthood; but although, by the opponents of the Episcopalian doctrine, the word is used with the express design of excluding the sacerdotal idea, it has come, in the popular language of Roman Catholic theology, to be identical with Priest. From an early period, however, a distinction of rank among the presbyters came into use. Several being, in some cases, attached to a single church, one of the number received the title of *protopresbyter* or *archi-presbyter;* but it is quite certain this office bore no analogy to that of the bishop.

In all existing Presbyterian churches, a primary element is the representation of congregations in presbyteries, &c., by their delegated elders; of whom the 'minister,' or preaching elder, is always one; and this system of representation is advocated partly on the general ground of the unity of the church, and partly on the special ground of the example of the church in the apostolic age (Acts xv.). The affairs of particular congregations are managed by a court, styled in Scotland the Kirk-session, consisting of the minister, or ministers, if there are more than one, and the other elders, the minister or one of the ministers presiding, but each member having equal power and vote. From the decisions of this court, an appeal lies to the Presbytery, which is usually constituted of the ministers of a certain number of congregations and one 'ruling elder' from each congregation. Further appeals may be taken to *Synods* and *General Assemblies*, in churches so large that for convenience the presbyteries of a district are grouped into a 'Provincial Synod,' and all the provincial synods are subordinated to a General Assembly; but in respect of this there are considerable diversities, and the 'supreme' church court, whether *Synod* or *General Assembly*, is variously constituted by direct representation of each congregation, of each presbytery, or of each provincial synod. Nor are diversities of this kind regarded as in the least degree affecting the principle of Presbyterianism.

Presbyterian churches generally recognize an order of *Deacons* (q. v.) as existing in the church, with power only over its secular affairs; but in many Presbyterian churches this office is merged in that of the elder, and all its functions are exercised by the members of the Kirk-session. A tendency to revive the distinct office of deacon, has, however, been recently manifested in some of the Presbyterian churches.

Some Presbyterians maintain the *divine right of Presbytery*, as the one system of church government authorized by the Word of God; others only maintain that Presbyterianism is *consistent* with the Word of God; whilst many Presbyterians maintain that the Presbyterian system, whatever its imperfections as existing anywhere, is, of all systems that have ever existed in the church, the most agreeable to the principles of church government which may be deduced from Scripture.

Presbyterianism, variously modified, is the form of church government subsisting in many Protestant churches, but is most perfectly developed in Britain and America. In Britain, it prevails chiefly in Scotland, although on the revolution in the 17th c., it was for a very short time in the ascendant in England also. The *consistorial* system of the continent of Europe (see Consistory) cannot, in any of its modifications, be regarded as essentially Presbyterian, although in some respects it approaches to Presbyterianism. The French consistorial system is more nearly Presbyterian than the German. In other churches, also, Presbyterianism is modified by the relations of the church to the state. At the General Presbyterian Council held at Philadelphia, U.S., in 1880, 44 denominations of Presbyterians in America, Europe, and elsewhere were represented.

PRESBYTERIAN CHURCH IN AMERICA. The first Presbyterians in America were emigrants from Scotland and Ireland. The first Presbyterian congregations in America were organized in Maryland before the close of the 17th c.—the oldest, that of Rehoboth, dating about 1690; and the first presbytery in Philadelphia in 1705. A synod, consisting of four presbyteries, was constituted in 1716. Dissensions ensued; but in 1758 the American Presbyterian churches were united in one; and in 1788 a General Assembly was instituted, the whole number of congregations being then 419, and of ministers 188. The increase of the church was rapid, and in 1834 it contained 22 synods, 111 presbyteries, and about 1900 ministers. In 1801, a scheme of union was adopted between Presbyterians and Congregationalists, under which hundreds of congregations were formed in the state of New York and elsewhere. About the beginning of the present century, the Cumberland Presbyterians (q. v.) separated from the main body; and in 1838, the American Presbyterian Church was divided into two great sections, commonly known as *Old School* and *New School* Presbyterians; the former holding high Calvinistic doctrines; the latter, a somewhat modified Calvinism. Both of these churches are extended over the whole of the United States, and both of them have missions in different parts of the heathen

world, their collections for missions forming a large part of the contributions for that object from the United States of America. For some years, they showed symptoms of a sincere desire to reunite; and this object they accomplished in 1869, notwithstanding the dissensions and new divisions caused by the struggles between the Northern and Southern States on the question of slavery. At the time of this union, the Old School Presbyterians counted 2381 ministers, 2740 churches, and 258,903 communicants; while the New School numbered 1848 ministers, 1631 churches, and 17,562 communicants.

The former possessed at the same time the following theological seminaries: 'Princeton,' 'The Western,' 'Union,' 'Danville,' and 'Chicago;' and the latter owned the 'Union,' 'Auburn,' 'Lane,' 'Blackburn,' and 'Lind.'—Besides the Cumberland Presbyterians, there are other minor branches of the Presbyterian Church in America, connected with different denominations in Scotland.

PRESBYTERIAN CHURCH IN ENGLAND. The principles of the Puritans (q. v.) were essentially Presbyterian, although many of them were so much occupied with questions of doctrine and discipline, and with resistance to power exercised, as they believed, contrary to the word of God, that they paid little heed to the development of their principles in church government. Yet, in 1572, a presbytery was formed at Wandsworth, in Surrey, by ministers of London and its neighborhood, separating from the Church of England; and other presbyteries were soon formed, notwithstanding the extreme hostility of Queen Elizabeth. When the Westminster Assembly met in 1643, the Puritans of England were generally inclined to adopt Presbyterianism as their system of church government, although some still preferred a modified Episcopacy, and some had adopted the principles of Independency or Congregationalism. The Presbyterians were, however, the strongest party in the beginning of the Revolution, although the Independents gained the ascendency afterwards. The establishment of Presbyterian church government in the Church of England was voted by parliament (the Long Parliament), 13th October 1647; but it was never really established. The influence of the Independents prevented it. London and its neighborhood were, meanwhile, formed into twelve presbyteries, constituting the Provincial Synod of London, which continued to hold regular half-yearly meetings till 1655, the meetings of presbyteries being continued till a later date; but the whole Presbyterian system was overturned by Cromwell's Committee of Triers, appointed for the examining and approving of all persons elected or nominated to any ecclesiastical office.

Cromwell's policy aimed at bringing all ecclesiastical matters under the immediate control of the civil power. The Restoration was followed by the fruitless Savoy Conference (q. v.), and soon after by the Act of Uniformity, which came into force on 24th August 1662; and on that day, about 2000 ministers in England and Wales resigned their benefices, or submitted to be ejected from them, for conscience' sake. The first Nonconformists (q. v.) were mostly Presbyterians, but a small minority of Independents among them prevented the institution of a regular Presbyterian system, and the consequence was that the Nonconformists of England became in general practically Independent. Antinomianism and Arminianism soon appeared among them, and were followed by Socinianism or Unitarianism to such an extent, that the name *Presbyterian* became synonymous in England with *Socinian* or *Unitarian;* old endowments, legacies of Presbyterians, being in many instances enjoyed by Unitarians. Meanwhile, there existed in England a few congregations connected with the Church of Scotland, and with what was formerly known as the 'Secession Church,' now the United Presbyterian Church. The number of such afterwards very much increased. At the time of the formation of the Free Church of Scotland (q. v.), the greater number of the English Presbyterian churches connected with the Church of Scotland sympathized with the cause of the Free Church, and took the name of the Presbyterian Church in England. In 1876 a union, which had been long desired, was consummated between the synod more intimately related to the Free Church of Scotland and the congregations belonging to the United Presbyterian Church. The name assumed by the united church is the Presbyterian Church of England. At the time of the union, the Presbyterian Church in England had about 150 churches, and the United Presbyterian Church more than 100. At the same date the Church of Scotland in England had about 20 congregations.

PRESBYTERIAN CHURCH IN IRELAND. The Irish Presbyterian Church originated in the settlement of Ulster by Scottish colonists during the reign of James I. After various struggles, a Presbyterian church was founded by the formation of a presbytery at Carrickfergus in 1642. The Presbyterian population of Ulster was greatly increased in number by immigration from Scotland about the middle of the 17th c.; and notwithstanding many difficulties, from the opposition of prelates and of the civil power, the church continued to increase. It is a curious fact that the Presbyterian ministers received a pension from government, under Charles II., in 1672, which *Regium Donum* (q. v.), however, was not regularly paid until the reign of William, when it was augmented, although only to the paltry amount in all of £1200 a year. It was afterwards repeatedly augmented, till it reached the amount of £70 for each minister. A seminary for the education of ministers was erected at Killaleagh; and in 1710, the synod of the Presbyterian Church resolved to institute the preaching of the gospel to the Irish in their own language. During this period of its history, the Irish Presbyterian Church experienced the utmost opposition from the *High Church* party. Afterwards, dissensions sprung up within it, and these with reference to the most important doctrines. A body opposed to the doctrine of the Westminster Confession of Faith was organized as the Presbytery of Antrim. But the doctrine of the Westminster Confession was more and more departed from in the Irish Presbyterian Church itself, which became to a large extent Arian or Unitarian. In 1830, a separation took place from the Arians, who then formed the *Remonstrant Synod of Ulster*. In 1840, a union took place of the Irish Presbyterian Church forming the *Synod of Ulster*, and the *Secession Church in Ireland*, an offshoot of the Scottish Secession Church, which then reckoned 141 congregations in the north of Ireland.

The Irish Presbyterian Church now consists of about 600 congregations, and has not only displayed much zeal for the advancement of Protestantism in Ireland, but also of Christianity in other parts of the world, and supports a very successful mission in Guzerat. The act disestablishing the Irish church in 1869, provided also for the discontinuance of the *Regium Donum* to the Presbyterians, with reservation of annuities for life to ministers already entitled to it; and further gave power for commutation of annuities for a capital sum, of which advantage has been taken to a very large extent, so that a fund has been formed for paying annuities and leaving a large surplus as the nucleus of a Sustentation Fund for the ministers in time to come. There are two colleges—one purely theological, at Belfast, with seven professors; the other, at Londonderry, has eight professors and a complete curriculum. The colleges were empowered in 1881 jointly to grant degrees in theology.

PRESBYTERIAN CHURCHES OF SCOTLAND. See SCOTLAND, CHURCH OF; FREE CHURCH OF SCOTLAND; UNITED PRESBYTERIAN CHURCH; &c.

PRE'SBYTERY, the space in the choir of a church in which the high altar is placed; the name is sometimes extended to the whole choir.

PRESBYTERY, in Scotch Law, is an ecclesiastical division of the country, as well as a court. In its local sense, it includes a combination of parishes, varying from 4 to 30. See SCOTLAND, CHURCH OF.

PRE'SCOT, a manufacturing town of Lancashire, 8 miles east of Liverpool. P. has manufactures of watch-tools, watch-movements, small files, &c., and there are potteries near it. Pop. (1881) 6418.

PRESCOTT, WILLIAM HICKLING, LL.D., American historian, son of a distinguished lawyer and statesman, and grandson of Colonel William Prescott, an officer of the Revolution, was born at Salem, Massachusetts, on May 4, 1796. He entered Harvard College in 1811, and graduated in 1814. During his college course, he had one eye blinded by a piece of bread playfully thrown by a fellow-student, and his studies so affected the other, that he was sent abroad for his health, and traveled in England, France, and Italy. On his return to America, he married, and abandoned the study of law for literature. In 1819, he determined to devote ten years to study, and the succeeding ten to composition. He contributed, however, several papers to the *North American Review*, collected in his Miscellanies. In 1825, he was engaged in the study of Spanish literature, and selected materials for his *History of Ferdinand and Isabella*. While engaged in this work, his sight failed, and, with the aid of a reader who knew no Spanish, he went through the seven quarto volumes of Mariana's History. After ten years of painful labor, his work was made ready for the press, and a few copies struck off for his friends, whose warm approval secured its publication in 1837 (3 vols. 8vo, Boston and London). It met with immediate success, and was translated into French, Spanish, and German. He next devoted six years to the *History of the Conquest of Mexico* (3 vols., 1843, London and New York); and four years to the *Conquest of Peru* (2 vols., 1847). These careful, elaborate, and charmingly written works made for him a high reputation. He was chosen corresponding member of the French Institute; and, on his visit to Europe in 1850, he was received with the highest distinction. In 1855, he published two volumes of his *History of Philip II.*, and a third volume in 1858, but left it unfinished. He died at Boston, January 28, 1859.

Mr. Prescott was an elegant scholar and writer, a man of a cheerful humor and affectionate character, methodical in his habits, and persevering in his pursuits. He walked five miles regularly every day, composing as he walked. He devoted five hours to literary labor, two hours to novel-reading, for the refreshment of his mind—Scott, Dickens, Dumas, and Sue being his favorite authors. He gave one tenth of his ample income in charity, and divided his time between his winter mansion in Boston, a summer residence at Nahant, and a farmhouse, where he spent the autumn. In his large library, with the light carefully regulated for his imperfect vision, he wrote with a stylus each day what he had composed, which was then copied, read over, and carefully corrected. His life, by George Ticknor, was published in 1864.

PRESCRI'PTION is the term applied to the written direction or receipt given by the physician or surgeon to the chemist for the preparation of a medicinal substance suitable to a special case. In prescribing, the medical practitioner may either order an *officinal* or an *extemporaneous* compound. Officinal compounds (or preparations, as they are frequently termed) are those for which formulæ are introduced into the national pharmacopœias, and are therefore supposed to be always at hand in the laboratory of the dispensing chemist (such, for example, as *Mistura Ferri Composita, Pulvis Ipecacuanhæ Compositus, Confectio Aromatica,* &c.); while extemporaneous compounds are those which are devised on the instant with the view of meeting the various peculiarities which almost every case of disease presents. 'Too much importance,' as Dr. Paris very truly observes, 'cannot be assigned to the art that thus enables the physician to adapt and graduate a powerful remedy to each particular case by a prompt and accurate prescription. If he prescribes upon truly scientific principles, he will rarely, in the course of his practice, compose two formulæ that shall *in every respect* be perfectly similar, for the plain reason, that he will never meet with two cases exactly alike.'—*Pharmacologia*, 9th ed., 1843, p. 374.

The author whom we have just quoted, and who is the highest English authority on the subject, lays down *five objects* which the physician should have in view in the construction of an extemporaneous formula or prescription. They are: 1. To promote the action of the principal medicine (or, as he terms it, the basis) of a formula. 2. To correct the operation of the basis. 3. To obtain the joint operation of two or more medicines which act in totally different ways. 4. To obtain a new and active remedy not afforded by any single substance. 5. To select an eligible form. The *first object* may be attained (*a*) by combining different preparations of the same substance, as, tincture of senna with infusion of senna in the ordinary Black Draught; or (*b*) by combining different substances of a similar action, as, for example, opium with hyoscyamus or conium; or sulphate of magnesia with the preparations of senna; or quinine with the preparations of iron. The *second object* may be obtained in various ways. For example, the addition of extract of hyoscyamus to the compound extract of colocynth renders the purgative action of the latter much less griping, but not less efficacious; the addition of dilute sulphuric acid to a solution of sulphate of magnesia renders that purgative salt less liable to gripe, and makes it sit easier on the stomach; and extract of elaterium, if given in hot brandy and water, acts equally powerfully as a hydragogue cathartic without causing the depression of the vital powers, which it often occasions if given alone. As an illustration of a mode of attaining the *third object*, we may refer to the operation of purgatives and of diuretics.

If we administer a purgative which acts mainly in increasing the peristaltic motion of the intestines, their contents will be urged forward and evacuated, but the operation will be slow and difficult, and probably be accompanied with griping; but if we combine this medicine with one which acts by increasing the flow of fluids into the intestine, the purgative action will be increased and quickened, and all griping will be avoided. A combination of foxglove, squill, and blue pill or calomel will act much more powerfully as a diuretic than any one of the substances taken alone; and they probably all act in different ways on the system. The *fourth object* is usually attained by chemical decomposition. The activity of the *Mistura Ferri Composita* is due to the carbonate of iron which it contains, and which is yielded by the double decomposition of the two ingredients of the mixture, sulphate of iron and carbonate of potash. By prescribing a mixture of solution of iodide of potassium and corrosive sublimate, we obtain an extemporaneous formation of biniodide of mercury. The Black Wash (see LINIMENTS) owes its active ingredient to the decomposition of calomel by lime-water. In some cases, where no chemical action is apparent or probable, a mixture of two or more drugs seems to modify the physiological effect of each ingredient. For example, Dover's Powder contains as its active ingredients ipecacuanha and opium, and yet in well-regulated doses it neither exhibits the nauseating properties of the former, nor the narcotic influence of the latter substance. The *fifth object*, the selection of the most eligible form of the remedy, is of extreme importance. The physician here has to determine whether he shall prescribe his remedy in the form of pill, powder, or mixture; whether he shall administer it as an injection into the lower bowel; whether the patient shall (in certain cases) inhale it; &c.

As a general rule, we should accommodate the form and flavor of our remedies, provided we do not sacrifice their virtues, to the taste of the patient, who usually prefers pills to draughts or powders. The unpleasant taste of many medicines which must be given in the fluid form may often be obviated by the skill of the prescriber. Castor oil, cod-liver oil, and copaiba are most easily taken on the surface of orange wine, or water containing a bitter tincture, care being taken to moisten with water the edge or rim of the glass at the part applied to the mouth. The taste of solution of potash and of lime-water is best covered with milk; and the disagreeable flavor of senna is said to be concealed if its infusion is made with strong tea.

In conclusion, it may be remarked that in this country it is the custom to write prescriptions in the Latin language, to abbreviate well-known words, to use symbols for weights and measures, and to commence each prescription with the symbol ℞, which signifies *Recipe*, take. As an illustration, we append a prescription for a tonic draught:

(*Name of Patient.*)

℞	Infus. Calumbæ,	*f.* ʒix
	Tinct. Calumbæ,	*f.* ʒi
	Acid. Sulph. Dilut.,	♏x
	Syrup. Aurant.,	*f.* ʒiss

M. *Fiat Haustus ter quotidie sumendus.*

Date (*in Latin*). (*Initials or name of prescriber.*)

PRESCRIPTION, in Law, is the limit of time within which one may acquire certain legal rights, by reason of the want of vindication by some other person of such rights and putting in force his legal remedies. In England, however, it has a limited meaning, confined to a certain class of rights relating to lands, such as rights of way, of water-course, of fishing, shooting, &c.; while in Scotland, it is a general term, applicable to all legal rights and to real property; and hence prescription in Scotland corresponds to prescription, *plus* Limitation (q. v.), in England. Prescription in England is thus a mode of acquiring a legal right, incident to land, by the mere force of claiming and exercising it, without dispute, for a certain length of time. Thus, if a neighboring owner has for 30 years, without interruption, actually enjoyed a right of common, such as pasture, fishery, shooting, &c., over another's lands, he will be entitled to it as a legal right for ever after, unless in certain exceptional cases; and if he has enjoyed it for 60 years, his title for ever after cannot be defeated. So, if a person has for 20 years enjoyed, without interruption, a right of way, or of watercourse, or of watering cattle, and similar Easements (q. v.) on another's lands, he will be entitled, for ever thereafter, to enjoy these, except in a few exceptional cases; and if the enjoyment has been for 40 years, he is entitled in all circumstances. So, if a person whose house adjoins another's lands, and whose windows open upon such land, has enjoyed the light coming to these windows for 20 years, he can for ever thereafter prevent his neighbor from building on his land, and thereby darkening such lights. In Scotland, prescription includes such rights as have been already mentioned, and also the other substantive rights of property. With respect to servitudes, such as right of way, water-course, fuel, feal, and divot, the right can be gained by the enjoyment for 40 years. Prescription is divided into positive and negative.

By the positive prescription, whenever one enjoys lands for 40 years, and can show an infeftment, or a series of infeftments, during such time, though no previous title at the commencement of such period, such person obtains a right to the property. This enactment applies to all kinds of heritable subjects, including leases and servitudes, which require no infeftment, and as to which mere possession for 40 years, without interruption, will give the right. By the negative prescription of 40 years, rights are cut off, unless sued for within that period as a debt due on a heritable bond, and on all contracts whatever. Servitudes are also lost by the lapse of 40 years without enjoyment. Besides these prescriptions, there are others, called the lesser prescriptions. Thus, there is a 20 years' or vicennial prescription, applicable to certain written contracts; a ten years' or decennial prescription, applicable to actions against tutors and curators; a seven years' or septennial prescription, applicable to actions against cautioners; a sexennial or six years' prescription, applicable to actions on bills of exchange; a quinquennial or five years' prescription, applicable to actions for arrears of rent and verbal contracts; a three years' or triennial prescription, applicable to actions on ordinary merchants' accounts, for servants' wages, rent due on a verbal lease, and for work done by work-

men, attorneys, &c. With regard to crimes, also, in Scotland, but not in England, a 20 years' prescription applies, and no prosecution is competent after that period.

PRESENTA'TION, the name of the act by which a patron of a living in the Established Church of Scotland appointed a minister; so called because the presentee had to be presented to the presbytery for inquiry into his qualifications, and for induction, if these were satisfactory. If the patron failed to present within six months, the right then devolved on the presbytery. When a presentee was objected to by the major part of the congregation, whether with or without reason, the General Assembly of the church formerly claimed the right to declare that he should not be inducted or entitled to the benefice. This declaration was contained in an act of Assembly, dated 1835, called the Veto Act. But after much litigation, it was decided by the courts of law that such Veto Act was *ultra vires* and void; and this decision led to a secession of many ministers and people from the Established Church, and to the formation of a new dissenting church, called the Free Church (q. v.). It was then settled by law that it was the presbytery, not the congregation, who were to consider all objections to the presentee, mere dislike on the part of the people not being a ground of rejection. In 1874, however, an act of parliament was passed by which patronage was abolished, and the right of choosing their minister transferred to the congregation. See PATRONAGE.

PRESE'NTMENT is, in English Law, the formal representation made by a grand-jury of the finding of an indictment; by churchwardens to the ordinary of the state of the parish; by the Court of Quarter Sessions of the fact of the disrepair of a bridge, &c. Presentment, with reference to bills of exchange, is the formal demand made by the creditor to the debtor, who is primarily liable, calling upon him to accept the bill or to pay it. If the bill is not paid, then notice of dishonor must be sent to the other parties secondarily liable, who are then bound. See BILLS OF EXCHANGE.

PRESERVES, PRESERVED PROVISIONS, &c. Much variety is comprehended under these terms: the first is generally understood to mean fruits preserved with sugar or brandy; and the latter, such articles of animal or vegetable food as are used ordinarily, but which are preserved by any means for the convenience of carriage, and for use beyond the time they would remain uninjured by ordinary keeping. Fruits intended for confectionery are preserved in four different ways: First, They may be preserved in the form of jam, in which the fruit is simply boiled with from one-half to equal its weight of sugar. By this method, the fruit becomes broken, and the juice set free; but all is preserved, as the latter forms a thick syrup with the sugar. Such preserves can be kept, if well made, for several years, but are best used during the first winter. A second plan is to preserve only the juice, which, when carefully strained from the solid portions of the fruit, and boiled with a third or half its weight of refined sugar, constitutes the fruit-jellies of the cooks and confectioners. Another method is called candying, and consists in taking fruits whole or in pieces, and boiling them in a clear syrup previously prepared. In this way, they absorb the syrup, and are then dried by a gentle heat, which causes the sugar of the syrup to crystallize on the surface and through the substance of the preserved fruits, which retain their form, and much, if not all of their color. The remaining method is to carefully stew them in a weak syrup of refined sugar and water, so that they are rendered soft, but are not broken. They are then transferred, with the syrup, to jars with well-prepared covers, to prevent evaporation; and pale brandy, equal in quantity to the syrup, is added. As a rule, only stone-fruits, such as peaches, plums, and cherries, are preserved in this way. Several fruits and vegetables, such as olives, cucumbers, cabbage, &c.; are preserved for food in a saturated solution of salt and water poured in hot; others, in vinegar. See PICKLES.

But the most approved methods of preserving vegetable and animal substances for food-purposes, so as to be used as nearly as possible as if they were in the fresh state, is either to desiccate them, or to seal them in air-tight cases. The first method was introduced by M. Chollet of Paris in 1852, and patented in England in 1854. It was, and still is, chiefly applied to vegetables, and a few kinds of fruit, such as apples and pears, which have a small amount of juice. By his method, M. Chollet entirely removes all moisture from the vegetables, by drying either in a vacuum or by the aid of heated air, which reduces their bulk more than one-half. They are then compressed under powerful presses, which, besides rendering them extremely portable, also makes them less liable to absorb moisture from the atmosphere, which is very desirable, as they are very absorbent. In this way, both the color and distinctive flavor of the vegetables are completely preserved, and mere soaking in water restores them almost precisely to their original condition. The introduction of this process has been of great benefit to voyagers, as it enables ships to carry a complete supply of vegetable provisions on the longest voyage.

The method of sealing cooked provisions in air-tight metallic cases, which is now so largely in use, is of comparatively recent invention, and has only been brought into use during the present century. In 1810, Augustus de Heine took out a patent in this country for preserving food in tin or other metal cases, by simply exhausting the air by means of an air-pump; but it was unsuccessful. It was followed by a number of others by various persons, all of which were more or less failures, until Wertheimer's patents, which were three in number, from 1839 to 1841. By his plan, the provisions of whatever kind are put into the metal cases, and closely packed, and the interstices filled in with water or other appropriate liquid, such as gravy in the case of flesh-food. The lids are then soldered on very securely; two small perforations are made in each lid, and the cases are set in a water-bath, in which muriate of lime is dissolved, and heat is applied until the whole boils, and the air is expelled through the small openings in the lids of the cases. When this is complete, the small holes are quickly soldered up, and the tins are removed from the bath.

The muriate of lime is used because its solution can easily be maintained at a heat of 270° to 280° Fahr., without material evaporation. Other plans have been patented similar in principle, but varying in the mode of applying it. A large business of this kind has for several years been successfully carried on by John Gillon & Co., Leith, and by Moir, Aberdeen, whose cases of preserved meats and soups are well known as an article of commerce. The imports of tinned meats from Australia and New Zealand are now extensive, and are yearly increasing. A very ingenious and scientific plan for preserving meat fresh was invented by Professor George Hamilton of Cheshire. It consists in cutting the meat small, and putting it into jars of binoxide of nitrogen, which perfectly preserves its sweetness and ordinary appearance. This plan has been tried with success on a small scale, and was shown in the Paris Exhibition of 1855 as a French discovery, although Professor Hamilton's paper was in Paris in 1854. The fresh meat of late so largely imported from America, may be said to be preserved, as it is kept fresh—*not* frozen—by being packed in chambers cooled by the presence of large quantities of ice. See PRESERVES.

In addition to the methods described, we have to notice here some recent efforts to preserve animal food. As yet the most successful method is by placing it when boiled in tins of convenient size for household consumption, hermetically sealed from the air. The waste of animal food in Australia and America had long been a cause of regret, and the sending of it to Europe in a dried state was only partially attempted, when the plan of preserving it in a boiled condition was first tried, on any scale, in 1866 or 1867. Since then, the quantity of Australian and American mutton and beef from Australia and the United States consumed in Great Britain has increased very rapidly. In 1872, the total value of the imports of unsalted meats was not far short of a million sterling. In 1880 the value of the imports of meat, salted, fresh, or otherwise preserved, was over two millions sterling. Of this a value of £1,428,563 was for meat from the United States.

The eminent chemist Liebig suggested the manufacture of a concentrated extract of meat; and this is now carried on very extensively both at home and abroad. It is chiefly used by invalids, and for quickly making soups. Only the lean or muscular part is used, and this boiled until all but the fibrin is dissolved out; the liquid is then concentrated until it is brought to the state of a thick paste, in which state it is easily preserved. Much controversy has of late taken place concerning the nourishing properties, not only of Liebig's, but of all meat extracts. Still those physiologists who have least to say in their favor, do not deny that they have some useful properties as food, and their use is decidedly on the increase. The Liebig Extract of Meat Company is said to have slaughtered, in the year 1872, 150,000 head of cattle.

A few years ago, Professor Redwood patented a method of preserving fresh meat by a coating of paraffin; but this substance, from its brittleness, is apt to crack, and we are not aware that it is now in use. Signor Mariotti has patented a rather peculiar plan, which consists in carbonizing the whole surface of the meat by taking advantage of the high temperature of boiling fat into which it is dipped. No way of preserving animal food fresh, however, excels the simple one of storing it in chambers or cabins at a temperature as little as possible above the freezing-point. By this method large supplies of fresh meat have been conveyed to this country from the United States and Canada in steamers fitted up for that purpose. The value of the beef alone thus imported amounted in 1880 to £1,889,730.

Two large companies, an English and a Swiss, have been lately formed for the supply of condensed milk, and also coffee and cocoa mixed with it and sugar, in such a way as to be ready for

use with the addition of boiling water. Coffee so prepared is at present very much in demand.

PRE'SES OF MEETING, a name given in Scotland to the chairman of a meeting, who is often popularly believed to have some mysterious power or authority; but in point of fact, he has no more power than any other person present, and is merely for convenience, used as a mouthpiece for putting questions and amendments to ascertain the will of the majority. In meetings of creditors under the Bankrupt Act, a preses requires to be elected before any business is done; but his power is confined to that of constituting the meeting, and preserving order, so far as the creditors mutually agree to obey his suggestions. As a general rule, a preses, or chairman, has only a single vote, like other persons, and not a casting vote, unless where some act of parliament expressly gives it to him, according to the nature of the meeting held.

PRESS, FREEDOM OF THE, the expression used to denote the absence of any authorized official restraint on publication. The press is an instrument well adapted for disturbing the functions of government, and committing injuries against reputation; and when its power as a political engine was first discovered, the European governments took it into their own hands, no one being allowed to print any work till it had obtained the sanction of the proper authorities. The clergy also, on behalf of the papal hierarchy, claimed a share in the censorship, where questions of religion was concerned. In England, at the Reformation, the control of the press came to be more completely centred in the crown than elsewhere, the ecclesiastical in addition to the secular department being vested in Henry VIII. as temporal head of the church. The Company of Stationers, who came to have the sole right to print, were servants of the government, subject to the control of the Star Chamber, the censorship of the press was enforced by the Long Parliament, and was re-established more rigorously at the Restoration. It was continued at the Revolution, and the statute regulating it was renewed from time to time till 1693, when the Commons, by a special vote, struck it out of the list of temporary acts to be continued. Since that time, the censorship of the press has ceased to exist in Britain. But though there are no official restrictions on what shall and what shall not be published, the authors and publishers of criminal or injurious matter are amenable to the law of libel; and there are certain statutory requirements in force to enable them to be traced. The existing statutes which apply to all printed publications are 39 Geo. III. c. 79, amended by 51 Geo. III. c. 65, 2 and 3 Vict. c. 12, and 32 and 33 Vict. c. 24.

Every person who prints anything for hire or reward must, under a penalty of £20, keep one copy at least of the matter printed, and write on it the name and place of abode of the person who employed him to print it. By statute 2 and 3 Vict. c. 12, every person who shall print any paper meant to be published, must print, on the first or last leaf, his name and usual place of business; and on failure to do so, he forfeits the sum of £5, and so does any person publishing the same. There are a few printed papers exempted from conforming to the above requirement—as for instance papers printed by parliament or in government offices, engravings, auction lists, bank-notes, bills of lading, receipts for money, and a few other similar matters. In the case of a libel, legal publication is constituted by the sending of a copy printed or in manuscript to a man, and the sale of a newspaper or other publication in a shop, or its delivery to an officer at the Stamp-office, is also considered an act of publication. The truth of the statements published may be urged as a plea of defence in an action for libel, but only on the ground of its publication being calculated to promote the public interest. See LIBEL. The existing statutes affecting newspapers are 2 Geo. IV. and 1 Wil. IV. c. 73, 6 and 7 Wil. IV. c. 76, and 32 and 33 Vict. c. 24. If a bill shall be filed in any court for the discovery of the name of the printer, publisher, or proprietor of a newspaper or other publication, with a view of rendering him liable in damages for slanderous matter, the defendant is bound to make the discovery required, which, however, cannot be made use of against him in any other proceeding than that for which it has been made. The penalties against newspapers can only be sued for in the name of the Attorney-general or Solicitor-general, or Lord Advocate. Certain regulations also exist regarding the exhibition of plays, for which see Laws as to THEATERS. Subject to these restrictions, the freedom of the press has subsisted in Britain since 1693.

A more or less rigorous censorship of the press exists in most European states. There is often no direct supervision previous to publication, but the official censor has it in his power to stop any publication which he deems objectionable, to confiscate the edition, and to prosecute the author and editor. Newspapers and pamphlets are generally subjected to a stricter censorship than larger works.

PRESSING TO DEATH. See PEINE FORTE ET DURE.

PRESSIRO'STRES, a tribe of birds of the order *Grallatores*, distinguished by a bill of moderate size, not so strong as in the *Cultrirostres*; whilst the hind toe is either wanting, or so short as not to touch the ground. To this tribe belong bustards, plovers, lapwings, oyster-catchers, &c.

PRESSTI'SSIMO (Ital. very quick) is the most rapid degree of movement known in musical composition.

PRESTER JOHN. See JOHN, PRESTER.

PRE'STO (Ital. quick), in Music, a direction that a piece should be performed in a rapid lively manner.

PRE'STON, an important manufacturing and market town, a municipal and parliamentary borough in Lancashire, on the north bank of the Ribble, and at the head of the estuary of that river, 27 miles north-north-east of Liverpool. It occupies an eminence 120 feet above the Ribble, and it covers an area 2 miles square. The houses are mostly built of brick, and the town is on the whole well laid out, and is surrounded with pleasing scenery. The river is crossed by two bridges and several railway viaducts. There are 14 churches, 7 Catholic and 20 other dissenting chapels. The chief public buildings are the Town-hall, of Gothic design, which contains the Guild-hall and Exchange, and was erected at a cost of upwards of £60,000; the Preston and County of Lancaster Royal Infirmary, erected 1869; the Corn Exchange and market-house; the House of Correction and court-house; the Institution for the Diffusion of Useful Knowledge, with a library of 10,000 volumes; the Institute and School for the Blind. It has also several public libraries; 2 weekly and 2 semi-weekly newspapers. Linen manufactures were formerly the staple, and though still extensive, have been supplanted by the cotton manufacture, which now holds the first place. P. contains in all about 90 cotton-mills, which give employment to about 27,500 hands. There are also iron and brass foundries, iron ship-building yards, carriage-works, and machine-shops; and malting, brewing, and rope-making are also carried on. P. is a free port, and is reached at spring-tides by vessels drawing 14 feet. In 1880, 255 vessels of 17,348 tons entered and cleared the port. Its imports are chiefly corn, iron, and timber; its exports principally coal.

Four great fairs are held here during the year, besides the usual weekly markets. The celebrated guild of merchants, called Preston Guild, is still observed here every 20 years. On the last occasion, 1862, the foundation stone of the new Town-hall was laid. It is about 700 years since the guild merchant of Preston was acknowledged by royal charter. The first of its 14 royal charters was granted in the reign of Henry II. Preston alone has kept up the celebration of its guild to the present day. The borough returns two members to the House of Commons. Pop. (1881) 93,707.

PRESTONPA'NS, a village of Haddingtonshire, having a station on the North British Railway, 8½ miles east of Edinburgh. It is supposed to have had salt-pans as early as the 12th c., and possessed thriving manufactures till some time after the Reformation. Its present manufacturing industry is limited to that of ale. Pop. (1881) 2265. Near P. was fought the famous battle of that name, in which the Jacobites under Prince Charles Edward completely routed the royal army under Sir John Cope, capturing their cannon, baggage, and military chest.

PRESTWICH, a cotton manufacturing village and township of Lancashire, 4 miles N.W. from Manchester. It has a fine old Gothic church, built in the 13th c., and restored in 1861, also a large county lunatic asylum, erected in 1861. Pop. (1881) 8627.

PRESU'MPTION is an inference drawn by the law in certain circumstances or conditions of fact, and is used generally as a mere starting-point in an argument or litigation. Presumptions are often divided into *presumptio juris* and *presumptio juris et de jure*. The former serves as a mere starting-point, and may be rebutted by proof to the contrary. Thus, a person who has possession of goods, is presumed to be the owner till the contrary is proved. A man is presumed to be innocent until the contrary is proved. A *presumptio juris et de jure* is said to be a presumption which cannot be rebutted; but there are few instances of this. Presumptions abound in all departments of the law, and are adopted from the necessity of coming to some conclusion or other in most cases where the evidence is general or inconclusive. Thus, a common illustration is where two persons are drowned at sea, and legal rights depend on the fact which of them survived the other. In such a case, it is presumed by the law of some countries, that the younger person survives; but there is no presumption in England. But in case of mother and child dying during delivery, the presumption is that neither survived. If a person disappear, and is not heard of, he is presumed to be living. But by an act of parliament this presumption was put an end to, or at least was not allowed to interfere with the right of a married woman to consider herself a widow, after her husband has left her, and has not been heard of for seven years.

PRETE'NCE, ESCUTCHEON OF, or ESCUTCHEON SURTOUT, in Heraldry, a small shield placed in the center of the field of another shield. The husband of an heiress may bear the

arms of his wife in an escutcheon of pretence, instead of impaling them. Feudal arms are also sometimes placed on an escutcheon of pretence, particularly in the insignia of elective sovereigns, who have been in use of bearing their own proper arms in surtout over those of the dominions to which they are entitled. The crown of Charlemagne is placed in surtout in the arms of Hanover; and from 1801 till the accession of Queen Victoria, the Hanoverian insignia occupied an escutcheon of pretence in the center of the royal arms of the United Kingdom.

PRE'VEZA, or PREVISA, a busy trading town on the north shore of the strait which forms the mouth of the Gulf of Arta. The Berlin Congress included P. in the part of Epirus to be restored to Greece; but at the rectification of the frontier in 1881 it was retained by Turkey, it being arranged that the fortifications should be destroyed. Pop. 8000.

PREVOST-PARADOL, Lucien Anatole, a distinguished French littérateur, born at Paris, 8th August, 1829, studied at the Collége Bourbon and the Ecole Normale; in 1851, obtained from the Académie the prize for eloquence, and was admitted Docteur-és-lettres in 1855. In that year, he was named to the chair of French literature by the Faculty of Aix; but in the following year resigned it, and became one of the editors of the *Journal des Débats*, writing generally the leading articles. His advocacy of a responsible ministry brought him into difficulties with the censorship. He was twice an unsuccessful candidate for a seat in the Chamber. In 1865, he was elected a member of the Académie. Believing that the Empire had at last adopted the principle of parliamentary government, he consented, in 1870, to fill the post of envoy at Washington; but undeceived by the events connected with the proclamation of war with Prussia, he died by his own hand, 20th July 1870. His chief works are—*Revue de l'Histoire Universelle*, 1854; *Essais de Politique et de Littérature*, 1859–63; *Quelques Pagesd' Histoire Contemporaine*, 1862–66.

PRI'AM, king of Troy at the time of the Trojan war, was the son of Laomedon, and Strymo or Placia. The name P. (derived from *Priamai*, to ransom) was given him on account of his having been ransomed by his sister Hesione from Herakles, into whose hands he had fallen. His first wife was Arisbe, daughter of Merops, whom he gave away to a friend in order to marry Hecuba, by whom, according to Homer, he had nineteen sons; but as his intercourse with the other sex was not limited to Hecuba, the epic poet gives him in all 50 sons; while later writers add as many daughters. The best-known of these are Hector, Paris, Deïphobos, Helenus, Troilus, and Cassandra. P. is represented as too old to take any active part in the Trojan war; and in Homer, only once appears on the field of battle. The oldest Greek legends—i. e., the Homeric, are silent respecting his fate; but the later poets—Euripides, Virgil, &c.—say that he was slain by Pyrrhus at the altar of Zeus Herkeios, when the Greeks stormed the city.

PRICE, Richard, was born at Tynton, in Wales, on 22d February 1723. His father, Rice Price, was a dissenting minister possessed of some wealth, and remarkable for his intolerance. A leading characteristic of his son's mind, on the other hand, was the calm resolution with which, from his youth, he declared his own opinions, and advocated freedom of thought for others. He declined to bend his convictions to paternal authority; accordingly, on his father's death, Richard was so poorly provided for, that, having resolved to prosecute his studies in London, he was obliged to make the journey chiefly on foot. He obtained admission to a dissenting academy, where he acquired a good knowledge of mathematics, philosophy, and theology. At the end of four years, he engaged himself as chaplain to a Mr. Streatfield, with whom he lived for thirteen years. Mr. Streatfield, on his death, left P. some property; and his circumstances having been further improved by the death of an uncle in 1757, he was enabled to carry out a matrimonial engagement which he had formed with a Miss Blundell.

He then settled as a preacher at Hackney; but being shortly afterwards chosen minister at Newington Green, he removed to that place, where he lived till the death of his wife in 1786, when he returned to Hackney. Meanwhile, his life had been one of considerable literary and scientific activity. His *Review of the Principal Questions and Difficulties in Morals* (Lond. 1758), though a somewhat heavy work, established his reputation as a metaphysician and a moralist. In 1769, the degree of Doctor of Divinity was conferred on him by the university of Glasgow. In the same year, he published his *Treatise on Reversionary Payments;* this was followed by the compilation and publication of the celebrated *Northampton Mortality Tables*, and various other works relating to life-assurance and annuities, forming most valuable contributions to the branch of science to which they refer. In 1776, appeared his *Observations on Civil Liberty and the Justice and Policy of the War with America.* Of this work, 60,000 copies are said to have been sold in a few months. So greatly was it admired in the United States, that, in 1778, the American Congress, through Franklin, communicated to him their desire to consider him a fellow-citizen, and to receive his assistance in regulating their finances; an offer declined principally on the ground of age. He died April 19, 1791. P. was a believer in the immateriality of the soul holding that it remained in a dormant state between death and resurrection. Their difference of opinion on this subject led to a controversy of some celebrity between him and his friend Dr. Priestley. His views respecting the Son of God were what is called Low or semi-Arian. His moral character appears to have been a singularly beautiful one. 'Simplicity of manners,' says Dr. Priestley, 'with such genuine marks of perfect integrity and benevolence, diffused around him a charm which the forms of politeness can but poorly imitate.' See *Memoirs of the Life of Richard Price, D.D.*, by William Morgan, F.R.S., Lond. 1815.

PRICHARD. James Cowles, a distinguished ethnologist and physician, was born at Ross, in Herefordshire, on the 11th of February 1786. His father, Thomas Prichard, a member of the Society of Friends, and a merchant, had been married young, and was early left a widower with four children, upon whose education he bestowed the greatest care. Of these children, James Cowles, the eldest, was educated at home under private tutors. He learned Latin and Greek from a Mr. Barnes; French from an *émigré* named De Rosemond; and Italian and Spanish from an Italian named Mordenti—while his father himself taught him history, for the study of which young P. showed a strong predilection. At Bristol, where his father resided for some time in the pursuit of his business, the embryo ethnologist gave the first indications of his love for the study in which he afterwards became famous. On the quays, he met with foreigners from every country, and took much interest in observing their physical appearance, occasionally conversing with the sailors and others, as well as he was able, in their native tongues. On retiring from business, his father again took up his abode at Ross, where the son continued to pursue his studies under private tutors. When the time for choice of a profession arrived, young P. chose that of medicine as the one he thought most akin to his ethnological pursuits. He accordingly became a student of medicine, first at Bristol, afterwards at St. Thomas's Hospital, London, and finally at Edinburgh, where he took his degree of M.D. Before commencing practice, however, he entered himself a student at Trinity College, Cambridge where he read mathematics and theology for the most part. Subsequently, he studied at St. John's College and Trinity College, Oxford.

In 1810, he commenced practice in Bristol as a physician. His talents were soon recognized, both privately and publicly. He was first appointed physician to the Clifton Dispensary and St. Peter's Hospital, and afterwards physician to the Bristol Infirmary. In 1813, he published his first work, *Researches into the Physical History of Mankind*, which at once gave him a high standing as an ethnologist. Of this, a second and enlarged edition, in two vols., appeared in 1826; and a third, still further improved and enlarged, in five vols., appeared between the years 1836 and 1847. The second and third editions of this work, each in succession, gave remarkable proofs of the extraordinary zeal with which Dr. P. pursued his ethnological investigations; and not only so, for at the same time he devoted himself much to the pursuit of philology, which he rightly judged to be absolutely necessary to an enlarged study of ethnology. In a few years, he became acquainted, not only with the Teutonic and Celtic languages, but with Sanscrit, Hebrew, and Arabic; showing a practical result of his studies in the publication of his work entitled *The Eastern Origin of the Celtic Nations.* In this publication, which appeared at Oxford in 1831, he compared the different dialects of the Celtic with the Sanscrit, Greek, Latin, and Teutonic languages, and succeeded in proving a strong affinity between them all, from which he argued in favor of a common origin for all the peoples speaking those languages. His theory has met with general acceptation; and the work in which it appeared, says Mr. Norris, 'is admitted by the most distinguished philologists to be unsurpassed in ability and soundness, while not a few deem it to be that which has made the greatest advance in comparative philology during the present century.' A previous work—namely, his *Analysis of Egyptian Mythology*, first published in 1819, had the honor of being translated into German in 1837, and edited by A. W. Schlegel, who, however, took occasion to dissent from some of the author's views.

In 1843, Dr. P. published the first edition of his *Natural History of Man*, in 2 vols. Two other editions of this work appeared during the author's lifetime; and a fourth, ably edited and enlarged, by Mr. Edwin Norris, was given to the world in 1855. Dr. P.'s other published works are for the most part on medical subjects —namely, *History of the Epidemic Fevers which prevailed in Bristol during the years* 1817, 1818, *and* 1819, published in 1820; *Treatise on Diseases of the Nervous System* (1822); *A Treatise on Insanity and other Diseases affecting the Mind* (1835); and *On the Different Forms of Insanity in Relation to Jurisprudence* (1842). He also

contributed various articles to the *Cyclopædia of Practical Medicine* and to the *Library of Medicine*. As a tribute to his eminence as an ethnologist, Dr. P. was elected President of the Ethnological Society; while, in recognition of his researches into the nature and various forms of insanity, he received the government appointment of Commissioner in Lunacy. This occasioned his removal from Bristol to London, where, unfortunately for the interest of science, he expired of rheumatic fever, on the 22d of December 1848, at the comparatively early age of 62. Dr. P.'s fame as the greatest of ethnologists, which, during his lifetime, was universally acknowledged, remains undisturbed to this day, notwithstanding any difference of opinion as to his favorite doctrine of the unity of the human race, which he constantly upheld. He was the first to raise ethnology to the rank of a science, and in his work, *The Physical History of Mankind*, he has left behind him a noble monument of his genius, skill, and perseverance.

PRICKLE (*Aculeus*), in Botany, a strong and hard, elongated and pointed hair. See HAIRS, in *Botany*.—The prickle is connected only with the bark, and not with the wood, in which it essentially differs from the spine or thorn. Prickles are sometimes straight, sometimes curved. They have often a pretty extended base—of some definite shape—by which they are attached to the bark.

PRICKLY HEAT is the popular name in India and other tropical countries for a severe form of the skin-disease known as *Lichen*. It more frequently attacks strangers from temperate climates than the natives, although the latter are not altogether exempt from it. The sensations of itching and stinging which attend it are intense, and give rise to an almost irresistible propensity to scratching, which of course only aggravates the irritation. Little or nothing can be done in the way of treatment, except keeping as cool as possible; but the remedies recommended in the article LICHEN may perhaps slightly alleviate the symptoms.

PRICKLY PEAR, or INDIAN FIG (*Opuntia*), a genus of plants of the natural order *Cacteæ* (q. v.), having a fleshy stem, generally formed of compressed articulations, sometimes of cylindrical articulations; leafless, except that the youngest shoots produce small cylindrical leaves, which soon fall off; generally covered with clusters of strong hairs or of prickles; the flowers springing from among the clusters of prickles, or from the margin or summit of the articulations, solitary, or corymboso-paniculate, generally yellow, rarely white or red; the fruit resembling a fig or pear, with clusters of prickles on the skin, mucilaginious, generally eatable—that of some species pleasant, that of others insipid. The fruit imparts a red color to the urine. The prickles of some species are so strong, and their stems grow up in such number and strength, that they are used for hedge-plants in warm countries.

The COMMON P. P. or I. F. (*O. vulgaris*), a native of Virginia and more southern parts of North America, is now naturalized in many parts of the south of Europe and north of Africa, and in other warm countries. It grows well on the barest rocks, and spreads over expanses of volcanic sand and ashes too arid for almost any other plant. It is of humble growth; its fruit oval, rather larger than a hen's egg, yellow, and tinged with purple, the pulp red or purple, juicy, and pleasantly combining sweetness with acidity. It is extensively used in many countries as a substantive article of food. In the south of England, the P. P. lives in the open air, and occasionally ripens its fruit. In America, it is cultivated considerably to the north of its native region. Lime rubbish is often mixed with the soil in which it is to be planted. The fruit is imported into Britain, to a small extent, from the Mediterranean.—The DWARF P. P. (*O. nana*), very similar, but smaller, and having prostrate stems, is naturalized in Europe as far north as the sunny slopes of the Tyrol.—The TUNA (*O. tuna*), much used in some parts of the West Indies as a hedge-plant, and also valuable as one of the species which afford food to the cochineal insect, yields a pleasant fruit. It has red flowers, with long stamens, which display a remarkable irritability.

PRIDE, in Heraldry. A peacock, or other bird, when the tail is spread out in a circular form, the wings dropped, it is said to be 'in his pride.'

PRIDEAUX, HUMPHREY, an English scholar and divine, was born of an ancient and honorable family at Padstow, in Cornwall, May 3, 1648. He was educated first at Westminster School, under Dr. Busby; and afterwards at Christ Church, Oxford, where he took the degree of B.A. in 1672. In 1676, he published an account of the Arundelian Marbles, under the title of *Marmora Oxoniensia*, which greatly increased his fame as a scholar, and in the following year, took the degree of M.A. The *Marmora* procured for P. the friendship of the Lord Chancellor Finch (afterwards Earl of Nottingham), who, in 1679, appointed him rector of St. Clement's at Oxford, and, in 1681, a prebendary of the cathedral of Norwich. After several minor preferments he was collated, in 1688, to the archdeaconry of Suffolk; and in 1702, was made Dean of Norwich. He died November 1, 1724. His principal works are, his *Life of Mahomet* (1697), which was long very popular, and has gone through many editions, but is now entirely superseded; and *The Connection of the History of the Old and New Testament* (1715—1718). The last of these treats with much learning, but less discernment, the affairs of ancient Egypt, Assyria, Persia, Judea, Greece, and Rome, as far as they bear on the subject of sacred prophecy. P. was a zealous but not an intolerant churchman, most conscientious in the discharge of his own duties, equally anxious that others should do theirs, and possessed of a considerably greater share of piety than was usual in his age.

PRIE'GO, a town of Andalusia, Spain, 45 miles S.E. of Cordova. There are oil-mills, flour-mills, tanneries, and potteries. There were formerly very important silk manufactures. Pop. (1877) 15,674.

PRIESSNITZ, VINCENT, the founder of Hydropathy (q. v.), was born at Gräfenburg (q. v.), in Austrian Silesia, October 5, 1799. He was the son of a peasant-proprietor, and received at the school of Freiwaldau an education suitable to his station, and afterwards farmed his paternal estate. It appears that a neighbor, who had been in the way of healing trifling wounds on himself and others by means of cold water, treated P. successfully in this way for a serious injury from the kick of a horse; and P., having thus had his attention directed to the virtues of cold water, and being indisputably possessed of great sharpness of intellect and aptitude for the practice of the healing art, began to give advice to his neighbors how to cure all ailments with cold water, and soon attained considerable reputation among them. Although several times brought before the authorities for unlicensed practising, the simplicity of the means he used made it impossible to interfere with him. As the number of applicants for advice went on increasing, he gradually came, by experimental modifications of the way of applying his remedy, to form a kind of system of treatment for the various cases that presented themselves. At last, about 1826, strangers began to repair to Gräfenberg, and stay there for some time for treatment; in 1829, there were as many as 49 water-patients, and in 1837, the number had risen to 586. P. continued till 1833 to carry on his farming; but after that, his practice, and the care of the establishments which he had to provide for the reception and treatment of his patients, fully occupied him. He died November 28, 1851, leaving his establishment to his son-in-law. Very different judgments have been pronounced on the character of P. and his system of treatment, mostly according to the prejudices of the critics. He, himself, has left nothing in writing on his method of cure.—Wunde, *Die Gräf. Wasserheilanstalt und die P.'sche Curmethode* (6th ed. Leip. 1845).

PRIEST (Gr. *presbyteros*, Lat. *presbyter*, Fr. *prêtre*), the title, in its most general signification, of a minister of public worship, but specially applied to the minister of sacrifice or other mediatorial offices. In the early history of mankind, the functions of the priest seem to have commonly been discharged by the head of each family; but on the expansion of the family into the state, the office of priest became a public one, which absorbed the duties as well as the privileges which before belonged to the heads of the separate families or communities. It thus came to pass that in many instances the priestly office was associated with that of the sovereign, whatever might be the particular form of sovereignty. But in many religious and political bodies, also, the orders were maintained in complete independence, and the priests formed a distinct, and generally speaking, a privileged class (see *Egyptian Priests*, *Indian Priests*, below). The priestly order, in most of the ancient religions, included a graduated hierarchy; and to the chief, whatever was his title, were assigned the most solemn of the religious offices intrusted to the body. In sacred history, the patriarchal period furnishes an example of the family priesthood; while in the instance of Melchizedec, king of Salem, we find the union of the royal with the priestly character. In the Mosaic law, the whole theory of the priesthood, as a sacrificial and mediatorial office, is fully developed. The priest of the Mosaic law stands in the position of a mediator between God and the people; and even if the sacrifices which he offered be regarded as but typical and prospective in their moral efficacy, the priest must be considered as administering them with full authority in all that regards their legal value.

The Mosaic priesthood was the inheritance of the family of Aaron, of the tribe of Levi. It consisted of a high priest (q. v.), and of inferior ministers, distributed into 24 classes. The age for admission to the priesthood is nowhere expressly fixed; but from 2d Chronicles xxxi. 17, it would seem that the minimum age was 20. In the service of the temple, the priests were divided into 24 classes, each of which was subject to a chief priest, and served, each company for a week, following each other in rotation. Their duties in the temple consisted in preparing, slaying, and offering victims; in preparing the shew-bread, burning the

incense, and tending the lights of the sanctuary. Outside, they were employed in instructing the people, attending to the daily offerings, enforcing the laws regarding legal uncleanness, &c. For their maintenance were set aside certain offerings (see FIRST-FRUITS) and other gifts. They wore a distinguishing dress, the chief characteristics of which were a white tunic, an embroidered cincture, and a turban-shaped head-dress. The Jewish priesthood may be said to have practically ceased with the destruction of the temple.

In the Christian dispensation, the name primitively given to the public ministers of religion was *presbyteros*, of which the English name 'priest' is but a form derived through the old French or Norman *prestre*. The name given in classical Greek to the sacrificing priests of the pagan religion, Gr. *hiereus*, Lat. *sacerdos*, is not found in the New Testament explicitly applied to ministers of the Christian ministry; but very early in ecclesiastical use, it appears as an ordinary designation; and with all those bodies of Christians, Roman Catholics, Greeks, Syrians, and other orientals who regard the Eucharist as a sacrifice (see MASS), the two names were applied indiscriminately.

The priesthood of the Christian church is one of the grades of the Hierarchy (q. v.), second in order only to that of bishop, with which order the priesthood has many functions in common. The priest is regarded as the ordinary minister of the Eucharist, whether as a sacrament or as a sacrifice; of baptism, penance, and extreme unction; and although the contracting parties are held in the modern schools to be themselves the ministers of marriage, the priest is regarded by all schools of Roman divines as at least the normal and official witness of its celebration. The priest is also officially charged with the instruction of the people and the direction of their spiritual concerns, and by long-established use, special districts, called Parishes (q. v.), are assigned to priests, within which they are intrusted with the care and supervision of the spiritual wants of all the inhabitants. The holy order of priesthood can only be conferred by a bishop, and he is ordinarily assisted by two or more priests, who, in common with the bishop, impose hands on the candidate. The rest of the ceremonial of ordination consists in investing the candidate with the sacred instruments and ornaments of his order, anointing his hands, and reciting certain prayers significative of the gifts and the duties of the office. The distinguishing vestment of the priest is the *chasuble* (Lat. *planeta*). In Roman Catholic countries, priests wear even in public a distinctive dress, which, however, in most respects is common to them with the other orders of the clergy. In the Latin Church, priests are bound to a life of celibacy. In the Greek and oriental churches, married men may be advanced to the priesthood; but no one is permitted to marry after ordination, nor is a married priest permitted to marry a second time, should his wife die.

In the Church of England, and other Reformed Episcopal Churches, the term priest is retained as the designation of the second order of clergy, whose special office it is (1) to celebrate the Sacrament of the Lord's Supper; (2) to pronounce the forms of Absolution in the Morning and Evening Prayer, in the Communion Service, and in the Office for the Visitation of the Sick; and (3) to preach, though this last office is, by special license, sometimes extended to deacons.

Priests only can hold a benifice with cure of souls. The age for admission into the priesthood is 24 years. (For the manner and ceremonies of admission, see ORDINATION.) Priests in the Church of England are ordinarily distinguished during divine service by a black stole of silk worn upon the surplice over both shoulders; deacons according to the ancient use, wearing it over one shoulder only. Marriage is permitted in the Church of England to all orders of the clergy.

Egyptian Priests.—In the political division of Egypt, the population is supposed to have been divided into three or four castes, at the head of which was the sacerdotal, or priests. This division, however, was not very strictly observed, as the son did not invariably follow the profession of the father. That of the priest appears most honorable, and two principal classes of priests were in existence at the earliest periods—the *hont*, or prophets, and the *ab*, or inferior priests. The first were attached to the worship of all the deities of Egypt; and in the greater cities, there was *hont api*, high prophet, or priest, who presided over the others; at Thebes there were as many as four prophets of Ammon. Their duties appear to have comprised the general cultus of the deity. They also interpreted the oracles of the temples. Besides the prophets of the gods, others were attached to the worship of the king, and to various offices connected with the administration of the temples.

The class of priests called *ab*, or 'pure,' were inferior, and were also attached to the principal deities and to the personal worship of the monarch. They were presided over by a superintendent, but had no high priest. A third class of priests, the *karheb*, appear in connection with funeral and other ceremonies, and some other inferior persons of the hierarchy. The *scribes* formed a caste apart, but those who were attached to the temple were of the priestly order. Besides these above mentioned, the Greeks enumerate a variety of sacred officials. The administration of the temples by the hierarchy was as follows: the temple was governed by a superintendent, or *epistetes*, called in Egyptian *mer*, either the high priest or a prophet. Under him was a vicar, and a royal officer, called *epimeletes*, or overseer, by the Greeks. These attended to the receipts and expenses. Lay brethren, or *hierodules*, attended and assisted the priests in their functions; and in addition to these, there were a kind of monks in the Serapeium, who lived within the precincts of the temple, which they were not allowed on any account to quit. At Alexandria, under the Ptolemies, there was a priest of Alexander the Great, and others attached to the worship of the deceased Ptolemies, and also one attached to the worship of the living monarch. This priest, it appears, was nominated by the king himself, and drew a revenue from the different temples of Egypt. He was at this period the high priest of the whole country, and had no doubt superseded the former high priest of Ptah at Memphis, and of Amen-Ra at Thebes, who had formerly exercised a kind of pontificate. On solemn occasions a synod of the priests was held for purposes affecting the whole body.

Some light has been thrown on the relative dignities of the hierarchy by the hieroglyphical inscription on a statue of Bakenhonsou, a high priest of Amen-Ra, now at Munich. At the age of 16, he held a civil employment under Sethos I.; he was then made priest *ab* of Amen-Ra, which office he exercised for four years; after this, he rose to the rank of 'divine father' of the god, which office he held for 12 years; after that, he became third prophet of the same deity for 15 years; then second prophet for 12 years; and finally, at the age of 59, chief prophet or high priest of the god—held the post for 27 years, and died at the age of 86. The youthful age at which offices were held was probably owing to the careful education which the young priests had to undergo, and the habits required for the order. They were required to be scrupulously neat and clean, entirely shaven, clad in linen, and shod with papyrus sandals, and to maintain a rigid diet, in which was a careful abstaining from pork, mutton, beans, and salt, to which was added a bath twice a day, and other ablutions. They also fasted, and one of their fasts lasted 42 days; others even longer; they then lived on vegetable food alone, and exercised a rigid continence. They were, however, not unmarried, but allowed one wife. Their support was derived from various sources—as from royal and other endowments of the temples, from the gifts of votaries, and from charges on the produce of the country. On festivals, not only were they often clad in fine linen, but the addition of a panther-skin was often added to their attire; and they were anointed with perfumes and unguents. They offered water and burning incense.

Although Herodotus has stated that no woman was a priestess in Egypt, many functions connected with the temples were held by women. The most important was that of 'divine wife of Amen-Ra,' called by Diodorus the *pallakis*, or concubine, of Jupiter, which was conferred upon queens and princesses only. Another title was that of 'divine hand,' or adorer of the same god, a rank also held by royal personages. During the 4th dynasty, at the time of Cheops and the pyramids, there were prophetesses; but the order does not appear to have been kept up, for at a later period there only appear the *sua*, or singing women of the gods, and the *aha*, or performers, of the principal deities, who attended with *sistra* at the festivals. Besides these, other women had charge of certain things connected with the temple, and *canephoroi*, or basket-bearers. They had no distinctive dress, and were often the wives of prophets or other priests.—Boeck, *Corp. Inscr. Græc.*, p. xxix., p. 303; Schmidt, *De Sacerdot. Ægyptior.*; Wilkinson, *Manners and Customs*, vol. i. p. 257; Devéria, *Monument de Bakenkhonsou* (Paris, 1862).

Indian Priests.—The priesthood of India belongs to the first caste, or that of the Brâhman'as exclusively; for no member either of the Kshattriya or the Vais'ya, or the S'ûdra caste is allowed to perform the functions of a priest. But as the proper performance of such functions requires, even in a Brâhman'a, the knowledge of the sacred texts to be recited at a sacrifice, and of the complicated ceremonial of which the sacrificial acts consist, none but a Brahman'a learned in one or more Vedas (q. v.), and versed in the works treating of the ritual (see KALPA-SUTURA), possesses, according to the ancient law, the qualification of a priest; and so strict in ancient times, were the obligations imposed upon a priest, that any defective knowledge on his part, or any defective performance by him of the sacrificial rites, was supposed to entail upon him the most serious consequences both in this life and in the future.

As the duration of a Hindu sacrifice varies from one to a hundred days, the number of priests required at such a ceremony is likewise stated to be varying; again, as there are sacrificial acts at which verses from the R'igveda only were recited, others requiring the inaudible muttering of verses from the Yajurveda only; others,

again, at which verses only of the Sâmaveda were chanted; and others, too, at which all these three Vedas were indispensable—there were priests who merely knew and practised the ritual of the R'igveda, or the Yajurveda, or the Sâmaveda; while there were others who had a knowledge of all these Vedas and their rituals. The full contingent of priests required at the great sacrifices amounts to 16. Other inferior assistants at a sacrifice such as the ladle-holders, slayers, choristers, and the like, are not looked upon as priests. Such was the staff of priests required at the great and solemn sacrifices, which took place on special occasions, and could be instituted only by very wealthy people; from one to four priests, however, sufficed at the minor sacrifices, or those of daily occurrence. These were the rules and practices when the Hindu ceremonial obeyed the canon of the Vaidik ritual; and the latter probably still prevailed at the epic period of India, though many deviations from it are perceptible in the Mahâbhârata and Râmâyan'a (q. v.). But at the Paurân'ik period and from that time downwards, when the study of the Vedas had fallen into disuse, and the Vaidik rites had made room for other ceremonies which required no knowledge on the part of a priest, except that of the reading of a prayer-book, and an acquaintance with the observances enjoined by the Puran'as, but easy to go through, almost every Brahman, not utterly ignorant, became qualified to be a priest.—For the priesthood of the Buddhists, Jainas, and Tibetans, see BUDDHISM, JAINAS, and LAMAISM.

PRIESTLEY, JOSEPH, son of Jonas Priestley, a cloth-draper at Fieldhead, near Leeds, was born at Fieldhead on 13th March 1833, O.S. His mother having died when he was six years old, he was adopted by an aunt, by whom he was sent to a free school. There he learned Latin and Greek. During vacation, he taught himself various languages, both ancient and modern. For some time he was obliged to abandon his studies, owing to weak health: he then betook himself to mercantile pursuits. With returning strength, his literary studies were resumed, and successfuly prosecuted at a dissenting academy at Daventry under Mr. (afterwards Dr.) Ashworth, successor to Dr. Doddrige. Though his father and aunt were strong Calvinists, their house was the resort of many men who held very different opinions; and the theological discussions which he was in the habit of hearing, seem to have had much effect on young P.: before he was 19, he calls himself rather a believer in the doctrines of Arminius, but adds: 'I had by no means rejected the doctrine of the Trinity or that of the Atonement.' Before leaving home, he wished to join a Calvinistic communion, but he was refused admission, the ground of refusal being, that he had stated doubts as to the liability of the whole human race to 'the wrath of God and pains of for ever.' During his residence at the academy, he conceived himself called on to renounce nearly all the theological and metaphysical opinions of his youth. 'I came,' he says, 'to embrace what is called the heterodox side of every question.' In 1755, he became minister to a small congregation at Needham Market, in Suffolk, with an average salary of £30 per annum. While here, he composed his work entitled *The Scripture Doctrine of Remission, which shows that the Death of Christ is no proper Sacrifice nor Satisfaction for Sin*. His leading theological doctrine seems to have been, that the Bible is indeed a divine revelation, made from God to man through Christ, himself a man and no more, nor claiming to be more.

He seems to have rejected all theological dogmas which appeared to him to rest solely upon the interpretation put upon certain passages of the Bible by ecclesiastical authority. Even the fundamental doctrines of the Trinity and of the Atonement he did not consider as warranted by Scripture, when read by the light of his own heart and understanding. It does not, however, appear that these doctrinal errors produced any morally evil results. He not only contrived to live on £30 a year; but by adding a little to his income by means of teaching, he was enabled to purchase a variety of instruments to help him in his scientific studies. In 1758, he quitted Needham for Nantwich; and in 1761 he removed to Warrington, where he was appointed successor to Mr. (afterwards Dr.) Aikin, as teacher of languages and belles-lettres. At Warrington, he married Miss Wilkinson, a lady of great talent and amiability. Here his literary career may be said first fairly to have begun. A visit to London led to his making the acquaintance of Franklin and Dr. Price. The former supplied him with books which enabled him to write his *History and Present State of Electricity*, published in 1767. It was followed by a work on *Vision, Light, and Colors*. In 1762, he published his *Theory of Language and Universal Grammar*. In 1766, he was made a member of the Royal Society, and a Doctor of Laws by the university of Edinburgh. In the following year, he removed to Millhill, near Leeds, where he was appointed minister of a dissenting chapel. The fact of a brewery being beside his dwelling gave a new direction to his energetic and versatile mind; he begun to study pneumatic chemistry, publishing various important works connected with this science.

'No one,' says Dr. Thomson, 'ever entered on the study of chemistry with more disadvantages than Dr. Priestley, and yet few have occupied a more dignified station in it.' While at Leeds, he agreed to accompany Captain Cook on his second voyage; but certain ecclesiastics having objected to the latitude of his theological views, the Board of Longitude refused to sanction the arrangement, and he did not go. In 1773, he was appointed librarian and literary companion to Lord Shelburn, with a salary of £250 per annum, and a separate residence. He accompanied the earl on a continental tour in the year 1774. Having been told by certain Parisian savans that he was the only man they had ever known, of any understanding, who believed in Christianity, he wrote, in reply, the *Letters to a Philosophical Unbeliever*, and various other works, containing criticisms on the doctrines of Hume and others. His public position was rather a hard one; for while laughed at in Paris as a believer, at home he was branded as an atheist. To escape the odium arising from the latter imputation, he published, in 1777, his *Disquisition Relating to Matter and Spirit*. In this work, while he partly materializes spirit, he at the same time partly spiritualizes matter. He holds, however, that our hopes of resurrection must rest solely on the truth of the Christian revelation, and that on science they have no foundation whatever. The doctrines of a Revelation and a Resurrection appear to him to have supported one another. He believed in a Revelation, because it declared a Resurrection; and he believed in a Resurrection, because he found it declared in the Revelation. On leaving Lord Shelburn, he became minister of a dissenting chapel at Birmingham.

The publication in 1786, of his *History of Early Opinions concerning Jesus Christ*, occasioned the renewal of a controversy, which had begun in 1778, between him and Dr. Horsley, concerning the doctrines of Free Will, Materialism, and Unitarianism. The victory in this controversy will probably be awarded by most men in accordance with their own preconceived views on the questions at issue. His reply to Burke's *Reflections on the French Revolution* led to his being made a citizen of the French Republic; and this led to a mob on one occasion breaking into his house, and destroying all its contents, books, manuscripts, scientific instruments, &c. He states that the sum awarded to him as damage fell £2000 short of the actual pecuniary loss. A brother-in-law, however, about this time left him £10,000, with an annuity of £200. In 1791 he succeeded to the charge at Hackney, which had become vacant by the resignation of Dr. Price. He did not remain long here, however. His honestly-avowed opinions had made him as unpopular as an honest avowal of opinions generally does. He removed to America, where he was received with respect, if not with enthusiasm. He had the offer of the professorship of Chemistry at Philadelphia, which he declined. In 1796, his wife died. To the day of his death, he continued to pursue his literary and scientific pursuits with as much ardor as he had shown at any period of his active life. He died 6th February 1804, expressing his satisfaction with his having led a life so useful, and his confidence in immortality. At Paris, his *éloge* was read by Cuvier before the National Institute. He has given us his autobiography down to 24th March 1795. He was a man of irreproachable moral and domestic character, remarkable for zeal for truth, patience, and serenity of temper. He appears to have been fearless in proclaiming his convictions, whether theological, political, or scientific. See Memoirs of his own life, continued by his son with observations by T. Cooper. Also life by John Corry.

PRILOU'KY, a district town of Little Russia, in the government of Poltava, and 150 miles north-west of the town of that name. Tobacco, corn, cattle, and tallow are the principal articles of trade, and are sold on the spot to dealers for export to Moscow, St. Petersburg, Riga, Poland, and abroad. The climate is good, and the soil fertile. Pop. (1880) 12,878, most of whom are engaged in the cultivation of tobacco.

PRILU'KI, a town of European Russia, in the government of Poltava, 138 miles north-west from Poltava. It has a considerable trade in corn, cattle, brandy, and saltpetre. Pop. (1880) 12,878.

PRI'MA DO'NNA (Ital.), the first female singer in an opera.

PRI'MARY or PRIMITIVE LIMESTONE, the name formerly given to crystalline limestones, because it was supposed that they belonged to the oldest primary deposits. But as it is now known that many of these limestones are of much later origin, some even as late as the Tertiary Period, the name has fallen into disuse. See MARBLE.

PRI'MATE (Lat. *primus*, Fr. *primat*, first) is the title of that grade in the hierarchy which is immediately below the rank of patriarch. The title strictly belongs to the Latin Church, but in its general use it corresponds with that of exarch (Gr. *exarchos*) in the Greek Church, although there were some exarchs who were not immediately subject (as were all primates) to a patriarch. This arose in the Eastern Church from the variation in the limits

of the patriarchates, which were not of simultaneous origin; but in the West, where the patriarch (i. e., the Roman bishop) was recognized as possessing universal jurisdiction, this exemption of any particular primate from superior jurisdiction could not of course arise.

The primate, as such, was the head of a particular church or country, and held rank, and, in some churches, a certain degree of jurisdiction, over all bishops and archbishops within the national church. This jurisdiction, however, was confined to the right of visitation and of receiving appeals. In Africa, the Bishop of Carthage, without the title, possessed all the rank and authority of a primate. The chief primatial sees of the West were: in Spain, Seville and Tarragona, afterwards united in Toledo; in France, Arles, Rheims, Lyon, and Rouen (among whom the Archbishop of Lyon, claims the title of *Primat des Primats*, 'Primate of the Primates'); in England, Canterbury; in Germany, Mainz, Salzburg, and Trier; in Ireland, Armagh, and for the Pale, Dublin; in Scotland, St. Andrews; in Hungary, Gran; in Poland, Gnesen; and in the northern kingdoms, Lund. In the Church of England the Archbishop of Canterbury is styled Primate of all England; the Archbishop of York, Primate of England.

In Ireland, the Archbishop of Armagh is Primate of all Ireland, and the Archbishop of Dublin Primate of Ireland. The title of Primate in England and Ireland confers no jurisdiction beyond that of archbishop. The name *primus* is applied in the Scottish Episcopal Church to the presiding bishop. He is chosen by the bishops out out of their own number, without their being bound to give effect to seniority of consecration or precedency of diocese.

PRIMA'TÉS, the name given by Linnæus to the first order of Mammalia in his system, and which he placed first (whence the name, Lat. *primus*, first), because he ranked man amongst them, and account them highest in the scale of nature. He assigned as the characters of the order, incisor teeth in the front of the mouth, four in the upper jaw, in one row; mammæ two, pectoral In this order he placed four genera, *Homo* (in which he included man and the orang-outang), *Simia*, *Lemur*, and *Vespertilio*; corresponding to the *Bimanr* (Man alone), *Quadrumana*, and *Cheiroptera* of Cuvier. That many of the P. of Linnæus really occupy a higher place in the scale of nature, either as to organization or intelligence, than many other Mammalia, is more than doubtful.

PRIME (Lat. *prima*, the first—i. e., hour), the first of the so-called 'lesser hours' of the Roman BREVIARY (q. v.). It may be called the public morning-prayer of that church, and corresponds in substance with the morning service of the other ancient liturgies, allowance being made for Latin peculiarities. Prime commences with the beautiful hymn of Prudentius, *Jam lucis orto sidere*, which is followed by three, and occasionally four psalms, the last portion of which consists of the opening verses of the 118th (in the authorized version, 119th) psalm, which is continued throughout the rest of the 'lesser hours.' Prime concludes with prayers appropriate to the beginning of a Christian's day.

PRIMOGE'NITURE is the rule of law under which the eldest son of the family succeeds to the father's real estate in preference to, and in absolute exclusion of, the younger sons and all the sisters. This is the rule adopted in Britain and in most European countries, though latterly the policy of the rule has been disputed, and the contrary example of France pointed to as an example or a warning, according to the theory advocated. The rule operates as follows: whenever a man dies intestate, leaving real estate—i. e., lands and houses—his eldest son is the only person entitled by law to the whole; and if the other brothers and the sisters are not otherwise provided for out of the personality they are left destitute. If the eldest son is dead, but has left an eldest son, such grandson of the deceased, in like manner, succeeds to the whole lands exclusively, and so on, following in succession, the eldest sons of eldest sons, and their next eldest sons, one by one, in their order of seniority. But when the male line is exhausted, then females do not succeed in the same way singly and by seniority, but all together succeed jointly. Such is the rule in England and in Scotland. The preference of males to females was also the Jewish rule and the Greek rule, or at least that which prevailed at Athens; but it was unknown to the Romans. It is generally said our preference of males took its origin from the feudal system, by which the devolution of land depended on the personal ability of the party to perform military service. Our Danish ancestors seem not to have acknowledged any preference of the males, but the Saxons did so.

Our law does not, like the Salic law, totally exclude females, but merely postpones them until the males are exhausted. Though, however, it is the general law of England, as well as Scotland and Ireland, there is one county in England, that of Kent, where, by ancient custom—called gavelkind—a different rule prevails, and the land, instead of going wholly to the eldest son, is divided equally among all the sons. So there is an exception, called Borough English, in some boroughs and cities of England, where the land, instead of going to the eldest son, goes wholly to the youngest son. The evils said to be attendant on the law of primogeniture are alleged to be, that it often produces great hardship, by making one of the family enormously rich, and the others very poor, thereby introducing a sense of inequality and injustice among those who are apt to believe themselves equals by the law of nature. It also tends to encourage the accumulation of landed property in a few hands, and thereby cuts off the great mass of the people from the gratification of a natural desire, and from one incentive to industry—viz., the acquisition of a portion of the soil. On the other hand, it is said that the cases of hardship in reality seldom occur, for, especially in modern times, an equal amount of personal property is often held by the same owners, and the rule does not apply to personality, which is equally divided among all the children. Moreover, the great landowners seldom die intestate, but almost invariably provide for their younger children by means of charges or burdens on the family estate, and so counteract the effect of the law of primogeniture.

The accumulation of landed property is said to be not an evil, but the contrary, for it enables agriculture to flourish, inasmuch as the larger the farms, the greater is the capital required, and the greater benefit to the land, and ultimately to the public. The law of primogeniture in England is not as it is or was in Scotland, stereotyped in its most odious form by the practice of entailing the lands, and so locking them up for generations in one family, secluding them from commerce, and of necessity preventing the successive heirs in possession from making improvements. The evils of the Scotch entail system have long been exposed, and led, in 1848, to a relaxation of the law, by which the practice of disentailing the property is made more easy and frequent. But in England, land cannot be locked up for a greater period than the lives of persons in existence, and for 21 years more, after which the parties entitled can sell or bring the lands into the market at their discretion; so that it is not correct to say that the accumulation of land in the great families is caused by the law of primogeniture, for practically each successive generation can do what it likes with the property, and squander it at will. It is only by the operation of the natural feelings of family pride that the family estates are kept together in a family.

The mode in which this is practically done in England is as follows: the peer or head of the family being tenant for life, and the inheritance being entailed upon his eldest son, who is about to marry, the father and son take the proper legal steps (which they can always do jointly) for unsettling the estate, and obtaining the absolute dominion over it. They then proceed to resettle the estate, making the father as before tenant for life, then the son is reduced in his turn to a tenant for life also, after the father, instead of, as before, being tenant in tail, or full proprietor. Thus, the maintenance of the family dignity is secured for another generation by settling the inheritance on the eldest male issue of the intended marriage; and when the grandson attains the age of 21, or is about to marry, he and his father act in the same way towards the next generation. The English law of landed property has been said to answer admirably all the purposes to which it is applicable, for a testamentary power is given which stimulates industry, and encourages accumulation; and while capricious limitations, such as perpetual entails, are restrained, property is allowed to be moulded according to the circumstances and wants of every family.

PRI'MROSE (*Primula*), a genus of plants of the natural order *Primulaceæ*, having a bell-shaped or tubular 5-toothed calyx, a



Common Primrose (*Primula vulgaris*).

salver-shaped corolla with five segments, five stamens, a globose germen containing many ovules, and a many-seeded capsule opening by five valves, and generally with ten teeth at the apex. The species are all herbaceous perennials, generally having only radical leaves; and the flowers in a simple umbel, more rarely with scapes bearing solitary flowers. Almost all of them are natives of Europe and the north of Asia. Some of them are among the finest ornaments of our groves and meadows; some are found in

mountainous regions. Their fine colors and soft delicate beauty have led to the cultivation of some of them as garden flowers, probably from the very beginning of floriculture. The name P. (Fr. *Primevère*, Lat. *Primula*) is derived from the Latin *primus*, first, and refers to the early appearance of the flowers of some of the most common species in spring.—The COMMON P. (*P. vulgaris*), abundant in woods, hedgebanks, and pastures in Britain and in most parts of Europe, has obovate-oblong, wrinkled leaves, and single-flowered scapes; the flowers about an inch broad, yellowish white. This is the plant to which the English name P. specially belongs. Akin to it is the COWSLIP (q. v.), or PAIGLE (*P. veris*), and perhaps still more nearly related is the OXLIP (*P. elatior*), apparently wild in some parts of England, particularly in the eastern counties, but supposed by some botanists to be intermediate between the Common P. and the Cowslip, which they therefore regard as extreme forms of one species.

The POLYANTHUS (q. v.) is a cultivated variety of the Cowslip.—The AURICULA (q. v.) (*P. auricula*), an Alpine species, is a favorite garden flower.—The BIRD'S EYE P. (*P. farinosa*) and the SCOTTISH P. (*P. Scotica*) are both flowers of exquisite beauty, found in the northern parts of Britain; the latter chiefly on the coasts of Sutherland, Caithness, and the Orkney Islands. The Alps and the Himalaya Mountains produce several species.—The CHINESE P. (*P, Sinensis*) has for more than forty years been very common in Britain, not only as a greenhouse but a window plant. It produces compound umbels of very numerous lilac or white flowers, which are displayed in autumn, winter, and spring.

PRIMULA'CEÆ, a natural order of exogenous plants, containing more than 200 known species, mostly natives of temperate and cold regions. They are all herbaceous, or scarcely half-shrubby, with leaves generally all radical, and no stipules. The calyx is generally 5-cleft, inferior or half-superior, regular, persistent; the corolla, with the limb divided into as many segments as the calyx, rarely wanting; the stamens inserted on the corolla, one opposite to each of its lobes; the ovary one-celled, the style solitary, the stigma capitate; the capsule with a central placenta and many seeds.—Many of the P. have flowers of much beauty, and some are very fragrant, as the Primrose, Cowslip, Auricula, Pimpernel, Loosestrife, &c.

PRI'MUM MO'BILE. See PTOLEMAIC SYSTEM.

PRINCE (Lat. *princeps*, from *primus*, first, and *capio*, I take), an epithet which was originally applied to the *princeps senatûs* of the Roman state, and afterwards became a title of dignity. It was adopted by Augustus and his successors; hence the word was afterwards applied to persons enjoying kingly power, more especially the rulers of small states, either sovereign, as in the case of the ancient Princes of Wales, or dependent, like the rulers of certain states in Germany. The title is now very generally applied to the sons of kings and emperors, and persons of the blood-royal. In various parts of continental Europe, the title Prince is borne by families of eminent rank, but not possessed of sovereignty; and in England, a duke is, in strict heraldic language, entitled to be styled 'High Puissant and most Noble Prince;' and a Marquess or Earl as 'Most Noble and Puissant Prince.' Practically, however, in Britain, the term prince is restricted to members of the royal family. The eldest son of the reigning sovereign is by a special patent created Prince of Wales, and this is the only case in which the title prince is connected with a territorial distinction. In Germany, the ambiguity of applying the same title to members of royal houses and princely families, not sovereign, is avoided, the former being styled 'Prinz,' the latter 'Fürst.' The German Fürst takes rank below the Duke (Herzog). Most of the counts who had a seat in the old German Diet were elevated to the dignity of prince on their acquiescence in the dismemberment of the German empire. In a more general acceptation, the term prince is often used for a sovereign or the ruler of a state.

PRINCE EDWARD ISLAND, a province of the Dominion of Canada, in the south of the Gulf of St. Lawrence, and separated from New Brunswick and Nova Scotia by the Strait of Northumberland, lat. about 45° 56′—47° 4′ N., long. 62°—64° 23′ W. Length, 130 miles; breadth, 4 to 34 miles; area, 2173 square miles. Pop. (1841) 47,034; (1871) 94,021; (1881) 108.928. The surface is undulating; but few of the hills, the chief of which are in the middle of the island, and run from north to south, are upwards of 300 feet in height. The coasts are girdled by a bold line of red sandstone cliffs, varying in height from 20 to 100 feet, and are indented with numerous bays and inlets, several of which, as Cardigan Bay on the east, the entrance to Georgetown, and Hillsborough Bay on the south, the entrance to Charlottetown (the capital of the colony), are deep and spacious, and afford safe anchorage for large vessels. Other inlets are Bedeque and Egmont Bays on the south, and Holland, Richmond, and St. Peter's Bays on the north. The rivers are mostly short. The soil, which is well watered with numerous springs and rivers, rests upon red sandstone, and consists for the most part of a layer of vegetable matter above a light loam, which rests upon stiff clay above sandstone. It is of great fertility, and the agricultural products are about double the quantity required for local consumption. Of the whole area, consisting of 1,360,000 acres, 1,300,000 are 'good' land, and 60,000 acres are 'poor' land; and in 1851, there were under cultivation 215,389 acres; in 1871, 1,097,860 acres.

Since the year 1848, agriculture has become a much more important branch of industry. Between 1848 and 1861 the agricultural products had increased in many instances fourfold. In 1871, the amount of wheat produced was 269,392 bushels; of barley, 176,441 bushels; oats, 3,128,576 bushels; beans and peas, 1326 bushels; maize, 2411 bushels; and potatoes, 3,375,726 bushels. In April 1871, the live-stock in the colony comprised 25,329 horses, 62,984 large cattle, 147,364 sheep and lambs, and 52,514 pigs. The soil and climate are admirably adapted for producing wheat, and all the cereals, fruits, and vegetables grown in temperate climes are produced here. The climate, milder than that of the continental regions in the vicinity, and free from the fogs which prevail on Cape Breton and Nova Scotia, is very healthy. P. E. I. is extremely poor in minerals; copper and bog-iron ore are known to exist in small quantities. In the neighboring waters, extensive and profitable fisheries are carried on. The fish caught are principally mackerel, salmon, alewives or gaspereaux (of the herring family), herrings, cod-fish, and hake. Manufactures are not important, though cloth is made to some small extent. The Prince Edward Island Railway, 198 miles in length, was opened in 1875. It is constructed on a 3 feet 6 inch gauge, and cost about £3300 per mile. In the three years 1879—1881, the value of exports varied from $1,830,000 to $1,730,000, and the imports from $835,000 to $965,000. The provincial government is vested in a lieutenant-governor, a House of Assembly, a legislative council, and an executive council appointed by the lieutenant-governor. The legislature of P. E. I. declined to agree to the plan for a union of the British North American colonies which resulted from the negotiations begun in 1864; but at last, in 1873, this colony entered the Confederation, and became one of the provinces of the Dominion.

Charlotte-town, the provincial capital, had in 1871 a pop. of 8807, and in 1881, of 11,485. P. E. I. possesses about 350 vessels of nearly 60.000 tons. There are in the province a college, a normal school, a model school, 18 grammar-schools, and about 400 district schools. Tuition is free in all but the college, with the exception of a small fee for fuel. In 11 months ended January 1, 1874, £11,838 was disbursed from the colonial treasury for public education. The island is divided into 3 counties—Prince, Queen's and King's counties—of which the chief towns are respectively Summerside, Charlottetown, and Georgetown. All parts of the island are traversed by coach-roads; and the island has a telegraphic system, partly submarine. The railway crosses the island, connecting Charlottetown with Tignish on the N.W., and Georgetown and Souris on the S.E. The island was first taken possession of by the British in 1745, and was retaken by them, and finally annexed to their possessions in 1758.

PRINCE OF WALES, the title borne by the eldest son of the sovereign of England. The native sovereigns of Wales were so designated in the days of Welsh independence; and on the conquest of Wales, the principality of Wales and earldom of Chester were bestowed by Henry III. on his son, afterwards Edward I., but as an office of trust and government, rather than as a title. It is traditionally related that Edward I. engaged to give the Welsh people a prince who would be born among them, and not know a word of English, and fulfilled the promise by bestowing the principality on his infant son, Edward, born at Caernarvon Castle. Edward, by the death of his elder brother, became heir-apparent. Edward III., his son, was never Prince of Wales; but in 1843, he invested his son Edward the Black Prince with the principality, and from that time the title of prince of Wales has been borne by the eldest son of the reigning king. The title is, however, not inherited, and has usually been bestowed by patent and investiture, though, in a few instances, the heir to the throne has become Prince of Wales simply by being so declared.

The eldest son of the sovereign is by inheritance Duke of Cornwall, a title first conferred in 1337 on Edward the Black Prince, on the death of his uncle, John of Eltham, the last Earl of Cornwall, and held, according to the terms of the grant, by the first-begotten son of the king. The title of Earl of Chester, borne by Edward III. before his accession to the throne, has since been given along with the principality of Wales. That earldom was, by 21 Richard II. c. 9; erected into a principality; and it was enacted that it should be given in future to the king's eldest son—a precedent which has since been followed, although that statute, along with all others in the same parliament, was repealed by 1 Henry IV. c. 3. On the death of a Prince of Wales in his father's lifetime, the title has been conferred on the sovereign's grandson, or next younger son, being

heir-apparent. As heir of the crown of Scotland, the eldest son of the sovereign is Prince and High Steward of Scotland, Duke of Rothesay, Earl of Carrick, Baron of Renfrew, and Lord of the Isles. The high office held by the House of Stewart (see STEWART, HOUSE OF) became merged in the crown when Robert II. the representative of the family, ascended the throne of Scotland in 1371. The earldom of Carrick was conferred by Robert II. on his eldest son. The dukedom of Rothesay was created by a solemn council held at Scone in 1398, and conferred on David, eldest son and heir of Robert III.; and when David, in 1402, fell a victim to the ambition of his uncle, it was transferred to his brother James, afterwards James I. of Scotland. Renfrew was the chief patrimony of the Stewards of Scotland, to whom it was granted by the sovereign in the 12th century, their principal residence having been in the burgh of Renfrew.

In 1404, King Robert III. granted the barony of Renfrew and other portions of the estates of the Stewards to his son and heir, James, since which time the eldest son of the sovereign has borne the title of Baron of Renfrew. By act of the Scottish parliament of 1469, the titles of prince and High Steward of Scotland, Duke of Rothesay, Earl of Carrick, Baron of Renfrew, and Lord of the Isles were vested in the eldest son and heir-apparent of the crown of Scotland for ever. The present Prince of Wales was created Earl of Dublin on September 10, 1849, that dignity being destined to him and his heirs, kings of the United Kingdom of Great Britain and Ireland, for ever.

An annuity of £40,000 was settled on the Prince of Wales by 26 Vict. c. 1. He has besides the revenues of the duchy of Cornwall. These amounted previously to 1840 to between £11,000 and £16,000; since that period, they have grealy risen, amounting in 1876 to £99,827. Only a small part of this income has been expended since the birth of the present Prince of Wales. The sum paid over to the Prince of Wales in 1868 was £55,252; and in 1876, £70,375. An income of £10,000 has been settled by parliament on the Princess of Wales, to be raised to £30,000 in the event of her widowhood. The annuities of the Prince and Princess of Wales are charged on the Consolidated Fund.

The Prince of Wales has a separate household, as also has the Princess of Wales. Act 35 Geo. III. c. 125 makes provision to prevent the accumulation of debt by any future heir-apparent to the crown, and enacts that as soon as he shall have a separate establishment, the treasurer or principal officer shall make a plan of such establishment in distinct departments and classes, with the salaries and payments of each class, and of each individual officer; and the treasurer is made responsible for the punctuality of all payments, and required to submit his accounts to the Lords of the Treasury. The statute of treasons, 25 Edw. III., makes it treason to compass the death of the Prince of Wales, or violate the chastity of his consort.

By a statute of the order of the Garter, of date 1805, the Prince of Wales becomes a Knight of the Garter as soon as he receives that title.

In 1788, on the illness of George III., it was made a question whether the Prince of Wales was not, as heir-apparent entitled to the regency; the recovery of the king prevented the necessity for a decision, but it is now held that he has no such right.

The arms of the Prince of Wales are those of the sovereign, differenced by a label of three points argent, and the present Prince of Wales bears *en surtout* the escutcheon of the house of Saxony. The supporters and crest are the same as those of royalty. The ancient coronet of the Princes of Wales was a circle of gold set round with four crosses patée, and as many fleurs-de-lis alternately. Since the Restoration, it has been closed with one arch only, adorned with pearls, surmounted by a mound and cross, and furnished with a cap trimmed with ermine, like that of the sovereign. The Prince of Wales has further a distinguishing badge, composed of a plume of three white ostrich feathers, encircled by an ancient coronet of a Prince of Wales, and accompanied by the motto 'Ich dien' (I serve). This device is said by a tradition, on which considerable doubts have been thrown, to have been first assumed by the Black Prince after the battle of Crécy, in 1346, when he took such a plume from John, king of Bohemia, whom he had slain with his own hand. The motto has been supposed to allude to the fact that the king of Bohemia served, or was stipendiary to the French king in his wars.

PRINCE OF WALES ISLAND, or PU'LO PINA'NG (Betel Nut Island), an important British possession, and one of the Straits Settlements (q. v.), lies at the mouth of the Strait of Malacca, near the W. coast of the Malay Peninsula, in lat. 5° 16′—5° 30′ N., and long. 100° 9′—100° 25′ E. Length, 13¼ m.; breadth, 5 to 10 m.; area, 106 sq. m. A belt of cocoa-nut and lofty areca palms runs along the coast. A slip of low land, interspersed with hills, stretches along the east side of the island, where rice, pepper, betel, fruits, provisions, &c., are planted on the level parts; nutmeg and clove-trees on the heights. This district is watered by numerous streams, cut by well-kept roads, and dotted with villas and gardens. Sugar, coffee, and pepper plantations are on the south and south-west coasts; thence rises a wooded mountain ridge, which increases in elevation towards the north, where, at the Sanitarium bungalows of Strawberry Hill, it attains a height of 2922 feet. The rocks are granite and mica schist; the soil, a rich vegetable mould.

The climate of P. of W. I. is healthy, a sea-breeze blowing every day, and rain falling during all the months of the year, except January and February. In the low lands, the thermometer ranges from 80° to 90°, and at Strawberry Hill, from 62° to 75°, affording a pleasant change within a few miles of Georgetown. From the Sanitarium a splendid view is obtained of the plantations, town, shipping, and the lofty hills of Queda.

The products are timber, pepper, sugar, nutmegs, cloves, coffee, coco and areca nuts, ginger, sweet potatoes, rice, &c.; and the pine-apple, shaddock, plantain, banana, orange, lemon, mango, guava, &c., abound. The attempt to grow cotton has proved a failure. Tin ore is found at the base of the mountains. The imports may be valued at about £1,600,000; the exports at £2,000,000. European and American manufactures, and a share of the produce of the Eastern Archipelago, China, India, Siam, and Burmah, enter the emporium of P. of W. I. on their way to suitable markets.

Georgetown, the capital, is situated at the north-east extremity of the island, and is defended by Fort Cornwallis. The governor's house and the hospital are at some distance from the town, which is the seat of government for the Eastern Straits settlements, including Malacca and Singapore. On the peninsula opposite lies the province of Wellesley, a strip of country 35 miles in length by 4 to 11 miles in breadth. The population of P. of W. I., in 1871, was 61,797, and along with that of the province of Wellesley, 133,230; of whom the greater number are Malays, many are Chinese, four or five hundred are Europeans and their descendants, the remainder being Siamese, Burmans, Bengalese, &c.

Towards the end of last century, a Captain F. Light married the daughter of the king of Queda, from whom he received the gift of P. of W. I.; but in 1786, it was handed over to the East India Company, who retained Captain Light as superintendent, and paid the king 6000 dollars annually. By an arrangement to pay an additional 4000 dollars yearly, the province of Wellesley was afterwards ceded to the Company. Population rapidly increased, the forests were cleared for plantations, and a large trade sprung up. It has been nearly stationary for several years, except in agriculture, owing to the more favorable situation of Singapore for the general commerce of these seas.

PRINCE RUPERT'S DROPS. These scientific toys, so called from Prince Rupert (see RUPERT), their inventor, are simply drops of glass thrown, when melted, into water, and thus suddenly consolidated. They have usually a form somewhat resembling a tadpole. The thick end may be subjected to smart hammering on an anvil without its breaking; but if the smallest fragment of the tail be nipped off, the whole flies into fine dust with almost explosive violence. The phenomenon is due to the state of strain in the interior of the mass of glass, caused by the sudden consolidation of the crust. The crust is formed while the internal mass is still liquid. This tends to contract on cooling, but is prevented by the molecular forces which attach it to the crust. It is therefore somewhat in the state of the dog-head of a gun on full-cock, which will stand a smart blow without falling; while a slight touch applied to the trigger allows the spring to act. Another example of the same state of constraint is the Bologna phial—a glass cup with its sides thin but the bottom very thick. It also is cooled as quickly as possible. A bullet may be dropped into it with safety from a considerable height; but if a small, sharp-edged fragment of flint be dropped in, so as to scratch the surface in the slightest degree, the molecular forces are set free, and the whole falls to pieces.

PRINCE'S METAL. See TIN.

PRI'NCETON, a town and township of New Jersey, on a branch of the Pennsylvania Railway, 40 miles N.E. of Philadelphia. It is pleasantly situated, and contains many elegant residences; has a bank, a weekly newspaper, and several churches. The pop. of P. in 1870 was 3986. On January 3, 1777, it was the scene of a battle between the British under Colonel Mawhood, and the Americans under Washington, in which the former were defeated. P., however, is chiefly celebrated as the seat of the College of New Jersey, popularly known as Princeton College, founded by charter in 1746, under the auspices of the Presbyterian Synod of New York, and transferred from Newark to P. in 1757, on the erection of a hall named Nassau Hall in honor of William III. The College of New Jersey has had several distinguished Presbyterian divines for its presidents, as Jonathan Edwards, Aaron Burr, and Dr. M'Cosh. In 1874–75 it had 14 professors, 6 instructors, and 403 students. The theological seminary, founded

in 1812, has 6 professors, 1 tutor, and 116 students. With the P. theological school is associated the fame of the *Biblical Repertory and Princeton Review*, founded in 1825, and for many years edited by Dr. Hodge, Professor in the theological seminary. The *P. Review* is now, however, edited in New York.

PRINCIPAL AND ACCESSORY. See ACCESSARY.

PRINCIPAL AND AGENT. The law of principal and agent is founded on the absolute necessity of having some one to act for another in times and places when the latter is not personally present, and this necessity pervades nearly all branches of the law; and as a general rule, the act of the agent is just as binding on the principal, and produces the same effect, as regards his liability, as if the principal had acted in person. Agents are divided into many classes; indeed, nobody can escape, in one capacity or another, being occasionally the agent of somebody else. Attorneys, solicitors, advocates, brokers, auctioneers, &c., may be said to make a business of agency. A wife is, in Law, for many purposes of household management, the agent of the husband, and so are the children. Mercantile agents are generally called factors or brokers. The contract between principal and agent implies that the agent shall keep within the limits of his commission, and that the principal will ratify and accept all his contracts, and relieve him of the liabilities. The remuneration of the agent is generally called his commission. As the agent binds his principal, it follows that the principal can be sued by third parties who deal with the agent. The nice distinctions that exist in the law on this subject as to the mutual rights and liabilities of the parties are too numerous to be here noticed.

PRINCIPAL AND SURETY. See SURETY.

PRINCIPA'TO, CITRA and ULTRA, formerly the name of two provinces of the kingdom of Naples. *Principato Citra*, now forming the province of Salerno in the reorganized kingdom of Italy, is a maritime province, bounded on the S.W. by the Mediterranean, and on the N. by the province of *Principato Ultra*, now called Avellino. The united area of the two provinces is 3405 square miles; pop. (1881) 942,849. Principal towns in Principato Citra are Salerno (from which it derives its present name), Sarno, and Pagani; in Principato Ultra, Avellino (from which it takes its present name), Ariano, and Cervinara.

PRINTERS, LAW AS TO. There were various restrictions on the sale and use of printing-presses, which had been imposed in consequence of the extended and secret influence often exercised by them; and the law of treason and libel is intimately associated with the press. By an act of 32 and 33 Vict. c. 24, which altered several older acts passed in the reign of George III. for suppressing seditious and treasonable practices, reciting the mischief produced by the publication of irreligious, treasonable, and seditious libels, and the difficulty of tracing them, it is not now law that every person having a printing-press, or types for printing, shall give notice thereof to the clerk of the peace where the same is intended to be used, and shall obtain a certificate of registration, otherwise he is liable to a penalty of £20. And the Queen's printers for England and Scotland, and the university presses of Oxford and Cambridge, were exempt. No letter-founders and makers of types need register themselves under a like penalty, and need not keep an account of all the persons to whom types and presses are sold, which account may be inspected by a justice of the peace. But printers must keep a copy of every paper they print for hire or reward, and shall endorse thereon the name of the person employing them to do so, under a penalty of £20. Every printer who shall print a book or paper without having the printer's name and address on the first or last leaf thereof, shall, by the act 32 and 33 Vict. c. 24, forfeit £5 for every copy printed; but the only person who can sue for or enforce this penalty is the Attorney or Solicitor General of England, or the Lord Advocate of Scotland. And any proceedings to enforce the statutes in the name of other persons are absolutely void.

The law is thus changed that a printer cannot recover his expenses for labor and materials in printing a work, unless he has complied with the statutory requirements. On a recent occasion, in which a printer in England who sued for his account was met with a defence founded on these statutes, it was discovered by the London printers that few of them had registered themselves; and such law is now repealed altogether. With regard to the printing trade, many customs prevail which do not differ in point of law from the customs affecting other trades, it being the rule that customs of a peculiar trade are binding unless specially excluded. As to obscene prints, see OBSCENE.

PRINTING is the art of producing impressions, from characters or figures, on paper or any other substance. There are several distinct branches of this important art—as the printing of books with movable types, the printing of engraved copper and steel plates (see ENGRAVING) and the taking of impressions from stone, called Lithography (q. v.) We have now to describe the art of printing books or sheets with movable types, generally called *letter-press printing*, and which may undoubtedly be esteemed the greatest of all human inventions.

The art of printing is of comparatively modern origin, only 400 years having elapsed since the first book was issued from the press; yet we have proofs that the principles upon which it was ultimately developed existed among the ancient Assyrian nations. Entire and undecayed bricks of the famed city and tower of Babylon have been fond stamped with various symbolical figures and hieroglyphic characters. In this, however as in every similar relic of antiquity, the object which stamped the figures was in one block or piece, and therefore could be employed only for one distinct subject. This, though a kind of printing, was totally useless for the propagation of literature, on account both of its expensiveness and tediousness.

The Chinese are the only existing people who still pursue this rude mode of printing by stamping paper with blocks of wood. The work which they intend to be printed is, in the first place, carefully written upon sheets of thin transparent paper; each of these sheets is glued, with the face downwards, upon a thin tablet of hard wood; and the engraver then, with proper instruments, cuts away the wood in all those parts on which nothing is traced; thus leaving the transcribed characters in *relief*, and ready for printing. In this way, as many tablets are necessary as there are written pages. No press is used; but when the ink is laid on, and the paper carefully placed above it, a brush is passed over with the proper degree of pressure. A similar kind of printing by blocks, for the production of playing cards and rude pictures of scriptual subjects, was in use in Europe towards the end of the 14th century. But in all this there was little merit. The great discovery was that of forming every letter or character of the alphabet separately, so as to be capable of rearrangement, and forming in succession the pages of a work, thereby avoiding the interminable labor of cutting new blocks of types for every page. The credit of discovering this simple yet marvelous art is contested by the Dutch in favor of Laurence Coster (q. v.), between 1420 and 1426; and by the Germans, on behalf of Johann Gänsfleisch of the Gutenberg (q. v.) family, about 1438. In all probability, the discovey was made almost simultaneously—such a theory being consistent with the general social progress at the period, and the secrecy which both inventors at first maintained respecting their art.

The types first employed were of wood; but soon the practice of casting them in metal was introduced. See TYPES. The earliest of these metal types resembled the black letter in use by transcribers, and one great aim of the first printers was to produce books which should closely resemble the works in manuscript hitherto in use. Between 1450 and 1455, Gutenberg succeeded in printing a Bible, copies of which are now exceedingly rare and valuable. It is in quarto size, double columns, the initial letters of the chapters being executed with the pen, in colors. Besides this Bible, some other specimens of the work of Gutenberg, the produce of his press at Mayence, have been discovered. The Dutch, at Haarlem, preserve and show with reverential care similar specimens of early printing by Coster. Mayence, Strasburg, and Haarlem were indisputably the places where printing was executed before the art was extended to Rome, Venice, Florence, Milan, Paris, Tours, and other continental cities. Previous to 1471, it had reached these and various other places; and about the same year, Caxton (q. v.) introduced the art into England, by setting up a press in Westminster Abbey.

Printing was introduced into Scotland about 30 years after Caxton had brought it to England; in 1551, it reached Dublin, and to other quarters it found its way very slowly. While coming into notice, its progress had been interrupted by the broils consequent on the Reformation; and soon afterwards, it was retarded by the civil war in Great Britain. Even the Restoration acted detrimentally, for it led to an act of parliament which prevented more than 20 printers carrying on their art in England. Printing, in short, has in almost every country been an ill-used art; and is still in various countries practised under fiscal restrictions. Germany, the mother of the art, had quite recently, on account of sundry obstructions, the repute of printing badly so far as appearance was concerned, but has of late made great progress in this particular. Holland, France, and the United States produce excellent fine art and general printing, and great proficiency has been attained in England also. Printing is done, with greater or less tastefulness, in all the British colonies. Even among uncivilized people missionaries have established the printing-press.

Retarded by the jealousy of governments, printing for some ages derived little advantage from mechanical ingenuity. Originating at the middle of the 15th, the art continued to be conducted until the middle of the 17th c. in a very clumsy manner. The press resembled a screw-press, with a contrivance for running the form of types under the point of pressure; force having been thus applied, the screw was relaxed, and the form withdrawn with the impression executed on the paper. The defects of this very rude

mechanism were at length partially remedied by an ingenious Dutch mechanic, Willem Jansen Blaeu, who carried on the business of a mathematical instrument-maker at Amsterdam. He contrived a press, in which the carriage holding the form was wound below the point of pressure, which was given by moving a handle

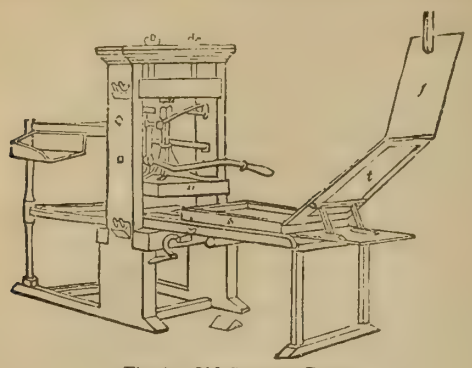


Fig. 1.—Old Common Press.

attached to a screw hanging in a beam having a spring, which spring caused the screw to fly back as soon as the impression was given. This species of press, which was almost entirely formed of wood, continued in general use in every country in Europe till the beginning of the present century. With certain lever powers attached to the screw and handle, it is represented above.

In connection with this representation of the old common press, the process of printing may be described. The form, being laid on the sole of the press (*s*), is fixed at the sides, so as to render it immovable from its position. There are two men employed: one puts ink on the form, either by means of stuffed balls or by a composition-roller, and the other works the press. The latter lifts a blank sheet from a table at his side, and places it on what is called the *tympan* (*t*), which is composed of parchment and blanket-stuff, fitted in a frame, and tightened like the top of a drum—and hence its name—and which, by means of hinges connecting it with the sole, folds down like a lid over the form. As the sheet, however, would fall off in the act of being brought down, a skeleton-like slender frame, called a *frisket* (*f*), is hinged to the upper extremity of the tympan, over which it is brought to hold on the paper. Thus, the frisket being first folded down over the tympan, and the tympan next folded down over the form, the impression is ready to be taken. This is done by the left hand of the pressman winding the carriage below the *platten* (*p*), or pressing surface, and the impression is performed by the right hand pulling the handle attached to the screw mechanism. The carriage is then wound back, the printed sheet lifted off, and another put on the tympan, the form again inked, and so on successively. In the above engraving, the press appears with the frisket and tympan sloping upwards, ready to receive the sheet, the frisket being sustained from falling backwards by a slip of wood depending from the ceiling.

One of the greatest niceties connected with this art is the printing of the sheet on the second side in such a manner, that each page, nay, each line, shall fall exactly on the corresponding page and line on the side first printed. To produce this desirable effect, two iron points are fixed in the middle of the sides of the frame of the tympan, which make two small holes in the sheet during the first pressure. When the sheet is laid on to receive an impression from the second form, these holes are placed on the same points, so as to cause the two impressions to correspond. This is termed producing *register;* and unless good register is effected, the printing has a very indifferent appearance. However improved, a press of the above description could not impress more than half a sheet; and the practice was to first squeeze so much of the sheet, then relax the handle, wind the second half below the platten, and print it in turn. Thus, each sheet required four squeezes to complete it—two on each side. It is not without a degree of wonder that one reflects on the rudimentary clumsiness of the whole operation; and it seems not less marvelous, that it was by no other process that the best typography could be produced until the conclusion of the 18th century.

The first improvement upon the printing-press was made by the celebrated Earl of Stanhope. He constructed the press of iron, and that of a size sufficient to print the whole surface of a sheet, and he applied such a combined action of levers to the screw as to make the pull a great deal less laborious to the pressman; the mechanism altogether being such as to permit much more rapid and efficient working. A multitude of improvements speedily succeeded that of Earl Stanhope, in most of which the screw was dismissed, the pressure being generally effected by levers, or by the simple and efficient principle of straightening a joint. Among those which have gained a large share of approbation may be mentioned the *Columbian press,* which is of American invention. This press, a representation of which is annexed, was brought to Great Britain in 1818 by Mr. George Clymer of Philadelphia, and patented.

The pressing-power in this instance is procured by a long bar or handle acting upon a combination of exceedingly powerful levers (*a, a, a, a*) above the platten; the return of the handle or levers being effected by means of counterpoises or weights (*c, c*). For ease and facility of *pull,* this press is preferred by most work-

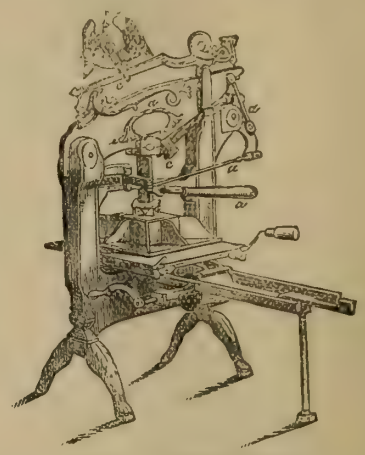


Fig. 2.—Columbian Press.

men; and certainly the powerful command which the leverage enables the workman to exercise, is favorable to delicacy and exactness of printing—his arm feeling, as it were, through the series of levers to the very face of the types. In the present day, the old wooden press of Blaeu is entirely discarded from use.

To secure good printing, the following points are essential. 1. The types, carefully set, fixed with precision in forms, rendered level all over, so that all parts may be pressed alike, and the whole properly cleaned by a wash of potash lye. 2. A uniform inking of the surface, to give uniformity of color. 3. The paper damped equably, neither too much nor too little, so as to take an impression easily and evenly. 4. An equable, firm, and smart pressure, and with that degree of steadiness in the mechanism that the sheet shall touch and leave the types without shaking and blurring. 5. Care in adjusting the pointers (or gauge), so that perfect register may be secured in printing the second side. 6. Such frequency in changing *fly* or under-sheets on the tympan, that the first side shall not get dirtied by off-setting when printing the second side. 7. The laying of small patches on the tympan, where, from any inequality, it seems necessary to bring up the pressing surface to a thorough equality. A regard to all these circumstances constitutes the duty of a pressman. Bad printing is usually a result of old and worn types, want of proper cleaning, and an inferior kind of ink.

Printing by hand-presses of an improved kind continues to be used in the case of limited impressions, or where extra care and elegance in typography are required; also where machinery is unattainable; but in general circumstances, and more particu-

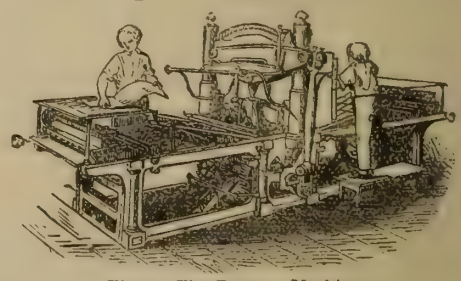


Fig. 3.—Flat-Pressure Machine.

larly to meet the demand for popular reading, printing is now executed by one or other of the varieties of cylinder-presses, moved by steam-power. Attempts have indeed been made to introduce flat-pressure machines, by which as many as 700 sides can be printed per hour; but these, though possessing the advantage of superseding severe bodily labor, and demanding only the services of a boy to lay on, and another to take off the sheets, have never become common. We offer a representation of a machine of this kind, made by J. Brown & Co., engineers, Kirkcaldy. More success, as regards flat-pressure machines, has been attained in the United States, where much fine work is provided by a clever adaptation of this kind, particularly in New York,

Boston, and Philadelphia. No flat pressure, however, can compete in point of speed, with the pressure which is communicated by revolving iron cylinders.

Cylinder-printing is the great modern fact in the history of the art, progress in which department has been facilitated by the invention of inking rollers made a certain composition, to supersede the old process of inking by stuffed balls (see ROLLERS). In 1790, Mr. Nicholson, the editor of the *Philosophical Journal*, procured a patent for certain improvements in printing, which patent embodies almost every principle since so successfully applied to printing-machines; and although he did not carry his views into practical effect, little has been left for subsequent engineers to do, but to apply, in the most judicious manner, the principles he laid down in his patent.

Whether Mr. Nicholson's ideas were known to Mr. König, a German, is now uncertain; but to him is due the distinguished merit of carrying steam-printing first into effect. Arriving in London about 1804, he first projected improvements on the common press; but after a while, he turned his attention to cylinder-printing. The first result of his experiments was a small machine, in which the two leading features of Nicholson's invention were embraced (the cylinders and the inking-rollers), which he exhibited to Mr. Walter, proprietor of the *Times* newspaper; and on showing what further improvements were contemplated, an agreement was entered into for the erection of two machines for printing that journal. Accordingly, on the 28th of November 1814, the public were apprised that the number of the *Times* of that date was the first ever printed by machinery, steam-propelled. At this period, but few persons knew of any attempts going on for the attainment of this object; whilst among those connected with printing, it had often been talked of, but treated as chimerical.

After the utility of cylindrical printing had been thus proved, it was thought highly desirable that the principle should be applied to printing fine book-work, where accurate register is indispensable. This was, to a certain extent, attained by using two large cylinders, the sheet of paper being conveyed from the bottom of the first cylinder (where it had received the first impression) by means of tapes, leading in a diagonal direction to the top of the second cylinder, round which the sheet was carried till the second side was printed. The first machine of this description was erected at Mr. Bensley's office, where it continued at work for some years, till more modern machines superseded it.

In the course of 1818, Messrs. Applegath and Cowper took out a patent for improvements in cylindrical printing machinery. The chief improvements were, the application of two drums placed betwixt the cylinders to insure accuracy in the register, over and under which the sheet was conveyed in its progress from one cylinder to the other, instead of being carried, as in König's machine, in a straight line from the one cylinder to the other; and the mode of distributing the ink upon tables instead of rollers—two principles which have secured to machines of this construction a decided preference for fine work. Machines of this construction were made by Applegath and Cowper for the principal printing establishments in London, Paris, Edinburgh, and many other cities; and it is nearly upon the model of their machines that other manufacturers now construct their steam-presses for the execution of ordinary book-work. Printing-machines may be divided into two distinct classes—those for printing book-work, in which register is required, and those for printing newspapers, in which register is not sought for, and speed is of first consequence.

Applegath and Cowper's book-machine, as just mentioned, remains the best of its kind. The machine, moved by steam-power,

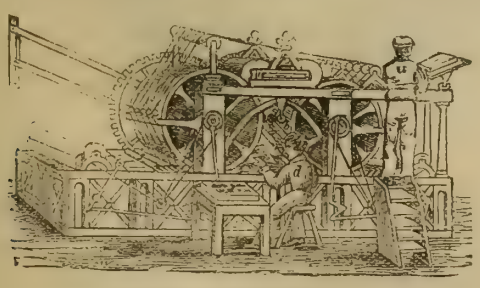


Fig. 4.—Book-Machine.

from which the annexed engraving is taken, is one of this description. It is about 15 feet long by 5 broad, and consists of a very strong cast-iron frame-work, secured together by two ends and several cross-bars. To this frame all parts of the machine are fixed.

In external figure, as seen in the cut, it is a large apparatus, of imposing appearance. On approaching it when at work, we perceive two cylinders, as large as hogsheads, revolving on upright supports; two smaller cylinders or drums revolving above them; and beneath, within the framework, a table, on which lie the types at both ends, going constantly backward and forward. A belt from a steam-engine, acting upon a shaft in the frame, gives motion to the whole apparatus. It will further be observed that a boy, marked *a* in the cut, is standing on the top of some steps feeding in sheets of paper, each of which, on being delivered, is swept round the first cylinder *b* (being held on by tapes), gets its impression below from the types, is carried over and betwixt the drums above, and then brought round on the second cylinder *c*; now it gets its second side printed, and issuing into the space between the cylinders, is seized by the boy *d*, who lays it on a table, completely printed. The whole operation is accompanied with a loud noise, from the revolving of the cylinders, the working of the notched wheels, and the driving of the table to and fro by a rack beneath, but without any strain on the mechanism, or risk of injury to the attendants. On minutely examining the parts, we observe that at each end there is an apparatus of rollers taking ink from a ductor or reservoir of that material, and placing it upon a portion of the moving table beneath; here other rollers distribute it, while others take it off and roll it upon the pages of types, ready for each impression.

The two printing cylinders are nearly nine feet in circumference each, and are placed about two feet apart. They are accurately turned, so that the surfaces of the type-carriages and the cylinders may be perfectly parallel. The axis of each cylinder works in brass bearings in the upright framework, where, by means of screws, the degree of pressure with which the cylinders are allowed to rest upon the types may be regulated to any degree of nicety.

The cylinders have a continuous rotary motion towards each other, given by two large toothed wheels, whilst the type-carriages move backward and forward under them. The movements are so contrived that the type-carriages shall have gone and returned to the same point during the period that the cylinders have made one entire revolution; consequently, each successive impression is taken from the types by the same part of each cylinder. The two drums placed between the cylinders are for the purpose of causing the sheet of paper to pass smoothly and accurately from one printing cylinder to the other. To preserve the sheet in its proper place on the cylinders, and carry it forward through the different parts of its journey from the hand of the one boy to that of the other, there is an extensive apparatus of tapes, some of which are observable in the cut. These tapes are half an inch broad, and are formed into a series of endless bands, arranged at certain distances apart, so as to fall into the interstices and margins of the forms, and therefore escape being crushed between the types and the cylinders. The machine may be stopped at any instant by turning the handle of a lever. Such is the form of the machine that has printed the present work.

Many modified varieties of the cylinder machine have been introduced; the most important of them is the *Gripper*. In this machine the types are laid on a traveling table like that described above; the cylinder which gives the pressure is reduced to 12 or 16 inches in diameter, the drums are dispensed with, and the tapes are replaced by a contrivance called a gripper. This consists of a series of brass grips like fingers arranged along, and fixed to the cylinder; these seize the sheet at the proper moment, and retain it till it is delivered printed. The single gripper is supplied with points for registering. In the double or perfecting variety, the sheet is delivered from the first cylinder into the grippers of the second. There are many varieties of gripper machines; the most popular are the Wharfedale, a single, and the double gripper, named after its maker, M. Marinoni of Paris. They produce good work, and are well adapted for general purposes.

Non-registering machines for rapid printing are of various kinds, according to the degree of speed which is demanded. In those first introduced, the principle was that of pressure by a cylinder on a form of types laid upon a table, which was passed beneath it by a forward and retrograde motion; the inking being effected as in the above described perfecting machines. Having received one side by this means, the sheets were afterwards printed on the second side; such second impression containing the news up till the latest hour of going to press. This species of single cylinder printing-machine was well adapted for newspapers of which only a few thousand copies were wanted; and for this purpose, it is still in use, particularly in provincial towns in Great Britain. As presses of this sort, however, do not usually yield more than 4000 or 5000 impressions per hour, they are quite unfitted for printing newspapers having a circulation of 20,000 copies and upwards, the whole of which must be promptly produced by a certain hour every morning.

The liberation of newspapers from the obligatory penny-stamp in 1855, caused so great an increase of circulation, that none of the ordinary processes, including that just referred to, was at all adequate for the work required. Recourse had to be made to an

entirely new method of printing, the invention of which is due to Richard M. Hoe of New York.

Hoe's process consisted in placing the types (for which stereotype plates were afterwards substituted) on a horizontal cylinder revolving on its axis, against which the sheets were pressed by exterior and smaller cylinders. The pages of type were arranged in segments of a circle, each segment forming a frame that could be fixed on the cylinder. These frames were technically called *turtles*. By the ingenous contrivance of making the brass rules that separate the columns of a bevelled or wedge shape, the thinner edge being towards the surface of the turtle, the form of type was susceptible of being tightened up and made firm. The forms occupied only a portion of the main cylinder, the remainder affording space for the inking apparatus. The smaller surrounding cylinders for effecting the pressure were arranged in a framework, in connection with slopes, by which the sheets were fed in blank, and came out printed on one side. The size of the main cylinder, the number of exterior cylinders, and the rate of speed determined the number of impressions printed per hour. Such was the method of working Hoe's rotary machines, which, as wanted, were made with 2, 4, 6, 8, or 10 subsidiary cylinders. The first introduced into Europe (with the exception of one made for the Paris newspaper, *La Patrie*, in 1848) was one with six cylinders for printing *Lloyd's Weekly Newspaper* in London, in 1857. Some idea of the process of working may be obtained from fig. 5, representing a rotary machine with six feeders. Such a machine with its six feeders, each laying in sheets at the rate of 2000 per hour, could deliver 12,000 impressions in the hour; and those with 8 and 10 cylinders in proportion.

About the time that the Hoe machines came commonly into use, another great advance was made in the art of rapid printing. The Hoe machine, with all its advantages, still retained the inconvenience of printing only one side at a time, and the multiplication of the feeding cylinders introduced too many complications. A great improvement was inaugurated by the plan of printing from curved stereotype plates and a continuous roll of paper; in the Exhibition of 1851, Mr. Thomas Nelson of Edinburgh exhibited a machine of this kind. The invention was not, however, found suitable for book-work, and its practicability for newspapers was not at first realized. But after much experimenting, printing from the web by means of curved stereotype plates was successfully carried on. The method was carried to great perfection in a new machine, the 'Walter,' contrived between 1863 and 1868 by the manager of the *Times* printing establishment. The 'Walter' machine (to which a folding-machine was subsequently attached) is represented in fig. 6.

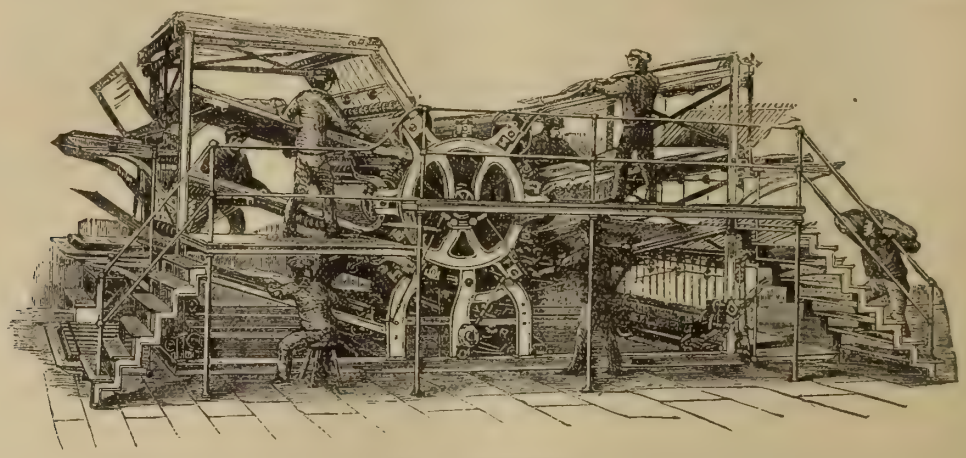


Fig. 5.—Hoe's Machine.

A reel of tightly rolled paper, just as it leaves the mill, is placed at one end of the machine, is damped while passing between small cylinders, and is then led between the first and second of four cylinders, placed one above the other, where it receives its first impression from the stereotype cast of the first cylinder. The paper then returns backward between the second and third cylinders; and passing forward again between the third and fourth, receives on its other side the second impression from the stereotype plates of the lowest cylinder. The roll is next cut into sheets, and the sheets numbered by an index. Carried up to the top of the machine, the sheets descend perpendicularly, and are thrown alternately backwards and forwards onto boards held by two lads. These, with the striker, who starts the machine, are the sole attendants necessary. The paper travels at the rate of 1000 feet per minute, and the finished sheets are delivered at the rate of 12,000 copies and upwards per hour. Repeated experiment has proved that good work may be done at the rate of 17,000 copies per hour. The other web-printing machines differ

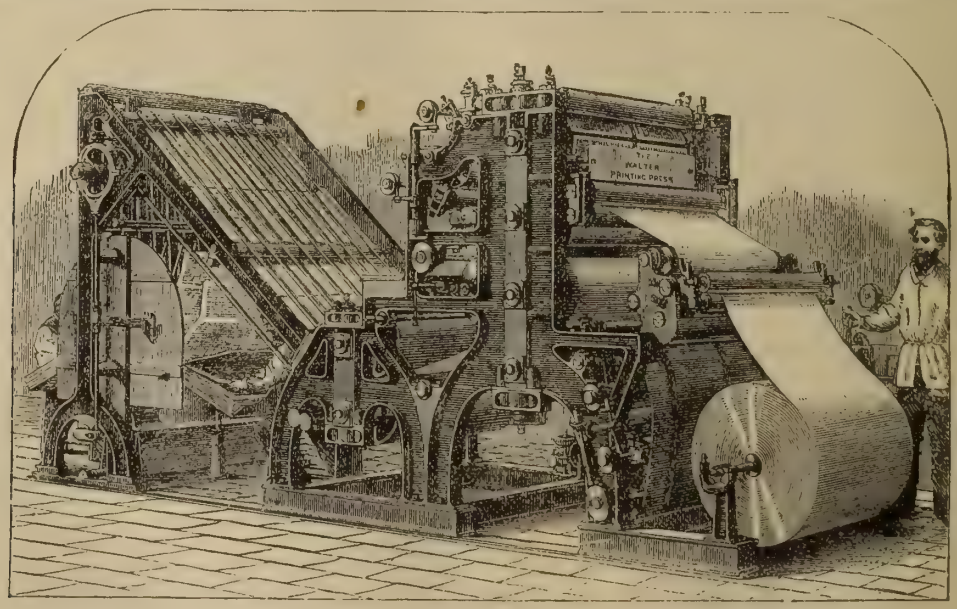


Fig. 6.—The Walter Printing Press.

more or less considerably in idea or details from that just described. The 'Bullock,' which is the invention of an American, has also, done excellent book-printing at the rate of 12,000 sheets per hour. The 'Victory,' nearly contemporaneous with the 'Walter,' differs from it in several points. It does not damp the paper; it has only a single delivery; but it delivers the finished sheets ready folded. The 'Prestonian' will print from type, whereas all other web-machines print only from stereotype. One of the most recent web-printing patents is the Hoe web-machine, which is also very favorably spoken of.

By the introduction of the steam-presses which we have now described, the profession of the printer has within these few years undergone a most extraordinary revolution; and although fewer hand-pressmen are now employed than formerly, the increase of employment to compositors, engineers, bookbinders, booksellers, &c. must be very great. The principal advance in the profession has been since the year 1832, when the printing of cheap literary sheets rose into importance; and, by a fortunate coincidence, the patents of various machines having about the same time expired, a new impulse was given to the trade. The making of printing machines has in itself become a great business. The printing-office is a factory; and the interior of one of those concerns usually presents a remarkable spectacle of industry, animate and inanimate, which to a stranger leaves a lasting impression on the memory.

PRINTING. In Printing, a remarkable American invention was brought into use in 1867. It is called the Matrix Compositor, and is only adapted for stereotyping, by making impressions on thick, soft paper of the letters in the order required, and then taking casts of the same in metal as usual. The peculiarity of this machine is, that it brings up any letter the compositor wishes to its right place in the line by simply touching the key which answers to that letter, in an arrangement like the front of a piano, each key being marked with its corresponding letter. At the moment the letter is brought to its place, it is made to press into the paper; and in this way the composition proceeds with only one alphabet of fixed types, which are made of steel to bear the pressure. With practice, a good compositor will work this machine, and thus form the matrix of the stereotype plates, as fast as he could set up the ordinary movable types. The saving in time and the wear of type is therefore very considerable.

PRINT-WORKS, in point of law, are regulated by the statutes 33 and 34 Vict. c. 62, and 37 and 38 Vict. c. 44, so far as regards the labor of children, young persons, and women; and the statute applies to all buildings where persons are employed to print figures, patterns, or designs upon any cotton, linen, woollen, worsted, or silken yarn, or woven or felted fabric, not being paper. The works are subject to the inspection of the factories inspectors, to whom particulars of the business and place are to be duly sent. Children under 10 years of age are not to be employed. No child under 14, or female, is to be employed during the night. Children under 14 must be sent by the parent to school for at least 60 days in the year, and certificates of these school attendances must be obtained before a child can be employed. A child between 13 and 14 ranks as a young person if holding a certificate of proficiency in reading, writing, and arithmetic. A register is to be kept of all the persons employed, and the times of employment; and the employment of any one contrary to the act, subjects the occupier of the works to a penalty.

PRI'OR. See MONASTERY.

PRIOR, MATTHEW, an English poet, was born, it is supposed, in London, where his father was a joiner, on the 21st July 1664. He was educated, through the liberality of an uncle, at Westminster School; and in 1682, he was sent by the Earl of Dorset, whose friendship he had formed, to St. John's College, Cambridge. Here he took his B.A., obtained a fellowship, and made the acquaintance of Charles Montagu, afterwards Earl of Halifax, in conjunction with whom he produced *The City Mouse and Country Mouse*, written to ridicule Dryden, in which it did not in the least succeed, although it lives yet in virtue of its own wit, polish, and grace.

After 1688, P. was introduced to court by the Earl of Dorset, and was appointed secretary to the embassy which was sent to the Hague in 1690. His conduct gave satisfaction to King William; and the lucky and well-mannered poet was appointed afterwards to several posts of a similar description. He was a favorite at the courts of Holland and France.

In 1701, P. entered parliament; and soon after he deserted the Whigs, and went over to the Tory party. In 1711, he was sent by government to Paris with private proposals for peace, and on his return, he brought with him one of the French ministers, who was invested with full powers to treat. At P.'s house, shortly after, the representatives of the British government met the French plenipotentiary; and his connection with this meeting was made the ground of a charge of treason, on which he was committed to prison, but released after a confinement of two years, without a trial. He had now nothing to live by except his fellowship and his wits. The publication of his poems by subscription, however, brought him 4000 guineas; and at the same time, Lord Harley, son of the Earl of Oxford, bought a small estate in Essex, and conferred it on him for life. At the age of 57, he died at the seat of the Earl of Oxford, September 18, 1721. A monument was erected to him in Westminster Abbey.

P. was one of the few poets who was also a diplomatist and man of the world. He filled his public offices with credit to himself, and he had the knack of making friends amongst those who had the giving of places and pensions. His poems, which comprise odes, songs, epistles, epigrams, and tales, are not much read. He has no fire, no enthusiasm, but everything is neat, pointed, well turned; and his lighter pieces are graceful and witty. If there is little inspiration in his verse there are the polish and felicity of a scholar and man of society.

PRI'SCIAN (Lat. *Priscianus*), surnamed CÆSARIENSIS, either because he was born or educated in the town of Cæsarea, is perhaps, in point of reputation, the first of Latin grammarians, though one of the last in point of time. He belongs to the middle of the 5th c., if he is not even considerably later, for he is mentioned by Paulus Diaconus as a contemporary of Cassiodorus (468—562 A.D.). He taught Latin at Constantinople, probably to the imperial court, for he enjoyed a government salary. The work which has mainly preserved his name is his *Commentariorum Grammaticorum Libri XVIII.*, dedicated to his patron the consul Julianus. The first 16 books treat of the different parts of speech as conceived by the ancients; the remaining two are devoted to syntax, and in one MS. bear the separate title of *De Constructione libri duo*. P.'s Commentary is, for the time, a solid and comprehensive work, the production of a man of great learning and good sense, and is enriched with quotations from many Greek and Latin authors no longer extant. The epitome executed by the German bishop, Rabanus Maurus (flor. in the 9th c.), was very popular in the middle ages. Besides the Commentary, B. wrote six smaller grammatical treatises, and two hexameter poems of the didactic sort, *De Laude Imperatoris Anastasii*, and a free translation of the *Periegesis* of Dionysius. The first edition of P. appeared at Venice (1470); the best is that by Krehl (2 vols., Leip. 1819—1820).—The phrase, 'to break the head of Priscian,' means to grossly violate the rules of grammar.

PRISCI'LLIAN, the author, or rather the chief propagator in Spain, during the latter part of the 4th c., of the doctrines professed by the sect known from his name as PRISCILLIANISTS. The first seed of their doctrines is said to have been carried into Spain by a Memphian named Marcus. P. was a man of noble birth; and by his eloquence and ascetic life obtained so much consideration, that a numerous party, including some priests, and at least two bishops, attached themselves to his school. His doctrine was substantially that of the Manichæans (q. v.). He taught expressly the *Dualism* and the *Docetism* of that sect, and it is equally certain that he adopted the moral consequences as to marriage, &c., by which they had rendered themselves obnoxious even to the civil authorities in the East and Africa. He was warmly opposed by two bishops, Idacius and Ithacius; and the council of Cæsar-Augusta (Saragossa) having in the year 380 condemned his doctrines, a decree for his banishment was issued in the same year. He not only obtained, however, a reversal of this decree, but succeeded in affecting the banishment of his chief opponent, Ithacius. By an appeal to the usurper Maximus at Treves Ithacius caused P. and several of his followers to be brought to trial, and put to death in 385; a proceeding which was regarded with so much abhorrence by St. Martin of Tours, St. Ambrose, and other bishops, that they separated from the communion of Ithacius. The sect did not die out with its founder, though there was a considerable reaction against it at the close of the 4th c.; and at all times through the medieval period we find its traces under various names and forms, especially in the north of Spain, in Languedoc, and in Northern Italy.

PRISM, in Geometry, a solid figure which can be most easily conceived of if we imagine a number of plane figures (triangles, quadrilaterals, &c.) exactly similar in form and size to be cut out of paper or any thin plate, and piled one above the other, and then the whole pile to become one body. It will thus be seen that the top and bottom of the prism are similar, equal, and parallel to each other, and that the sides are plane figures, rectangular if the prism be 'right' (i. e., if in the above illustration the pile of plane figures be built up perpendicularly), and rhomboidal if the prism be 'oblique' (i. e., if the pile slope to one side); but under all circumstances the sides of a prism must be parallelograms. The top and bottom faces may be either triangles, squares, parallelograms, or quadrilaterals of any sort, or figures of 5, 6, 7, &c. sides, provided only both are alike; and the number of sides in the plane figure which forms the top or bottom, of course determines the number of faces of the prism; thus, in a triangular prism, there are 5 faces in all (3 sides and 2 ends); in

a quadrangular prism, 6 faces (4 sides and 2 ends), &c. If two prisms, one being 'right,' and the other 'oblique,' have their bases of equal area, and be of the same vertical height, their solid content is the same, and is found by multiplying the area of the base by the vertical height. The Parallelepiped (q. v.) is a quadrangular prism, and the *cube* is a particular case of the parallelepiped.—PRISM, in Optics, is a triangular prism of glass or other transparent substance, its two ends being isosceles triangles, and having most frequently a very acute vertical angle, which gives the prism the appearance of a long wedge. The prism is a most important instrument in experiments on the refraction of light, and, in the hands of the most eminent optical philosophers, has been the means of largely adding to the science of optics. See REFRACTION.

PRISON DISCIPLINE means the method in which criminals, or other persons subjected to imprisonment are managed. In this, which is its original sense, prison discipline, as actually practised, may be good or bad in the estimation of the person speaking of it. Of late, however, the term has obtained a new meaning, having been used to express not merely the practice of ruling prisons, but the science of properly ruling them. It has gone even further, and sometimes has been used to express the principles of penal administration, or the philosophy and practice of punishment. This has arisen from the circumstance, that gradually other punishments have been dropped in this country, and detention within edifices and the grounds attached to them has become almost the only method of punishment for crimes. Torture, exposure in the pillory, and other like dedications of the offender to public vengeance, have been long abandoned as barbarous. Death-punishment has been much narrowed in its application; and transportation, apart from any question as to its effectiveness, has been rendered impracticable, except within a very narrow compass. We get nothing from the practice of the times anterior to Christianity, nor yet from that of the middle ages, to help us in estimating modern systems of prison discipline. They are a development of civilization; and, contradictory as it may seem to say so, of personal liberty. The institution of slavery renders any such system unnecessary. It removes the function of punishing ordinary criminals from the public administration of the affairs of a state, and places it in private hands. Hence, we have no criminal law, properly speaking, coming down to us from antiquity. The *corpus juris*, so full of minute regulations in all matters of civic right, has very little criminal law, because the criminals became slaves, and ceased to be objects of the attention of the law. When imprisonment became a function of the state in the administration of justice, it was often carelessly, and hence tyrannically, exercised, because the practice of awarding it as a punishment arose more rapidly than the organization for controlling its use. On several occasions, grave abuses have been exposed by parliamentary inquiries and otherwise in the practice of prison discipline in this country.

The exertions of Howard, Mrs. Fry, and other investigators awakened in the public mind the question, whether any practice in which the public interest was so much involved, should be left to something like mere chance—to the negligence of local authorities, and the personal disposition of jailers. The tendency lately has been to regulate prison discipline with extreme care. The public sometimes complain that too much pains is bestowed on it—that criminals are not worthy to have clean well-ventilated apartments, wholesome food, skilful medical attendance, industrial training, and education, as they now have in this country. There are many arguments in favor of criminals being so treated, and the objections urged against such treatment, are held by those who are best acquainted with the subject to be invalid; for it has never being maintained by any one that a course of crime has been commenced and pursued for the purpose of enjoying the advantages of imprisonment. Perhaps those who chiefly promoted the several prominent systems expected from them greater results, in the shape of the reformation of criminals, than any that have been obtained. If they have been disappointed in this, it can, at all events, be said that any prison in the now recognized system is no longer like the older prisons, an institution in which the young criminals advance into the rank of proficients, and the old improve each other's skill by mutual communication. The system now received is that of separation, so far as it is practicable. Two other systems were tried—the silent system and the solitary system. The former imposed entire silence among the prisoners even when assembled together; the latter endeavored to accomplish their complete isolation from sight of or communication with their race. By the separate system, the criminals are prohibited from communicating with each other; but they are visited by various persons with whom intercourse is more likely to elevate than to debase—as chaplains, teachers, scripture-readers, the superior officers of the prison, and those who have external control over it.

PRISONERS OF WAR are those who are captured from the enemy during naval or military operations. By the laws or recognized principles of war, the entire people of a vanquished town, state, or nation become the absolute property of the victors; but civilization has greatly modified this stern rule, and except when a country is devastated for military reasons, it is rare for non-combatant citizens to be subjected to penalties of conquest, beyond the levying of contributions in money or provisions. The combatants who have laid down their arms become prisoners of war. Their lives and liberty are at the disposal of their conquerors, and even in modern times, their lives are sometimes taken, as, for instance, when Napoleon put the Turkish prisoners to death at Jaffa in 1799; otherwise, prisoners of war are kept in confinement until peace ensues, or they are exchanged for prisoners of their conqueror's nation, held in captivity by their own countrymen. It is unusual to subject prisoners of war to penal discipline; but the loss of liberty and hard fare (for, of course, they are allowed no more than a bare subsistence) render captivity sufficiently irksome. In ancient times, the treatment of prisoners of war was far more severe. In the Greek wars, it was no uncommon thing to put the whole adult male population of a conquered state to the sword, while the women and children were enslaved. Although the putting to death of prisoners became less frequent, they and their families were commonly reduced to slavery to as recent a period as the 13th century. About that time, the more humane custom of exchanging prisoners came into practice. Notwithstanding frequent exchanges, large numbers of prisoners accumulate during war. In 1811, about 47,600 French were prisoners in England, while 10,300 English languished in the prisons of France. See PAROLE.

PRISRE'ND, a town of European Turkey (Albania), capital of a district, on the Rieka, 80 miles east of Scutari. It is one of the most beautiful, rich, and industrious towns in Turkey, with a citadel situated upwards of 1100 feet above sea-level. It contains an immense number of bazaars, and carries on an active trade in flints, saddlery, glass, copper, and steel wares. Among its edifices are 15 mosques. Pop. 35,000.

PRISTI'NA, a town of European Turkey, in the vilayet of Monastir, 30 miles north-north-east of Prisrend, stands on a hill, and is the most considerable town in old Servia. Pop. 12,000.

PRISTIS. See SAWFISH.

PR'ITHU is the name of several legendary kings of ancient India. It is, however, especially one king of this name who is the favorite hero of the Purân'as. His father was Ven'a, who perished through his wickedness; for when he was inaugurated monarch of the earth, he caused it to be everywhere proclaimed that no worship should be performed, no oblations offered, and no gifts bestowed upon the Brahmins. The R'ishis, or Saints, hearing of this proclamation, entreated the king to revoke it, but in vain; hence they fell upon him, and slew him. But the kingdom now being without a king, as Ven'a had left no offspring, and the people being without protection, the sages assembled, and consulted how to produce a son from the body of the dead king. First, then, they rubbed his thigh; from it, thus rubbed, came forth a being called Nishâda; and by this means the wickedness of Ven'a having been expelled, they proceeded to rub the right arm of the dead king, and by this friction, engendered P., who came forth resplendent in person, and in his right hand the mark of the discus of Vishnu, which proved him to be a universal emperor, one whose power would be invincible even by the gods. The mighty P. soon removed the grievances of the people; he protected the earth, performed many sacrifices, and gave liberal gifts to the Brahmans. On being informed that, in the interval in which the earth was without a king, all vegetable products had been withheld, and that, consequently, the people had perished, he in great wrath marched forward to assail the earth. The earth, assuming the figure of a cow, fled before him; but seeing no escape from the power of the king, at last submitted to him, and promised to renew her fertility, provided that he made all places level.

P. therefore uprooted mountains, levelled the surface of the earth, established boundaries of towns and villages, and induced his subjects to take up their abode where the ground was made level. The earth now fulfilled her promise; and as P., by thus granting her new life, became, as it were, her father, she was henceforth called Pr'ithivî. However little the worth of this piece of popular etymology—for *pr'ithivî*, or *pr'ithwî*, 'earth,' the feminine of *pr'ithu* (Greek *platu*) means etymologically 'the large' or 'wide'—the legend of P. itself seems to record some historical fact regarding the civilizing influences exerted by a great king of Hindu antiquity.

PRIVATE, the title applied in the British army to a common soldier of the cavalry and infantry, the corresponding rank in the artillery being gunner or driver, and in the engineers, the sapper. The pay of a private is one shilling a day in the infantry and 1*s.* 2*d.* in the cavalry—exclusive of a free ration or corresponding allowance. A private in the cavalry is sometimes called a trooper.

PRIVATEE'R, a ship owned by a private individual, which, under government permission expressed by a Letter of Marque (q. v.), makes war upon the shipping of a hostile power. To make war upon an enemy without this commission, or upon the shipping of a nation not specified in it, is piracy. Privateering was abolished by mutual agreement among European nations by the Treaty of Paris in 1856. It is doubtful, however, how far that abolition would stand in a general war, for privateering is the natural resource of a nation whose regular navy is too weak to make head against the maritime power of the enemy, especially when the latter offers the temptation of a wealthy commerce.

PRI'VET (*Ligustrum*), a genus of plants of the natural order *Oleaceæ*, containing a number of species of shrubs and small trees with opposite leaves, which are simple and entire at the margin; the flowers small, white, and in terminal panicles; the calyx slightly 4-toothed; the corolla funnel-shaped and 4-cleft; the stamens two, projecting beyond the tube of the corolla; the berries 2-celled. COMMON P. (*L. vulgare*) is a shrub growing in bushy places and about the borders of woods in the middle and south of Europe, and in some parts of Britain, now also naturalized in some parts of North America. It has half-evergreen, smooth, lanceolate leaves; and berries about the size of peas, black, rarely white, yellow, or green. The flowers have a strong and sweetish smell; the leaves are mildly astringent, and were formerly used in medicine; the berries, which hang on the shrub during winter, have a disagreeable taste, but serve as food for many kinds of birds; they are used for dyeing red, and with various additions, green, blue, and black. A rose-colored pigment obtained from them is used for coloring maps. The wood is hard, and is used by turners, and by shoemakers for making wooden pegs. P., although not spiny, is much used for hedges, often mixed with some spiny shrub, or with beech. It bears clipping well, and grows well in the smoke of towns, also under the shade of trees.—A number of species of P. are natives of different parts of the East, and some of them have begun to be introduced into shrubberies in Britain.—All kinds of P. grow readily from cuttings.

PRI'VILEGE (Lat. *privilegium*, from *privata lex*, a private law), a special ordinance or regulation, in virtue of which an individual or a class enjoys certain immunities or rights from or beyond the common provisions of the general law of the community. It differs from a *dispensation* inasmuch as the latter merely relaxes the existing law for a particular case or cases, while the privilege is a permanent and general right. Of ancient and medieval legislation, the law of privilege formed an important branch; and, in truth, the condition of the so-called 'privileged classes' was in all respects different, socially, civilly, and even religiously, from that of the non-privileged. In canon law, there were two privileges enjoyed by the clergy, which deserve especial notice from the frequency of the historical allusions to them—the 'privilege of the canon' (*privilegium canonis*) and the 'privilege of the forum,' *privilegium fori*). By the former, the person of the clergyman, of whatever degree, was protected from violence by the penalty of excommunication against the offender; by the latter—known in England as 'benefit of clergy' (q. v.)—the clergyman was exempted from the ordinary civil tribunals, and could only be tried in the ecclesiastical court. Most of the purely civil privileges are abolished throughout Europe by modern legislation.

PRIVILEGED DEBTS, in the Law of Scotland, such debts as are first paid out of certain funds. Thus, when a man dies, a certain sum is allowed out of his estate for Mournings (q. v.) to the widow and children. In case of bankruptcy, servants' wages are privileged to a certain extent.—PRIVILEGED DEEDS are holograph deeds, which are exempted from the statute which requires other deeds to be signed before witnesses.

PRIVY-CHAMBER, GENTLEMEN OF THE, officers of the royal household of England, instituted by King Henry VII., to attend on the king and queen at court, and in their progresses, diversions, &c. For a number of years past, no services have been required of these officers, and no salary or fee is attached to the office. There are also four Gentlemen Ushers of the Privy-chamber, who are in regular attendance on the sovereign, waiting in the Presence-chamber, and attending on the royal person; they have the honor of conducting her Majesty, in the absence of the higher officers.

PRIVY-COUNCIL (*consilium regis privatum*), an assembly of advisers on matters of state appointed by the sovereign. The Privy-council of England existed at a very early period in the history of the country. It was in its beginning a small permanent committee, or minor council, selected by the king out of the great council, or parliament; and in its powers were included—what still forms one of its functions—the right to inquire into all offences against the state, and to commit offenders for trial before the proper courts of law. It also frequently assumed the cognizance of questions of private right, a practice against which the statute 16 Charles I. c. 10 was directed, enacting that neither king nor council should have any jurisdiction in matters regarding the estates and liberties of the subject, which should be tried in the ordinary tribunals of the country. The Council in early times consisted of the Chancellor, the Treasurer, the Justices of either bench, the Exchequer, the Serjeants, some of the principal Clerks of the Chancery, and other members nominated by the king, who were generally bishops, earls, and barons. The Star-chamber and Court of Requests were both committees of Privy-council. The number of members, which had originally been 12, was gradually increased; and when the large number had become inconvenient, the sovereign sought the advice of a select body of the more influential among them.

Charles II. limited the number of councillors to 30, 15, of whom comprised the chief officers of state and the *ex officio* members, to whom were added 10 peers and 5 commoners named by the sovereign; and it was intended that the Council, thus remodelled, should practically resume its original duties, and have the control of every part of the executive administration. The Court of Privy-council has, however, long ceased to discharge the function of advising the crown on the general affairs of government and state policy, a select number of the body, under the denomination of the Cabinet Council, forming the recognized executive council of the crown. See MINISTRY. The list of privy-councillors now includes the members of the royal family, the Archbishops of Canterbury and York, the Bishop of London, the great officers of state, the Lord Chancellor and judges of the Courts of Equity, the Chief Justices of the Courts of Common Law, the Ecclesiastical and Admiralty Judges, and the Judge Advocate, several of the Puisne Judges, the Speaker of the House of Commons, the Ambassadors, some of the Ministers Plenipotentiary and Governors of Colonies, the Commander-in-chief, the Master-general of the Ordnance, the First Lord of the Admiralty, and generally also a Junior Lord of the Admiralty, as well as necessarily all the members of the Cabinet. The Vice-president of the Board of Trade, the Paymaster of the Forces, and the President of the Poor-law Board, are also generally members of the Privy-council; and sometimes other persons who have filled responsible offices under the crown. It is now understood that no members attend the deliberations of Council except those who are especially summoned. In ordinary cases, only the ministers, the great officers of the Household, and the Archbishop of Canterbury are summoned; but on some extraordinary occasions, summonses are sent to the whole Council—this was last done to receive her Majesty's communication of her intended marriage. Meetings of Council are usually held at intervals of three or four weeks at her Majesty's residence; and the attendance of six privy-councillors at least, with one of the clerks of Council, is considered necessary to constitute a council.

A privy-councillor must be a natural-born subject of Great Britain. The office is conferred by the sovereign's nomination, without any patent or grant, and complete by taking the oath of office. The duties of a privy-councillor, as defined by this oath, are—to the best of his discretion, duly and impartially to advise the king; to keep secret his council; to avoid corruption; to strengthen the king's council in all that by them is thought good for the king and his land; to withstand those who attempt the contrary, and to do all that a true councillor ought to do to his sovereign lord. The office of privy-councillor formerly fell by the demise of the crown; but by 6 Anne, c. 7, the Privy-council continues to exist for six months longer, unless sooner determined by the successor. Immediately on the decease of the sovereign, the Privy-council now assembles and proclaims his successor, the Lord Chancellor affixing the Great Seal to the proclamation. The members of the Privy-council are then re-sworn as council of the successor, and take the oath of allegiance, after which a privy-council is held, and the sovereign makes a declaration of his designs for the good government of the realm, and subscribes the requisite oaths.

The king in Council, or a committee of the Lords of Council, have been empowered by various statutes to issue orders which are to have the force of law, parliament thus delegating its authority to regulate such matters as may be more conveniently regulated by Order in Council. In cases of extreme public emergency, at a time when parliament was not sitting, Orders in Council have sometimes been issued in contravention of the existing law, and the indemnification of parliament has afterwards been sought. See ORDERS IN COUNCIL. The sovereign, with the advice of the Privy-council, is also empowered to issue proclamations, which, however, must be in accordance with, and in furtherance of, the law of the land. See PROCLAMATION.

Almost every act of importance done by the sovereign in person is performed in Council—such as declarations of, or public engagements by, the sovereign, and consent to marriages by members of the royal family. Among the functions of the Privy-

council are also the appointment of sheriffs in England and and Wales, and the issuing of orders for the laying on or removing of quarantine, or for granting reprisals, or for embargoes. The sovereign in Council has still more ample authority in all that relates to the colonies, including the making and enforcing of laws in such colonies as have no representative assemblies; and approving or disallowing the legislative acts of such as do possess them.

A large part of the business of the Privy-council is transacted by committees, to which petitions and other matters are submitted by the queen in Council. Among the permanent committees of Privy-council are the Board of Council for Trade and Foreign Plantations (see TRADE, BOARD OF); the Committee of Council for Education, appointed in 1839, to distribute the sum voted annually for educational purposes; and the Judicial Committee of Privy-council. This last-named committee consists of the Lord President, Lord Chancellor, Lords Justices, Lords of Appeal, and other great judicial officers, as well as privy-councillors who have held such offices, with any two other privy-councillors who may be named by the sovereign. It was established by 3 and 4 Will. IV. c. 41, for the purpose of deciding certain questions of right of privilege, particularly with regard to the colonies, and hearing certain appeals. Among these were appeals from the Courts of Equity, colonial appeals, and the causes reviewed by the Court of Delegates. The powers of the Privy-council were enlarged by 6 and 7 Vict. c. 68. Part of its jurisdiction was, however, abolished by the Judicature Act of 1873 and subsequent years. This act still left, for a time, the Privy-council the Court of Appeal for the British colonies and dominions abroad, though it was provided that appeals thence should ultimately be referable to the newly constituted Court of Appeal (see APPEAL).

To the latter court were transferred appeals from the Court of Admiralty and in Orders in Lunacy. But the Privy-council is still the great court of appeal in ecclesiastical matters. The acts of committees of the Privy-council are designated Acts of the Lords in Council, in contradistinction from Orders in Council, made by the sovereign, who is personally present, by advice of the Privy-council. The crown may refer to a Committee of Council any petition or claim of right for which the ordinary tribunals afford no remedy. The Lords of Council constitute a Court of Record for the investigation of offences against the state, the offenders being committed for trial before the ordinary tribunals. Certain state investigations, not of a criminal kind, have also been held to fall within their jurisdiction, such as the inquiry into the insanity of George III., the claim of Queen Caroline to the crown as consort of George IV., and questions regarding alleged illegal marriages of the royal family.

The Privy-council is styled collectively 'Her Majesty's most Honorable Privy-council.' Privy-councillors are entitled to the designation 'Right Honorable' prefixed to their name, and take precedence next after Knights of the Garter. The personal security of a member of Privy-council was formerly guarded by certain statutes, visiting with fine a blow struck in his house or presence, and making it felony to conspire against him or assault him in the execution of his office; but these immunities were done away with by 9 Geo. IV. 31.

The Lord President of the Council is the fourth great officer of state, and is appointed by letters-patent under the Great Seal. The office is very ancient, and was revived by Charles II. in favor of the Earl of Shaftesbury.

Scotland possessed a Privy-council, which was merged in that of England by 6 Anne, c. 6. There is a Privy-council for Ireland, which at present consists of 58 members, who are sworn pursuant to a sign-manual warrant directed to the Lord Lieutenant.

PRIVY-COUNCIL (COMMITTEE OF) ON EDUCATION. Till within the last forty years, primary education in England was left in the hands of individuals and societies. The only societies of importance which endeavored to overtake the enormous educational destitution which prevailed, were the British and Foreign School Society, founded under the patronage of George III.; and the National Society, of more recent date. The first-mentioned Society endeavored to get rid of all religious difficulties by avoiding the use of catechisms in the school, and confining themselves to the use of the Bible alone. The Church party, however, felt that in accepting for the children of the country a religious training so vague, they were untrue to their principles, and would probably fail to secure for the young any efficient religious instruction at all. Accordingly, the National Society was set on foot as a specially Church Institution. The object of both these societies was, by means of contributions collected from benevolent persons, to aid in the foundation and maintenance of elementary schools throughout England and Wales.

The prevailing destitution was, however, too widespread to be met by voluntary associations, and it consequently became necessary that the State should take some share in the education of the people. Parliamentary grants of small amount were made, which were distributed by the Treasury under regulations issued in 1833, the chief of which was as follows: 'That no application be entertained by the Treasury unless a sum be raised by private contribution equal, at least, to one-half of the total estimated expenditure.' These grants were for the purpose of erecting school-buildings. In 1839, after considerable opposition, it was resolved to increase the parliamentary grant, and to appoint a Committee of Her Majesty's Privy-council to administer it.

On the 3d June 1839, an order of Council laid down, that the grants of previous years not yet appropriated, as well as the grant for the current year, should be expended for the erection of schools, and that £10,000 voted for Normal Schools in 1835 should be given in equal proportions to the British and Foreign and the National Societies. The Privy-council Committee did not at first contemplate aiding any schools but those in connection with the two Societies which we have just named; but in September of 1839, they resolved to aid other schools, where special circumstances prevented their affiliation to the Societies. In the course of a year or two it came practically to this, that *all schools* were aided *in which the Bible was daily read from the authorized version.*

The various religious denominations, under the influence, partly, of the strong pecuniary inducement held out by the Committee of Council, now began to exert themselves to erect schools, and to claim state aid. The Committee of Council, seeing the large probable increase in the number of schools requiring to be maintained partially out of the state funds, had their attention specially directed to the principles of their administration, and the conditions on which alone aid was to be granted. The first measure of importance was the appointment of inspectors of schools. These were appointed by Her Majesty; but the Church of England was permitted to exercise a veto on those nominated for the inspection of Church schools, and the dissenting education committees were allowed a similar privilege with reference to those nominated for dissenting schools. No school was to be admitted to government aid in any form which did not declare its willingness to submit to inspection. The next measure of importance was the determining of the conditions on which aid should be given, first, for the erection, and secondly, for the maintenance of schools. Grants for the former purpose were given in proportion to the number of children to be educated and the amount of money raised by private contribution.

In 1846, the first step seems to have been made towards making grants for the *maintenance* of schools. It was resolved to apprentice promising boys and girls, the young persons (who were to be at least thirteen years of age on appointment) giving assistance in the school-work, and receiving separate instruction for one hour and a half daily from the principal teacher.

They were paid salaries rising from £10 by annual increments of £2, 10*s.* to £20. The teacher received a small extra payment for giving this instruction. The subjects were defined in a broad-sheet prepared by the Department, and embraced Euclid, algebra, and the common subjects taught in schools. The apprenticeship was intended to be five years in length; but, in cases of exceptional ability, the period was considerably shortened. These young people were called 'pupil-teachers.'

In contemplation of the close of the apprenticeship of pupil-teachers, it was further resolved to grant them a scholarship or bursary, to enable them to pursue their studies at one of the numerous male and female normal schools which had come into existence; and at the conclusion of their training, to allow a grant of money to the normal school to which they had resorted. The Queen's Scholarship, as the bursary was called, was fixed at £25 for a first class, and £20 for a second, was tenable for two years; and the grants to the normal school at £20, £25, and £30, according as they had trained the student for one, two, or three years—two-thirds of these sums being allowed in the case of female students. It was further necessary to contemplate the completion of the normal-school training, and to endeavor to secure for the public service the well-trained teachers who had been educated at the public expense. Accordingly, it was resolved to grant to teachers sums ranging from £15 to £30 per annum (and two-thirds of these sums in the case of females), provided the school-buildings in which they taught, and the character of their teaching, were satisfactory to Her Majesty's inspectors.

A condition, afterwards added, was, that the teacher should receive from local sources, including school-fees, not less than twice the amount paid by government, of which one-half should be from voluntary subscriptions. The amount which the teacher might claim, besides being payable only on the conditions stated above, was made partially dependent on the grade of certificate obtained at the normal school. Certificates are also granted on conditions specified in the Code which is issued annually by the Department.

What is known as 'The New Code' was introduced by Mr. Robert Lowe in 1862. It has undergone alterations every year;

but it still continues to be founded on the principle of 'payment by results.' The teachers receive no direct payment from the Department; but are left to make their own conditions with their managers. A grant is paid for every child's average attendance (6*s*.); and further payments are made for success in reading, writing, and arithmetic (3*s*. for each pass). To encourage a higher course of instruction, a further grant of 4s. on the average attendance is paid if the children are satisfactorily taught in two subjects (selected from geography, grammar, history, and needlework); and extra sums are given for success in Latin, French, English literature, science, &c. The grants are paid to the managers, and the distribution is left entirely in their hands. Pupil-teachers must now be 14 years of age on appointment, and are apprenticed for not more than four years.

These are the principles of administration which continued to regulate the action of the Privy-council, up to the date of the English Education Act of 1870, and the Scotch Education Act of 1872. The consequence has been an astonishingly rapid increase in the number of primary schools and normal schools or colleges; of the latter, there are about 40 in England and Scotland.

The above sketch of the Privy-council system applies also to Scotland, with this difference, that when the Revised Code was first issued, the opportunity was regarded as a favorable one for considering whether there were not peculiarities in the educational system of Scotland, which might make it advisable either to separate educational administration there from that of England, or to found a national system on the basis of the time-honored system of parochial schools—excellent in themselves, but too few to supply the wants of the country. With these objects in view, a Royal Commission was issued in 1864, to take evidence on the whole question as it affected Scotland, and this Commission reported in 1868. The Education Act of Scotland has separated the public schools—and in some cases the burgh schools—from their connection with the ecclesiastical bodies of the country, and placed them in the hands of elected school-boards. Privy-council grants are now paid to these Boards, since the passing of the last Act.

The minutes of the Privy-council Committee, or, as it is now called, 'The Education Department,' are constructed under the Education Acts above referred to, but they do not materially differ in principle from the code of 1863. There was up to 1878 a Scotch Educational Department in London, with a board in Edinburgh; but the latter is now abolished, while the former has been strengthened with additional powers. The Codes which regulate the elementary schools of England and Scotland are now almost identical; and the alterations made yearly seem to indicate the opinion of the Department that the primary instruction of the whole country should be conducted on the same lines.

PRIVY-PURSE, KEEPER OF THE, an officer of the royal household charged with the payment of the private expenses and charities of the sovereign.

PRIVY-SEAL, the seal appended to grants which are afterwards to pass the Great Seal, and to documents of minor importance which do not require the Great Seal. The officerwho has the custody of the Privy-seal was at one time called the Keeper, and afterwards the Lord Privy-seal. As early as the reign of Edward III., he was a member of the king's council, and a responsible minister of the crown. The Lord Privy-seal is now the fifth great officer of state, and has generally a seat in the cabinet. His office is conferred under the Great Seal during pleasure. Since the reign of Henry VIII., the Privy-seal has been the warrant of the legality of grants from the crown, and the authority for the Lord Chancellor to affix the Great Seal. Such grants are styled letters-patent, and the office of the Lord Privy-seal is one of the departments through which they must pass to secure their validity. Until recently, all letters-patent for the grant of appointments to office under the crown, of patents of invention, charters, naturalizations, pensions, creation of honors, pardons, licenses in mortmain, &c., required to pass from the Signet Office to the Privy-seal Office, in the form of Signet bills, verified by the Signet Seal and superscription, and the signature of the clerk of the Signet. These Signet bills were the warrant for the Privy-seal; and on the Privy-seal being attached to them, they were forwarded to the Lord Chancellor, by whom the patents were engrossed and completed in the office of the Great Seal. The statute 11 and 12 Vict. c. 82, abolished the Signet Office, and enacted that warrants under their royal sign-manual, prepared by the Attorney-general and Solicitor-general, setting forth the tenor and effect of the letters-patent to be granted, addressed to the Lord Chancellor, and countersigned by one of the principal secretaries of state, should be a sufficient authority for the Privy-seal being affixed; and that the sign-manual so signed, countersigned, and sealed, should be sufficient warrant to the Lord Chancellor to pass letters-patent under the Great Seal. This statute abolished the previously-existing offices of Clerks of the Signet and Clerks of the Privy-seal.

There is a Privy-seal in Scotland, which is used to authenticate royal grants of personal or assignable rights. Rights such as a subject would transmit by assignation, are transmitted by the sovereign under the Privy-seal.

PRIZE, PRIZE-MONEY, terms having reference to property captured from an enemy, or to enemy's property captured from a neutral in time of war. The circumstances under which such capture is justifiable are stated under CAPTURE, as regards naval operations; military prize and its distribution to the army are described under BOOTY. It remains only, therefore, to notice the procedure taken in respect to vessels and property captured by the navy. On a ship being taken, she must be sent to a port belonging to the capturing power, where the Court of Admiralty, on full evidence, adjudicates whether she be lawful prize or not. If the decision be affirmative, the prize is then sold; or if a ship-of-war, (a certain allowance per gun is granted by the state. The produce of the sale or grant is lodged in the hands of the Accountant-general of the Navy, for distribution to the officers and men who assisted at the capture. The net produce of the sale or grant is first divided rateably among any ships (if there be more than one) concerned in the capture. The share of each ship is then divided into eight equal parts. If she were employed under the orders of a flag-officer, he gets one-eighth, and the captain two-eighths; if not, the captain has three-eighths; one-eighth is divided among the lieutenants and officers of corresponding relative rank; one-eighth is shared by the junior commissioned officers and warrant officers; one-eighth goes to the midshipmen and petty officers; and the remaining two-eighths among the seamen, marines, and boys.

PRIZE-COURT is a court which adjudicates the property in vessels captured at sea from a belligerent; and the rule is, that when a captor brings home a prize, the tribunal of his own country has jurisdiction to declare whether he is entitled to it, which decision is binding everywhere. A prize-court differs from other courts in this, that the property of foreigners is brought within its jurisdiction, not by consent, as is implied with regard to the ordinary municipal courts, but by force. By natural law, one would suppose that the tribunals of the captor's country are no more the rightful exclusive judges of captures in war, made on the high seas, from under the neutral flag, than are the tribunals of the neutral country. Nevertheless, such is the rule of international law, which vests the jurisdiction in the prize-court. In Britain, the court is created by commission under the Great Seal, and the judge of the Admiralty Court is usually appointed. Lord Stowell was the judge during the French war, and, during the time he sat as judge, delivered many important judgments in this difficult branch of the law.

PRI'ZZI, a town of Sicily, in the province of Palermo, and 30 miles south-by-east from Palermo. It is of considerable commercial importance. Pop. (1871) 8835.

PRO'A, commonly known as the 'flying proa,' is a peculiarly-shaped canoe in use by the natives of the Eastern Archipelago, and especially by the Ladrone pirates. It is about 30 feet in length by 3 in width, and has the stem and stern equally sharp, so as to sail backward or forward without being turned round.



Proa.

One side is flat, and in a straight line with the stem and stern; the other side is rounded, as in ordinary boats. This peculiar formation would make it liable to be easily upset, were it not for a framework which projects to windward, supporting a weight which counterbalances the pressure of the wind on the sail. The

sail resembles the ordinary lug-sail, and is formed of mat. Slight variations from this form are found, but the principle of construction is the same.

PRO'BABILISM (Lat. *probabilismus*, a barbarous technical word, from *probabilis*, probable), in Roman Catholic theology, means the doctrines regarding the use of so-called 'probable opinions' in guiding the conscience as to the lawfulness or unlawfulness of any particular action. The word came prominently into discussion in the 17th c., and seems now fully accepted as a technical name. As the ground of the doctrine, it is assumed that, in human actions, absolute certainty is not always attainable as to their lawfulness or unlawfulness. Short of this certainty, the intellect passes through the stages of 'doubt' and of 'probability.' In the former, it is swayed between conflicting views, so as to be unable to decide, or even to approach towards deciding, what is true. In the latter, although there is a conflict of views, yet the reasons in their favor are not so equal that the intellect cannot see preponderating motives in favor of the truth of one or the other. Moreover, in the conflict of views, another element will arise, as to their comparative 'safety,' that is, the greater or less danger of moral culpability which they involve; and this greater or less moral 'safety' of a view may, or may not, coincide with its greater or less 'probability.'

The doctrine of 'probabilism' is founded upon these distinctions; and it presents itself in four different schools, all of which agree in professing that it is lawful, in certain cases, to act upon opinions which are merely 'probable.' Opposed to all these four, is the school of *Anti-probabilism*, which rejects altogether the use of probable opinions, and requires that an opinion shall be absolutely morally certain, in order that it may be lawful to act upon it. The four schools of probabilism are called: *Probabilism Simple*, *Æqui-probabilism*, *Probabiliorism* (from *probabilior*, more probable), and *Tutiorism* (from *tutior*, more safe). The first holds that it is lawful to act upon any probable opinion, no matter how slight its probability. The second requires that the opinion shall be 'solidly probable,' but holds that, provided it be really probable, it is lawful to act upon it, even though the conflicting opinion should be equally probable. The third, in the conflict of probable opinions, will only permit us to act on the more probable of the two; but permits this even when the less probable adverse opinion is the 'more safe.' The fourth requires that in all cases the more safe opinion shall be followed, even when the less safe opinion is much the more probable. It is commonly said that the system of probabilism is modern; but this is only true of the discussions regarding it, for the doctrine itself, in some of its forms, is as old as the study of ethics, even considered as a moral science. The disputes regarding it arose with the science of casuistry, when men, in the 16th and 17th centuries, began to reduce morals to a system. It formed a leading subject of the controversy between the Jesuits and the Jansenists, although it is a great, while it is a very common, mistake to suppose that all the Jesuits were probabilists, and that all the Jansenists were opposed thereto. Very few Jesuits, indeed, were of the school which is chiefly assailed in the *Provincial Letters* (see PASCAL), that of Probabilism Simple.

Without entering into the history of this very curious controversy, it will be enough to say that the Roman Church, while condemning the two extremes—the extreme of anti-probabilism, which excludes all use even of the most probable opinions, and the lax extreme of simple probabilism, which accepts even the slightest probablity as sufficient—has left the intermediate opinions for free discussion. The great modern master on the subject is St. Alfonzo de Liguori, whose system may be described as a kind of practical probabiliorism, in which, by the use of what are called reflex principles, an opinion which *objectively* is but probable, is made *subjectively* the basis of a certain and safe practical judgment. There can be no doubt that the system of probabilism has been pushed by some individual divines to scandalous extremes; but it is only just to add that these extremes have been condemned by authority in the Roman Church; and that, on the other hand, the principles of the higher Roman schools of probabilism are substantially the same as those of all moralists, whether of the old or of the new schools of ethics.

Protestants, however, and with them some Roman Catholics, reprobate probabilism in all its *schools* or forms, as a mere scheme for the delusion of conscience and excuse or justification of immorality. They maintain the Scriptural or Christian rule, and the only rule of true morality, to be that no man is entitled on any account to do that of which he doubts whether it is contrary or agreeable to the law of God. Every man must often choose between two courses, as to which is the most expedient; but this they hold to be a totally different thing. It is also urged against the probabilists, that they make the authority of *doctors*, or learned theologians, sufficient justification for a man's doing that which otherwise he would deem it unlawful to do; asserting that it will keep him safe at the judgment seat of God.

PROBABILITY, THE MATHEMATICAL THEORY OF. Of all mathematical theories which can be made in any sense popular, this is perhaps the least generally understood. There are several reasons for this curious fact, of which we may mention one or two. *First.*—As by far the simplest and most direct elementary illustrations of its principles are furnished by games of chance, these have been almost invariably used by writers on the subject; and the result has been a popular delusion, to the effect that the theory tends directly to the encouragement of gambling. Nothing can be more false than such an idea. Independent of moral considerations, with which we have nothing to do here, no arguments against gambling can be furnished at all comparable in power with those deduced from the mathematical analysis of the chances of the game. *Second.*—In many problems, some of them amongst the easiest in the theory, the very highest resources of mathematics are taxed in order to furnish a solution. One reason is very simple. The solutions, however elementary, involving often nothing but the common rules of arithmetic, sometimes lead to results depending upon enormous numbers, and very refined analysis is requisite to deduce *easily* from these what would otherwise involve calculations, simple enough in character, but of appalling labor. Higher mathematics here perform, in fact, something analogous to *skilled labor* in ordinary manufactures. The simplest illustration of this is in the use of LOGARITHMS (q. v.), which reduce multiplication, division, and extraction of roots to mere addition, subtraction, and division respectively. Powerful as logrithms are, analysis furnishes instruments almost infinitely more powerful. The large numbers which occur in probabilities are usually in the form of *products*, and we may exemplify the above remarks as follows.

To find the value of the product 1.3.5.7, no one would think of using anything but common arithmetic; but, if he were required to find the value of 1.3.5.7.9.....49, he would probably have recourse to logarithms, *merely to avoid useless labor of an elementary kind.* But in very simple questions in probabilities, it may be requisite to find (approximately) the value of a product such as 1.3.5.7.9..... .....23999—i. e., that of the first 12,000 odd numbers. No one in his senses would dream of attempting this by ordinary arithmetic, but it is the mere labor, not the inherent difficulty, which prevents him. Few would even attempt it by means of logarithms; for, even with their aid, the labor would be very great. It is here that the higher analysis steps in, and helps us *easily* to a sufficiently accurate approximation to the value of this enormous number. Thus, it appears that this objection to the study of the theory of probabilities is not applicable to their principles, which are very elementary, but to the mere mechanical details of the processes of solution of certain problems. *Third*—There are other objections, such as the (so-called) religious one, that 'there is no such thing as chance,' and that 'to calculate chances is to deny the existence of an all-ruling Providence,' &c.; but, like many other similar assertions, these are founded on a total ignorance of the nature of the science; and, therefore, although pernicious, may be safely treated with merited contempt. The authors of such objections remind us of the Irishman who attempted to smash Lord Rosse's great telescope, because 'it is irreligious to pry into the mysteries of nature.'

It appears to us that the best method of explaining the principles of the subject within our necessarily narrow limits, will be to introduce definitions, &c., as they may be called for, in the course of a few elementary illustrations, instead of elaborately premising them.

First Case.—The simplest possible illustrations are supplied by the common process of 'tossing' a coin, with the result of 'head' or 'tail.' Put H for head, and T for tail. Now, the result of one toss, unless the coin should fall on its edge (which is practically impossible), *must* be either

H or T.

Also, if the coin be not so fashioned as to be more likely to fall on one side than the other (as, for instance, is the case with loaded dice), *these events are equally likely;* or, in technical language, *equally probable.* To determine numerically the likelihood or the probability of either, we must assign some numerical value to *absolute certainty.* This value is usually taken as *unity*, so that a probability, if short of absolute certainty, is always represented by a proper fraction. Suppose that p (a proper fraction) represents the probability of H, then evidently p is also the probability of T, because the two events are equally likely. But one or other *must* happen; hence, the sum of the separate probabilities must represent certainty. That is,

$$p + p = 1, \text{ or } p = \frac{1}{2}.$$

Thus we have assigned a numerical value to the probability of either H or T, by finding what proportion each bears to certainty, and assigning to the latter a simple numerical value.

Suppose as a contrast, the coin to be an unfair one, such as those sometimes made for swindling purposes, with H on each side. Then we *must* have in one toss

H or H;

i. e., H is *certain*, or its probability is 1. There is no possibility of T, and therefore its probability is 0. Absolute impossibility is therefore represented by the numerical value of the probability becoming zero.

Second Case.—Suppose a 'fair' coin to be tossed twice in succession. The event *must* be one of the four—

H, H; H, T; T, H; or T, T.

Now all four are evidently equally likely; i. e., their probabilities are equal. But one of them *must* happen—hence the sum of their probabilities amounts to certainty, or 1. That is, each of the four cases has a probability measured by the fraction $\frac{1}{4}$.

Here we may introduce a new term. What are the *odds* against H, H? The answer is, the chance or probability of H, H is $\frac{1}{4}$; that is, *one* case in *four* is favorable, hence *three* are unfavorable, and the odds are said to be 3 to 1 against the event. *In general the odds against any event is the ratio of the probability that it will not, to the probability that it will, happen.*

Thus, in the first case above, the odds against H in one toss are even.

Third Case.—What is the chance of throwing both head and tail in two tosses of a coin? Remark that this is *not* the same question as, 'What is the chance of head followed by tail, in two tosses?' The latter question was answered in the *Second Case*, for the chance of H, T was there shown to be $\frac{1}{4}$. The present event contemplates *either* H, T or T, H—and its probability is therefore $\frac{1}{4} + \frac{1}{4}$, or $\frac{1}{2}$, since each has the separate probability $\frac{1}{4}$.

Or we may reason thus: Of the four possible cases of two tosses of a coin, *two* give both head and tail—*all four* are equally probable—hence the probability is 2 in 4, or 1 in 2; i. e, $\frac{1}{2}$.

Fourth Case.—What is the chance of throwing H in two tosses? Remark that this is *not* the same question as, 'What is the chance of H *once only* in two tosses?' The latter question is that of the Third Case merely put in a different form. Nor will it do to answer our question thus:

Chance of H in first throw $= \frac{1}{2}$.

Chance of H in second throw $= \frac{1}{2}$.

Therefore chance of H in two throws $= \frac{1}{2} + \frac{1}{2} = 1$.

For by this reasoning it would appear that we *must* get head once at least in two throws; which is obviously absurd, for we may have T, T.

This very elementary example shows how delicate the reasoning in this subject is, and how liable one is to make (complacently) the most preposterous mistakes.

The error of the above process is introduced by the fact, that we have not considered that *if H be obtained in the first throw, our object is attained, and no second throw is required.* The correct work is this—

Chance of H in first throw $= \frac{1}{2}$.

If H come, the game is finished.

Chance of T in the first throw, in which case we must throw again $= \frac{1}{2}$

Subsequent chance of H in second throw $= \frac{1}{2}$

Combining these, we have—

Chance of H at second throw *only* $= \frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$.

Add chance of H at first throw $= \frac{1}{2}$.

Sum, or chance of H in two throws $= \frac{3}{4}$.

A simpler method is this. The possible throws, all equally likely, are, as before—

H, H; H, T; T, H; and T, T.

The first three of these satisfy the requirements of the question; i. e., the required event has 3 chances in 4 in its favor, or its probability is $\frac{3}{4}$.

Fifth Case.—The chance of H in any one throw is $\frac{1}{2}$ (by *First Case*). The chance of H, H is $\frac{1}{4}$ (*Second Case*) Now $\frac{1}{4} = \frac{1}{2} \times \frac{1}{2}$; i. e., the chance of *joint occurrence of two independent events*, at least in this simple case, *is the product of their separate probabilities.* Contrast this with the principle, already several times employed, that the *probability of an event which may arise from one of a number of causes (no two of which can coexist), is the sum of the separate probabilities.* Simple proofs of these statements, in all their generality, will now be given, along with various other important propositions.

(A) If an event may occur in p ways, and fail in q ways—all being equally likely—the probability of its happening in one trial is $\frac{p}{p+q}$, and of its failing, $\frac{q}{p+q}$ —and the odds in its favor are $p : q$.

The simplest way of conceiving this, and many other hypothetical cases, is to suppose *one* ball to be drawn from a bag which contains a number of balls, differing from each other in color, or in some other quality not distinguishable by the touch. Suppose the bag to contain p white balls (W), and q black ones (B), and *one* ball to be drawn; what is the chance of its being white?

Here there are p chances in favor of a white ball being drawn, and q chances against it—these being *all equally likely*, or having *equal probabilities*—the chance of W is therefore p in $p + q$; i. e., is expressed by the fraction,

$$\frac{p}{p+q}.$$

The chance against W is q in $p + q$, or

$$\frac{q}{p+q}.$$

And the sum of these fractions is 1, or certainty, as it ought to be—for the ball drawn *must* be either W, or not W.

(B.) If an event may occur in p ways, and fail in q ways, all being equally likely—what are the chances of (a) its happening twice, (b) its happening the first, and failing the second, (c) its failing the first time, and happening the second, and (d) its failing twice, in two trials?

Taking the illustration in (A) above, we see that there are p independent ways of succeeding in the first case, and p in the second; hence, there are $p \times p$, or p^2 independent ways of *succeeding* twice. For any one of the first p may occur along with any one of the second. But the whole possible number of ways of experimenting twice is $(p + q)(p + q)$ or $(p + q)^2$; hence, the

Chance of (a) i. e. succeeding twice, is $\frac{p^2}{(p+q)^2}$.

Similarly, chance of (b) is $\frac{pq}{(p+q)^2}$.

" " " (c) is $\frac{qp}{(p+q)^2}$.

" " " (d) is $\frac{q^2}{(p+q)^2}$.

The sum of these is $\frac{p^2 + 2pq + q^2}{(p+q)^2} = 1$, as it ought.

(C.) An attentive consideration of (B) shows us that when we have the independent probabilities of two events, the probability that they will jointly occur is the *product* of their separate probabilities.

Thus, for W, in first trial, chance is $\frac{p}{p+q}$.

" " second " " " $\frac{p}{p+q}$.

Whose product is $\frac{p^2}{(p+q)^2}$; the probability of W in each of two successive trials.

Again, for W, in the first trial, chance is $\frac{p}{p+q}$.

" B " second " $\frac{q}{p+q}$.

Whose product is $\frac{pq}{(p+q)^2}$, which is found above to be the chance of WB. And so on.

(D.) This may be generalized as follows—the process will be evident to all who can understand the very elementary algebra employed:

$$\text{Certainty} = 1 = \frac{(p+q)^n}{(p+q)^n} =$$

$$\frac{p^n + np^{n-1}q + \frac{n.n-1}{1.2}p^{n-2}q^2 + \ldots\ldots + q^n}{(p+q)^n}$$

by the Binomial (q. v.) Theorem of Newton. Now the *parts* of this expression—i. e.,

$$\frac{p^n}{(p+q)^n}, \frac{np^{n-1}q}{(p+q)^n}, \ldots\ldots, \frac{q^n}{(p+q)^n}$$

represent, obviously, the chances of W n times, W $n-1$ times and B once, W $n-2$ times and B twice, ... , B n times, in n trials, where the *order* of occurrence is not considered.

If the *order* be considered, the chance of any arrangement, such as WBWWBBBW, for instance, is evidently

$$\frac{p \cdot q \cdot p \cdot p \cdot q \cdot q \cdot q \cdot p}{(p+q)^8} = \frac{p^4 q^4}{(p+q)^8}.$$

But the chance of 4W and 4B in 8 trials, *without respect to order*, is as above, the term containing p^4q^4 in the expansion of $(p+q)^8$, divided by $(p+q)^8$—i. e.,

$$\frac{70\, p^4 q^4}{(p+q)^8}.$$

To take a simple example: if there be 2W and 1B in a bag, and each ball be replaced immediately after drawing, the chance of W 4 times in succession is $\frac{2^4}{3^4} = \frac{16}{81}$.

Of the particular combination WBWB, the chance is $\frac{2}{3} \cdot \frac{1}{3} \cdot \frac{2}{3} \cdot \frac{1}{3} = \frac{4}{81}$.

But the chance of W twice, and B twice, *without respect to order*, is $6\frac{2^2 \cdot 1^2}{3^4} = \frac{24}{81}$; the numerator of the fraction being the term of $(2+1)^4$ which contains the product $2^2 \cdot 1^2$.

(E.) From the preceding results it is obvious that *the probability of the joint occurrence of any set of independent events is the product of their separate probabilities.*

(F.) We may vary the process by supposing that there are *several* bags, each containing some balls, which may be white or black; but the number in each bag, and the proportion of white to black, being any whatever. *One* ball only is to be drawn, what is the chance that it is W?

If n be the number of bags, the chance that the ball will be drawn from any particular bag is $\frac{1}{n}$ [see (A)]. And if in that bag there be p of W and q of B, the chance that W will be drawn from it is $\frac{p}{p+q}$ [see (A)].

Hence the chance that W is drawn, and from the particular bag is,

$$\frac{1}{n} \cdot \frac{p}{p+q} \text{ by (E).}$$

And the whole chance that W drawn is the sum of all the chances, $\frac{1}{n} \cdot \frac{p}{p+q}$ for each of the bags.

Thus let there be five bags, containing respectively, WB, WW, BB, WWB, WWW; our chance is found as follows: The chance of the ball being drawn from any particular bag is $\frac{1}{5}$, since all are equally likely to be chosen. Then, supposing the first chosen, the chance of W $\frac{1}{2}$; if the third be chosen, the chance of W is 0, &c. Hence on the whole, the chance of W is

$$\frac{1}{5} \cdot \frac{1}{2} + \frac{1}{5} \cdot 1 + \frac{1}{5} \cdot 0 + \frac{1}{5} \cdot \frac{2}{3} + \frac{1}{5} \cdot 1 = \frac{19}{30}.$$

(G.) Hence, *if an event may happen in consequence of any one of a set of causes, such that the action of one excludes that of the others; its probability is the sum of the products formed by multiplying the chance of the action of each cause by the chance that that cause, if operating, will produce the desired event.*

We might easily extend this very simple series of results, but our limits restrict us to an attempt to show more the *extent* of the subject than the details of its application to any particular set of questions. We therefore reluctantly pass to the consideration of an *inverse* problem or two.

(H.) An event has occurred, which may have arisen from any one of a set of mutually exclusive causes: to determine the probability that any particular cause was the efficient one—the probability of the event's happening, when any particular one of the causes operates, being known.

As a simple example will show us how to proceed in the most general case, take the 5 bags of (F) above. The chances of drawing W from them are, in order, $\frac{1}{2}$, 1, 0, $\frac{2}{3}$, 1. Suppose W *has* been drawn, what is the chance that it was drawn from any particular bag? It is obvious that the chance of W having been drawn from any particular bag is proportional to the chance that, if that bag had been selected, W would have been drawn from it. Hence, if p_1, p_2, p_3, p_4, p_5 be the chances that the several bags furnished the W actually drawn, we have

$$p_1 : p_2 : p_3 : p_4 : p_5 :: \frac{1}{2} : 1 : 0 : \frac{2}{3} : 1,$$

with the additional condition, that the ball *must* have been drawn from one of the bags, and therefore

$$p_1 + p_2 + p_3 + p_4 + p_5 = 1.$$

From these, by elementary algebra, we have

$$p_1 = \frac{3}{19}, p_2 = \frac{6}{19}, p_3 = 0, p_4 = \frac{4}{19}, p_5 = \frac{6}{19}.$$

And a very simple application of algebra will easily conduct us to the general formula for any such case.

(I.) If the nature of a cause is known only by its results, we have an interesting case of simultaneous application of the direct and inverse methods.

Thus, a bag contains 3 balls, each of which may be either black or white. A ball has been drawn from it on two occasions—replacing before drawing—and on each of these occasions the ball was W. What is the chance that a third drawing will give a *black* ball?

The contents of the bag are obviously one of the following—viz., W,W,W; W,W,B; or W,B,B—since it contains *one* W at least. Now if WWW be the contents, the probability of the observed event (two W in succession) is $1 \times 1 = 1$.

$$\text{If W,W,B,} \quad \frac{2}{3} \times \frac{2}{3} = \frac{4}{9}.$$

$$\text{If W,B,B,} \quad \frac{1}{3} \times \frac{1}{3} = \frac{1}{9}.$$

Hence the probabilities that these are, respectively, the contents of the bag are as $1 : \frac{4}{9} : \frac{1}{9}$, or as $9:4:1$; and are therefore $\frac{9}{14}$, $\frac{4}{14}$, and $\frac{1}{14}$ respectively, since their sum must be 1 or certainty.

Now for the chance of B in the third drawing; if WWW be the contents (of which the chance is $\frac{9}{14}$), the chance of B is 0. Hence we have one part of the chance for B, viz. $\frac{9}{14} \times 0 = 0$. Similar-

ly, the other parts are $\frac{4}{14} \times \frac{1}{3} = \frac{4}{42}$, and $\frac{1}{14} \times \frac{2}{3} = \frac{2}{42}$. The whole chance of B in the third drawing is therefore

$$0 + \frac{4}{42} + \frac{2}{42} = \frac{1}{7}$$

As exercises on the above principles, we will take first a few simple questions from Life Assurance, the subject to which, above all others, the elementary theory of Probability has been of the most indispensable service. We purposely choose the very simplest that the subject can furnish, but they are quite sufficient to show the great value of the theory.

A Table of Mortality (q. v.) gives the numbers alive at each successive year of their age out of a given number of children born. If A_n and A_{n+1} be the numbers in the table corresponding to the n^{th} and $\overline{n+1}^{th}$ years of age; the inference from the table is, that, of A_n individuals now alive, and of n years of age, A_{n+1} will live one additional year at least. Hence the chance that any one of them die during the year is

$$\frac{A_n - A_{n+1}}{A_n}.$$

Call this $1 - p$, then p is the chance that any one of them will survive the year.

Questions. Of two individuals, one n years old, and the other n_1, what are the chances that

(*a*.) Only one lives a year?
(*b*.) One, at least, lives a year?
(*c*.) Both do not live a year?

Calling the individuals A and B, the chance of A living out the year is p, and the chance of his dying within the year is $1 - p$. For B. these are p_1 and $1 - p_1$. Hence

(*a*) A lives and B dies—chance $p(1 - p_1)$.
B lives and A dies—chance $(1 - p)p_1$.

Hence answer to (*a*) is . . . $p + p_1 - 2pp_1$.

(*b*.) This includes, in addition to the conditions of (*a*), the chance that *both* survive, which is pp_1.

Hence answer to (*b*) is $p + p_1 - pp_1$.

(*c*.) In this case the chance that both *do* live a year is pp_1. Hence chance of (*c*) is $1 - pp_1$.

As another very instructive example, let us take the question, 'In how many throws of a die is it even betting that an ace will be thrown?'

This may, of course, be worked directly, proceeding in the following manner:

$$\text{Chance of ace in first throw} = \frac{1}{6}.$$

Then, remembering that there is no second throw unless the first fails,

$$\text{Chance of ace in second throw} = \frac{5}{6} \cdot \frac{1}{6}; \text{ and so on.}$$

Hence the odds against ace in 1 throw are 5 : 1.
" " " 2 throws 25 : 11;

and so on. But great care is requisite in this mode of working the problem.

The simplest procedure is this:

Chance *against* ace in 1 throw $\frac{5}{6}$.

" " " 2 throws $\frac{25}{36}$.

" " " 3 " $\frac{125}{216}$.

" " " 4 " $\frac{625}{1296}$.

Hence odds against ace in 1 throw 5 : 1.
" " " 2 throws 25 : 11.
" " " 3 " 125 : 91.
" " " 4 " 625 : 671.

That is, the odds are considerably *against* ace occurring in three throws, being about 11 to 8; while in four they are slightly in its favor, as 29 : 27 nearly. One is sure, therefore, of winning in the long run, if he can get any one to give him repeatedly an even bet against ace appearing in four throws of a die.

It is to be observed that when we say '*in the long run*,' we mean that the most likely event may not be that which will happen in the first trial, nor perhaps for many trials (because, unless its probability is 1 or certainty, it is of course, *possible* that it may never occur). But what is certain is this, that if a sufficient number of trials be made, we can have any amount of probability (short of certainty) that the ratio of the number of successful trials to the number of failures, will be in the ratio expressed by the odds in favor of success in any one trial.

And this introduces us to another department of the theory of Probabilities, what is called *Expectation*. We begin with a simple case, not involving what is called *Moral Expectation*, to which the next example will be devoted.

Suppose A, B, and C have made a pool, each subscribing £1; and that a game of *pure chance* (i. e., not dependent on skill) is to be played by them for the £3. What is (previous to play) the value of the expectation of each? By the conditions, all are equally likely to win the pool, hence its contingent value must be the same to each; and, obviously, the sum of these values must represent the whole amount in question. The worth of the expectation of each is therefore £1. That is, if A wishes to retire from the game before it is played out, the fair price which B or C ought to pay him for his share is simply £1. But this is obviously $\frac{1}{3} \times$ £3; i. e., the value of the pool mutiplied by his chance of getting it. Here we have taken an extremely simple case, because we have not room for the general proof (though it is closely analogous to that just given) that

The value of a contingent gain is the product of the sum to be gained into the chance of winning it.

So far, it has been assumed that the payment of his stake (which may be wholly lost) has not *morally* affected the position of any of the players; i. e., that the stake is a sum whose loss would in nowise embarrass him. And it is only with such cases that the strict mathematical theory can deal; for we cannot estimate with mathematical accuracy the value of the stake as depending on the fortune (the *possessions*, not the *luck*) of the player. The attempts which have been made to supply this apparent deficiency in the theory have, of course, not been very generally accepted. Still there is no doubt that two men of very unequal fortunes are placed in very different circumstances when they have subscribed equal sums to a pool which they have equal chances of gaining. The most commonly received method of *approximating* to a solution of such a question (for it is obvious that here we have left mathematical certainty behind) is that proposed by Daniel Bernoulli; which is, that the value of a small gain, or the inconvenience of a small loss, is directly proportional to the amount of the gain or loss (which is probably correct), and inversely proportional to the fortune of the person affected (which may be nearly true, except in very extreme cases). The application of this hypothetical principle necessitates, in general, the use of the integral calculus; but, to show the *mathematical folly* of gambling, we quote one of Bernoulli's results.

A, whose whole fortune is £100, bets £50 even with B on an event of which the chance is $\frac{1}{2}$. What is the moral value of A's fortune after making the bet (and before it is decided)? By applying the above method, he finds it to be £87. Thus A, by making the bet, has depreciated by 13 per cent. the value of his property. This is an extreme case, of course; and the method employed in obtaining the result is questionable; still it is certain that no legitimate method could show that A had otherwise than impaired his fortune by entering upon any such transaction. This, of course, is on supposition that the bet is a *fair* one; if A be a swindler, and get from B more than the proper odds against the event, he may, of course, improve to any extent the value of his fortune. But such would be a question of flats and sharpers not a question of probablity.

A very excellent example of *moral* as distinguished from *mathematical* probability is furnished by the famous 'St. Petersburg Problem.'

A and B play at heads and tails. A is to pay B £2 if H comes at the first throw, £4 if at the second and not before, £8 if at the third and not before; and so on, doubling each time. What should B pay (before the game) for his expectation?

Applying the mathematical method, we see that

$$\text{Chance of H at first throw} = \frac{1}{2};$$

in which case B gets £2, of which the contingent value is $\frac{1}{2} \times$ £2 = £1.

$$\text{Chance of H at second throw, and } \textit{not} \text{ before} = \frac{1}{4};$$

when B is to get £4, whose value is therefore $\frac{1}{4} \times$ £4 = £1.

Chance of H at third throw and not before $= \frac{1}{8}$

contingent value of B.'s £8 is therefore $\frac{1}{8} \times £8 = £1$.

And so on, for ever.

Hence B.'s expectation (mathematical) is £1 + £1 + £1 + &c. for ever, or an infinite sum. Now it is obvious that no man, in his senses, would pay even a moderately large sum for such a chance. Here the *moral* expectation comes into play; but the mathematical solution is perfectly correct, if we interpret it properly. *It does not attempt to tell what will be the actual result in ang one game—this is pure chance*—but it tells us what will be the average to which the results of larger and larger numbers of games *must* continually tend. In other words, if B. had an inexhaustible purse, he might safely pay *any* amount to A before each game, *and be sure of winning in the long run*, after an indefinitely great number of games were played. But this, though theoretically exact, is not applicable to mundane gambling—where limited purses and limited time circumscribe the field requisite for the proper development of the mathematical result.

Before quitting this part of the subject, we may give a couple of instances in which the mathematical theory may be easily tested by any one who has a little leisure. One of these we will develop at length, as a final instance of the simple calculations generally involved.

'To find the chance of throwing any given possible number with two dice.'

As the faces of the dice are numbered from 1 to 6—the smallest throw is 2, and the greatest 12.

In one throw, the chances are—

$$\text{For } 2 = 1 + 1; \frac{1}{6} \cdot \frac{1}{6} = \frac{1}{36};$$

the probabilities being *multiplied* (E) because the events are independent. For.

$3 = 1 + 2$, or $2 + 1$; $\frac{2}{36}$:

$4 = 1 + 3$, $2 + 2$, or $3 + 1$; $\frac{3}{36}$:

$5 = 1 + 4$, $2 + 3$, $3 + 2$, or $4 + 1$; $\frac{4}{36}$:

$6 = 1 + 5$, $2 + 4$, $3 + 3$, $4 + 2$, or $5 + 1$; $\frac{5}{36}$:

$7 = 1 + 6$, $2 + 5$, $3 + 4$, $4 + 3$, $5 + 2$, or $6 + 1$; $\frac{6}{36}$:

Then, in the inverse order—

$8 = 2 + 6$, $3 + 5$, $4 + 4$, $5 + 3$, or $6 + 2$; $\frac{5}{36}$:

and so on—the fact being that if we read the *lower* sides of the dice when the throw is 8, they will give 6, and so on—the sum being always 14.

The mathematical expectation for any one throw is therefore

$$\frac{1}{36} \cdot 2 + \frac{2}{36} \cdot 3 + \frac{3}{36} \cdot 4 + \frac{4}{36} \cdot 5 + \frac{5}{36} \cdot 6 + \frac{6}{36} \cdot 7 + \frac{5}{36} \cdot 8 + \frac{4}{36} \cdot 9 + \frac{3}{36} \cdot 10 + \frac{2}{36} \cdot 11 + \frac{1}{36} \cdot 12$$

In all—

$$\frac{1}{36}(2 + 6 + 12 + 20 + 30 + 42 + 40 + 36 + 30 + 22 + 12); \text{ or}$$

$$\frac{1}{36} \cdot 252 = 7.$$

The meaning of this is, *not* that we shall probably throw seven the first time, nor second, nor perhaps for many throws; but that if we throw a number of times, add the results, and divide by the number of throws, the final result will be more and more nearly equal to seven, the greater be the whole number of throws. It is very instructive to make the experiment, say on 100 throws of two dice, as in backgammon. If the mathematical result be not closely verified by such a trial, *the dice are loaded;* or, at least, are ill-made.

Another illustration, and a very excellent one, is furnished by the following theorem.

If the floor be ruled with equidistant parallel lines, and a straight rod, whose length is equal to the distance between any two contiguous lines, be dropped upon it at random, the chance of its falling on one of the lines is $\frac{2}{\pi}$, where π is the ratio of the circumference of a circle to its diameter (see QUADRATURE OF THE CIRCLE). The deduction of this result from the theory of Probabilities requires the use of the integral calculus, and cannot be given here; but we may put the above theorem to the test of practice in the following way. Let the rod be tossed a number of times, then the greater this number, the more nearly shall we have

$$\frac{\text{Twice number of throws}}{\text{Number of times the rod falls on a line}} = \pi = 3{\cdot}14159, \text{ &c.};$$

and therefore, by simply continuing this process long enough, we may obtain as accurate a value as we choose of the ratio of the circumference to the diameter of a circle.

To show how the theory of Probabilities would tend, if generally known, to the discouragement of gambling, would require a treatise—as every species of game would have to be treated—we shall therefore only take one case, about as bad a one as can be. This is when a man makes a 'book' on a horse race, so as to 'stand to win,' whatever be the result of the race. This is, of course, immoral; for, as it can make no matter who accepts his bets, suppose them all taken by one individual. The latter must therefore have been 'done' into a complex transaction by which he is *certain to lose*. The method of making such a 'book' is simple enough; it consists mainly in betting *against* each horse. Thus, if three horses, A, B, C, are to start, and he can get the following bets taken—

£4 : £3 against A,
£5 : £4 " B,
£6 : £5 " C;

his book stands thus :

If A win, he wins £4 + £5 — £4 or £5.
" B " " £5 + £3 — £5 " £3.
" C " " £4 + £3 — £6 " £1.

Now, to examine this case, suppose the *correct* odds to have been laid against A and B, what ought in fairness to be the odds as regards C ?

Chance of A winning is . . . $\frac{3}{7}$.

" B " . . . . $\frac{4}{9}$.

Chance of A or B winning . $= \frac{3}{7} + \frac{4}{9} = \frac{55}{63}$.

Hence, chance of C winning $= \frac{8}{63}$; and therefore the legitimate odds against C are 55 to 8, whereas our betting man has got a *fool* to accept 6 to 5.

The true cause of the detestation which attaches to gambling, is not so much the ruin, insanity, suicide, &c., in which it not unfrequently ends, as the fact, that a gambler's work in no case increases the wealth or comfort of the state; all it can effect is a more or less rapid and dishonest transfer of these from one state of distribution to another. It is as useless, so far as regards production, as the prison crank.

There is a common prejudice as to '*runs of luck*,' which are popularly supposed *not* to be compatible with the mathematical theory. This, also, is a complete delusion. To take a very simple case, the reader will easily see that, if he writes down all the possible cases which may occur in six tosses of a coin, the odds are 19 : 13 in favor of a run of three at least.

To give an instance of the principle of interpretation which we have several times above applied to the mathematical result—viz., that the greater the number of trials, the more nearly will the average result of these trials coincide with it—let us recur to heads and tails. Suppose a coin tossed ten times, and let H^n stand for H n times, then we have

$$1 = \left(\frac{1}{2} + \frac{1}{2}\right)^{10}$$

$$= \frac{1}{2^{10}}\left(1 + 10 + \frac{10 \cdot 9}{1 \cdot 2} + \frac{10 \cdot 9 \cdot 8}{1 \cdot 2 \cdot 3} +, \text{ &c.}\right)$$

of which the terms are [as in (D)] the probabilities of H^{10}, H^9T, H^8T^2, &c. respectively; the order not being taken account of. The largest term is the 6th, and its value is $\frac{252}{2^{10}} = \frac{252}{1024}$, or about $\frac{1}{4}$. This is the chance of H^5T^5, without regard to order, in ten throws. Although the most probable result, inasmuch as the chances of H^6T^4 and H^4T^6 are each about $\frac{1}{5}$ only, and those of the other possible combinations much smaller—yet it has not a very large chance. But the chance of a result *not deviating much from the*

most probable one, is very much larger: in the above case, the chance of having not less than 3H, and not less than 3T, is as much as $\frac{912}{1024}$. But this tendency of the bulk of the results to coincide very closely with the most probable one, is much more evident as we take a greater and greater number of trials. Thus, in 100 trials with the coin, we have—

$$1 = \left(\frac{1}{2} + \frac{1}{2}\right)^{100}$$

$$= \frac{1}{2^{100}}\left(1 + 100 + \ldots + \frac{100 \cdot 99 \cdot 98 \ldots\ldots 51}{1 \cdot 2 \cdot 3 \ldots\ldots 50} +, \text{ &c.}\right)$$

[*Now* we begin to see how the higher analysis comes in. Who is to work out by common arithmetic the value of the fraction $\frac{100 \cdot 99 \cdot 98 \ldots\ldots 51}{1 \cdot 2 \cdot 3 \ldots\ldots 50}$? Some calculating boy *might*, with no very enormous labor—but, wait a moment, we may wish to have the result of a million of trials, and what calculator (arithmetical) will tell us the value of

$$\frac{1{,}000{,}000 \times 999{,}999 \times \ldots\ldots \times 500{,}001}{1 \times 2 \times \ldots\ldots \times 500{,}000}?]$$

In this case, the most probable result is $H^{50}T^{50}$, without regard to order, but its chance is only about $\frac{2}{25}$. [The exact value is $\frac{1}{2^{100}} \cdot \frac{100 \cdot 99 \cdot 98 \ldots\ldots 51}{1 \cdot 2 \cdot 3 \ldots\ldots 50}$] Had there been 1000 throws, the chance of $H^{500}T^{500}$ (the most likely combination) would have been about $\frac{1}{38}$. But, as the number of throws increases, the number of terms grouped close to the largest in the expansion, and whose sum far exceeds that of all the rest, becomes a smaller and smaller fraction of the entire number of terms. Hence the chance that in 1000 tosses there should not be more than 600 nor less than 400 H, is much greater than that of not more than 60 nor less than 40 H in 100 throws; and so on.

Thus it is that all our statistical results, say the ratios of the numbers of births, marriages, suicides, &c. to the whole population—or that of the male to the female births—or that of the dead letters to the whole number posted, &c.—though perhaps never the same in any two years, yet fluctuate between very narrow limits. And thus it is that the theory of Probabilities has been the means of solidly establishing, beyond almost the possibility of failure, when properly applied, the inestimable securities afforded by life-assurance.

Another very important application of the theory is to the deduction of the *most probable* value from a number of observations (astronomical, meteorological, &c.), each of which is liable to error. We may confidently assert that, but for this, astronomy could not have taken the gigantic strides by which it has advanced during the present century. But the '*Method of Least Squares*,' as it is called, which is furnished for this purpose by the theory of probabilities, is far beyond the scope of elementary mathematics, and can therefore only be referred to here. Its fundamental features may be seen in the above process of determining the probability that the result of a number of trials shall lie within certain limits on each side of the most probable result.

The theory of Probabilities has been applied to many other important questions, of which we may mention only two—the value of evidence, and the probability of the correctness of the verdict given by various majorities in a jury. But for these, and for the further development of what we have given above from the simplest points of view, we must refer to the various treatises on the subject. Of these, the most accessible to an English reader are the very valuable works of Galloway and De Morgan. Poisson, Gauss, and especially Laplace, have also treated the subject in the most profound manner. But the difficulty of understanding Laplace's great work is such, that few have ever mastered it completely; and it is therefore particularly satisfactory that the late Professor Boole, in his *Laws of Thought*, has shown how to dispense with a great part of the analysis which renders Laplace's work so formidable.

PRO'BATE COURT is a court created in England in 1858, in lieu of the old Prerogative Courts, to exercise the exclusive jurisdiction in all matters touching the succession to personal estate. Since the Judicature Acts of 1873–75, the P. C. is included in the Probate, Divorce, and Admiralty Division of the new High Court of Justice. If a man at his death leaves a will, then it must be produced and verified, so as to prove that it is an authentic will, duly executed and signed in presence of witnesses, and therefore that the right to the personal estate is vested in the executors named by the will. The will is sworn to by the witnesses, on being produced; and if the evidence is satisfactory, it is registered, and the original deposited in the court, when copies are made. This process is called proving the will, and the act of court is called the probate of the will. If there is no will, then the rule being, that the personal estate devolves on the next of kin and widow, if any, it is necessary that an application be made to the court to appoint one of the next of kin to be the administrator, and take charge of the payment of debts. This is called taking out administration, and the act of the court appointing the administrators is called letters of administration. Numerous difficulties often arise as to irregularities in the making of wills and as to the party entitled to administration, and it is the function of the Court of Probate to dispose of these.

PROBOSCI'DEA, a section of *Pachydermata*, of which the characters are given under that head, contains one recent and one fossil genus, *Elephas* (see ELEPHANT) and *Mastodon* (q. v.); so that the P. seem not to have been numerous at any period of the world's history. Notwithstanding the great size of these creatures, comparative anatomists have pointed out various resemblances in their dentition, osteology, &c., to rodents.

PROBO'SCIS MONKEY. See NASALUS.

PRO'BUS, MARCUS AURELIUS, Emperor of Rome, was born at Sirmium, in Pannonia. His father, Maximus, served first as a centurion, and afterwards as a tribune in the Roman army, and died in Egypt, leaving to his only son a good name and a moderate income. P. early entered the army, and had the good fortune to attract the favorable notice of the Emperor Valerian, who elevated him before the legal period to the rank of tribune. His subsequent conduct justified his rapid promotion, for he greatly distinguished himself against the Sarmatians on the Danube, and subsequently in Africa, Egypt, Asia, Germany, and Gaul, winning golden opinions from Valerian's successors. Gallienus, Claudius II., Aurelian, and Tacitus. By the last-named emperor, he was appointed governor of the whole Asiatic possessions of Rome, and declared to be the chief mainstay of the Roman power; and such was the zealous attachment evinced for him by his soldiers, whose respect and love he had equally won by his firm discipline, by his care in providing for their wants and comforts, and his liberality in the distribution of plunder, that, on the death of Tacitus, they forced him to assume the purple; and his rival, Florianus, having been removed, P. was enthusiastically hailed emperor by all classes (276 A.D.). His brief reign was signalized by brilliant and important successes; the Germans, who, since Aurelian's time, had made Gaul almost a part of Germany, were driven out with enormous slaughter, pursued into the heart of their own country, compelled to restore their plunder, and to furnish a contingent to the Roman armies. Pursuing his victorious career, P. swept the inimical barbarians from the Rhætian, Pannonian, and Thracian frontiers, and forced Persia to agree to a humiliating peace. Various aspirants to the imperial purple were also put down.

On his return to Rome, P. celebrated these fortunate achievements by a triumph, and then, the external security of the empire being established, devoted himself to the development of its internal resources. The senate was confirmed in its privileges; liberal encouragement was given to agriculture; numerous colonies of barbarians were established in thinly-peopled spots, that they might adopt a civilized mode of life; and all branches of industry were protected and promoted. But P. was at a loss what to do with his army, as the Romans had now no enemies either at home or abroad; and fearing that their discipline would be deteriorated by a life of inactivity, he employed the soldiers as laborers in executing various extensive and important works of public utility. Such occupations, considered as degrading by the soldiers, excited among them the utmost irritation and discontent; and a large body of troops, who were engaged in draining the swamps about Sirmium, giving way to these feelings, under the excitement produced by the presence of the emperor, murdered him, 282 A.D. P. possessed great military genius, combined with equal administrative talent, and added to these a wisdom, justice, and amiability equal to that of Trajan or the Antonines.

PRO'CESS is the system of action by which a court calls parties into court for purposes of litigation. There are numerous rules governing the steps of process, but these are all of a technical nature.

PROCE'SSION OF THE HOLY GHOST, that doctrine regarding the Third Person of the Blessed Trinity which teaches that as the Son proceeds (or is born) from the Father, so the Holy Ghost proceeds (or emanates) from the Father and from the Son, but as from one principle. The question of the origin of the Holy Ghost was not distinctly raised in the early controversies, which fell chiefly upon the Second Person. In the Creed of Nicæa, no

allusion whatever is made to the subject; and in the Creed of Constantinople, the Holy Ghost is said simply to 'proceed from the Father.' Nevertheless, this was understood in the Latin Church to mean that, as the Son proceeds from the Father, the Holy Ghost proceeds from both Father and Son; and in the course of the 7th and 8th centuries, the words 'and from the Son,' for greater distinctness, came to be added to the creed in several churches—as the West. In the controversy with the Latins, Photius (q. v.) took exception to this addition, as unauthorized, and made the addition one of the grounds for his charge of heresy against them, which was resumed on the consummation of the schism under Michael Cerularius. In the union of the Greek and Latin churches at Florence (1437), an article of agreement on this head was adopted, and the words *Filioque* were sung twice over both in Latin and in Greek, in the solemn mass which celebrated the union. But this union had no root in the popular mind, and the dispute still continues as of old to divide the churches.

PROCE'SSIONAL (Lat. *processionale*), the service-book which contains the prayers, hymns, and general ceremonial of the different processions. Many ancient books of this class have been preserved. The processional approved for common use is that of Rome, of which many editions have been published.

PROCESSIONS, as solemn and religious rites, are of very great antiquity. With the Greeks and Romans, they took place chiefly on the festivals of Diana, Bacchus, Ceres, and other deities; also before the beginning of the games in the Circus; and in spring, when the fields were sprinkled with holy water to increase their fertility. The priests used to head them, carrying images of the gods and goddesses to be propitiated, and either started from certain temples or from the Capitol. Among the Jews, certain processions around the altar were (and still are to a certain extent) usual on the Feast of Tabernacles; and from them the Mohammedans have adopted their mode of encompassing the sanctuary seven times at Mecca (q. v.). Processions form a prominent part of the Buddhist worship. The practice was early adopted in the Christian Church. The Reformation abolished it; and even in the Roman Catholic Church, especially in mixed countries, processions are less frequent or popular now than in former years. They are there either supplicatory processions or cross processions, and are either directed to a certain distant place, to some miraculous image or object, or they are confined to the streets of the cities and the churches. Banners, crosses, and images are generally carried in front; the clergy follow; and the people make up the rear, singing hymns or reciting prayers. In some Protestant states, they are still permitted, under certain restrictions. There is no doubt that, whatever their general intrinsic value, they offer in many instances one of the most strikingly picturesque features of the Roman faith; and that they answer a certain instinctive want in the multitude. For extensive pilgrimages, as such, their history and rites, we refer to PILGRIM, MECCA, FESTIVALS, &c.

PROCHEIN AMI, the old Norman-French for next friend, still often used in English law, means the person in whose name an infant sues in a court of law, or a married woman in a court of equity. The chief object is to have a person responsible for costs. See NEXT FRIEND.

PRO'CIDA, an islet of Italy, between the island of Ischia and the shores of Naples, and separated from both of these by seaways about a mile in width, is three miles long and one mile broad. Pop. 13,810. On its shores is the city of the same name, with a commodious harbor, a fine regal palace, and a horrible state-prison, recently rendered famous by Carlo Poerio, who was confined there in chains.

PROCLAMA'TION, a public notice given by the sovereign to his subjects. The power of issuing proclamations is part of the prerogative of royalty as the fountain of justice. They sometimes consist of an authoritative announcement of some matter of state, or act of executive government affecting the duties of obligations of subjects. The demise of the crown, and accession of a new sovereign, a declaration of war, and the issue of new coin, are all occasions on which a royal proclamation is issued. A proclamation may also be issued to declare the intention of the crown to exercise some prerogative or enforce some law which has for a long time been dormant or suspended. In time of war, the crown by a proclamation may lay an embargo on shipping, and order the ports to be shut. But the most usual class of proclamations are admonitory notices for the prevention of offences, consisting of formal declarations of existing laws and penalties, and of the intention to enforce them; such as the proclamation against vice and immorality, appointed to be read at the opening of all courts of Quarter Sessions in England.

Proclamations are only binding when they do not contradict existing laws, or tend to establish new ones, but only enforce the execution of those which are already in being, in such manner as the sovereign judges necessary. A proclamation must be under the Great Seal. Statute 31 Henry VIII. c. 8 declared that the king's proclamations should be as binding as acts of parliament; an enactment which, while it subsisted, made an entire revolution in the government; but was repealed by 1 Edw. VI. c. 12. In later times, it was attempted to be maintained by the crown lawyers that the king might suspend or dispense with an existing law by proclamation; a power, however, which act 1 Will. and Mary c. 2 declared not to exist.

PRO'CLUS, called the successor (*Diadochos*)—i. e., of Syrianus, as the head of the Athenian school—a celebrated Neo-Platonist, was born in Constantinople in 412. He was of Lycian origin, and received his first instruction at Xanthus, in Lycia. He then studied at Alexandria under Arion, Leonaras, Hero, and especially under Heliodorus, with whom he applied himself chiefly to Aristotelian and Platonic philosophy. From thence he went to Athens, where a certain Plutarch, a philosopher, and his daughter, Asclepigieneia, became his instructors—the latter a priestess of Eleusis, chiefly in theurgic mysteries. The vivid imagination and enthusiastic temperament which in his childhood already had led him to believe in apparitions of Minerva and Apollo, naturally convinced, him when all the influences of the Mysteries (q. v.) were brought to bear upon him, still more of his immediate and direct intercommunication with the gods; and he distinctly believed himself to be one of the few chosen links of the Hermaic chain through which divine revelation reaches mankind. His soul had, he thought, once lived in Nicomachus the Pythagorean, and, like him, he had the power to command the elements to a certain extent, to produce rain, to temper the sun's heat, &c.

The Orphic Poems (q. v.), the writings of Hermes, and all that strangely mystical literature with which the age abounded, were to him the only source of true philosophy, and he considered them all more or less in the light of divine revelations. That same cosmopolitan spirit in religious matters which pervaded Rome towards her end, had spread throughout all the civilized 'pagan' world of those days, and P. distinctly laid it down as an axiom, that a true philosopher must also be a hierophant of the whole world. Acquainted with all the creeds and rites of the ancient Pantheons of the different nations, he not only philosophized upon them in an allegorizing and symbolizing spirit, as many of his contemporaries did, but practised all the ceremonies, however hard and painful. More especially was the practice of fasting in honor of Egyptian deities, while on the one hand, it fitted him more and more for his hallucinations and dreams of divine intercourse, on the other hand more than once endangered his life. Of an impulsive piety, and eager to win disciples from Christianity itself, he made himself obnoxious to the Christian authorities at Athens, who, in accordance with the spirit of religious intolerance and fanaticism which then began to animate the new and successful religion against which P. waged constant war, banished him from the city. Allowed to return, he acted with somewhat more prudence and circumspection, and only allowed his most approved disciples to take part in the nightly assemblies in which he propounded his doctrines. He died in 485, in his full vigor, and in the entire possession of all his mental powers, for which he was no less remarkable than for his personal beauty and strength.

Respecting his system, some modern philosophers have exalted it to an extent which his own works would hardly seem to warrant. Victor Cousin holds that he has concentrated in it all the philosophical rays which emanated from the heads of the greatest thinkers of Greece, such as Pythagoras, Plato, Aristotle, &c. P. recognizes a certain kind of unity of the Creator, or rather of the divine mind, of which he took the human to be a fragment; and he speaks of the 'One' and 'The First.' The human soul he considered wrapped up in various more or less dense veils, according to the degree of perfection attained; and he further assumed a certain sort of solidarity between the souls of those who naturally, or by certain immutable circumstances, were linked together, such as children and parents, rulers and subjects; and he carried this doctrine so far as to assert, that the children must naturally participate in their parents' faults. Faith alone, he further held, was essential to the attainment of Theurgy, which, comprising mantic and supernatural inspiration, is preferable to all human wisdom; and in this he chiefly differs from Plotinus (q. v.), with whose system he agrees in most other respects. He further tries to recognize and to fathom the original mysterious One by combination of figures, strongly reminding us of Gnosticism and the later Kabbala. His way of developing the finite beings out of the infinite Unit is also peculiar. A whole series of triads, at the head of each of which again stands a unit, goes in various gradations through the creation, the lower powers emanating from the higher, which are the thinking and creative ideas, &c. See PLOTINUS, GNOSTICS.

Of his manifold works, there have survived several hymns, which, by the true poetical and religious spirit which pervades

them, stand out most favorably among the generally inane Orphic hymns. Of his astronomical and mathematical writings, there have survived a short summary of the chief theories of Hipparchus, Aristarchus, Claudius Ptolemæus, and others, a work *On the Heavenly Spheres*, a Commentary on Euclid, and a work—only known in a Latin translation—*On the Effects of the Eclipses of the Sun and Moon*. His grammatical works consist of some commentaries on Homer, Hesiod, &c. The greater part of his writings is devoted to philosophy. These are partly commentaries and paraphrases of Platonic dialogue, and partly the embodiments of his own ideas in a systematic form. We thus have a work—again preserved in Latin only—*On Providence and Fate, On the Ten Doubts about Providence, &c., On Platonic Theology*, and other minor works, extant in a more or less fragmentary form, and repeatedly edited, with translations and modern commentaries. The most important of his works, however, is the *Philosophical and Theological Institution*, in which P. geometrically, as it were, evolves his doctrines by heading each of its 211 chapters by a kind of proposition, which he proceeds to demonstrate, appending corollaries in some instances. He chiefly treats in it of unity and multiplicity, on productive causes and effects, on the highest good, on that which suffices in itself, on immobility, perfection, eternity, divinity, and intelligence; on the soul, &c. Next in importance stand his commentaries on Plato's *Timæus*, which, however, now only embraces a third of this dialogue, a similar commentary on Plato's *Parmenides*, in seven books, on *Cratylus*, the *First Alcibiades*, and fragments on other Platonic writings. Some other works attributed to P. have by modern investigators been pronounced to be spurious.

PROCO'NSUL, a Roman magistrate not holding the consulship, who was invested with powers nearly approaching those of a consul, not, however, extending over the city and its vicinity. The proconsul was, at first, one who had held the office of consul, whose *imperium* was prolonged to enable him to bring an unfinished campaign to a close. The duration of the office was a year. During the latter period of the republic, when the consuls were expected to spend the year of their consulate at Rome, they were generally appointed at its close to undertake, as proconsuls, either the conduct of a war in some province, or its peaceful administration. Occasionally, the office of proconsul, with the government of a province, was conferred on a person who had never held the consulship. Under Constantine, parts of certain dioceses came to be governed by proconsuls.

PROCOP, ANDREW, the Hussite leader, known as P. the Elder, or the Holy, or the Shaven, in allusion to his having received the tonsure in early life, was born towards the close of the 14th c., and belonged to a noble family of Prague. After having traveled with an uncle for some years through France and Spain, he returned to Bohemia at the outbreak of the religious wars, in which Ziska (q. v.) took so prominent a part, and at once entered the ranks of the insurgent Hussites. His military genius soon raised him to the rank of an influential commander; and on the death of Ziska in 1424, P. was elected by the Taborites, who formed an important section of the Hussites, as their leader, and from this period to 1427, his history presents an almost unbroken series of daring attacks upon the Austrians. In the meantime, another body of Taborites, who called themselves Orphans, had overrun Lausitz, and burned Lauban, under the leadership of a man, subsequently known as Procop the Lesser, or Younger, who now, in concert with the more distinguished P., attacked Silesia, and took part in those internal feuds of the Hussite factions by which Bohemia was almost wholly ruined.

The threatened approach of three German armies, which had been levied by the neighboring states to carry on an exterminating crusade against the heretics, was alone able to restore unanimity to the divided Hussites, who, under the leadership of the two Procops, offered a desperate and successful resistance to the larger numbers of the Germans, subsequently pursuing their enemies with fire and sword through Silesia, Moravia, and Hungary, as far as Presburg. In 1429, P. made inroads into the German states as far as Magdeburg, and returned to Bohemia laden with spoil, and followed by a numerous band of captive nobles and knights; and in the following year, at the head of 50,000 men-at-arms, and half as many horsemen, he again broke into Misnia, Franconia, and Bavaria, and after having burned 100 castles and towns, and destroyed 1400 villages and hamlets, and carried off a vast amount of treasure, turned his arms against Moravia and Silesia. The Emperor Sigismund at this crisis offered to treat with him, but the imperial demand, that the Hussites should submit to the decision of a council, afforded P. a pretext for breaking off all negotiations with the imperial court. A second German crusading army now advanced in 1431, but was thoroughly defeated at Riesenburg. These successes, which were followed by others of nearly equal importance in Silesia, Hungary, and Saxony, where the princes had to purchase peace at the hands of the two Procops, on humiliating terms, induced the council of Basel to propose a meeting between the Hussite leaders and ten learned Catholic doctors. The meeting lasted fifty days, but was productive of no good result, and P. returned to Bohemia, where, combining his forces with those of Procop the Lesser, he laid siege to Pilsen. The council on this, passed an act, known as the Basel Compact, by which the Hussites were allowed the use of the cup in the Lord's Supper, and the Bohemians were designated by the title of the 'First Sons of the Catholic Church.'

The Taborites and Orphans, under the leadership of the two Procops, refused, however, to have anything to do with the pope, and hence dissensions arose between them and the more moderate of the Hussites. After many lesser encounters between these factions, a decisive battle was fought near Lipau in 1434, in which P. was induced, by a feint of the enemy, to leave his intrenchment. His followers at first fought desperately against the troops of the Bohemian nobles, who were commanded by Meinhard of Neuhaus; but at length, under the influence of a sudden panic, they gave way, and took to flight. P., after vainly striving to re-form their broken lines, threw himself into the midst of the enemy, and was killed. Procop the Lesser, following in his steps, was also slain, and with these two brave Hussite leaders the cause of the Taborites perished.

PROCO'PIUS, an eminent Byzantine historian, was born at Cæsarea, in Palestine, about the beginning of the 6th c., went to Constantinople when still a young man, and acquired there so high a reputation as a professor of rhetoric, that Belisarius, in 527, appointed him his private secretary. P. accompanied the great warrior in all his important campaigns in Asia, Africa, and Italy, and appears to have displayed remarkable practical as well as literary talent, for we find him placed at the head both of the commissariat department and of the Byzantine navy. He returned to Constantinople shortly before 542, was highly honored by Justinian, and appointed prefect of the metropolis in 562. His death occurred, it is thought, about three years later. P.'s principal works are his *Historiæ*, in 8 books (two on the Persian war, from 408 to 553; two on the war with the Vandals, from 395 to 545; four on the Gothic war, going down to 553); *Ktismata*, or six books on the buildings executed or restored by Justinian; and *Anekdota*, or *Historia Arcana* (of doubtful genuineness), a sort of *chronique scandaleuse* of the court of Justinian, in which the emperor, his wife Theodora, Belisarius, *his* wife Antonina, and other distinguished persons, are depicted in the darkest colors.

The most valuable of these productions is undoubtedly the first, in which P. writes with the clearness, weight, and fulness of knowledge that might be expected of a man who had been an eye-witness of much of what he narrates, and who had occupied a position that fitted him to thoroughly understand what he had seen. He is the principal authority for the reign of Justinian. His style is pure, vigorous, and flexible. The best edition of his complete works is that by Dindorf (3 vols., Bonn, 1833—1838).

PRO'CRUSTÉS (Gr. 'the Stretcher'), the surname of a celebrated robber of Attica, named Damastes, or Polypemon. According to the ancient legend, he was wont to place all persons who fell into his hands upon a bed which was made either too long or too short for them, and where he racked their limbs till they died. This he continued to do until Theseus overpowered him, and made him suffer the tortures he had inflicted on others. The story has given rise to a figurative expression. When an author is subjected by a critic to a cruel or unfair mode of criticism, he is said to be stretched on 'the bed of Procrustes.'

PROCTER, BRYAN WALLER, an English poet, better known as BARRY CORNWALL, was born 21st Nov. 1787, and educated at Harrow. He studied law, was called to the bar in 1831, and for many years was one of the Commissioners of Lunacy, but resigned in 1860. His *Dramatic Scenes and other Poems*, were published in 1819, and he subsequently produced several volumes, both of verse and prose, the most important being *Mirandola, a Tragedy*, produced with great success at Covent Garden. As a poet, P. belongs to the school of Keats and Hunt, and through all his works, the influence of the old English dramatists may be traced. It is not, however, on his *Dramatic Scenes* or his tragedies, but on his *English Songs and Lyrics*, that P.'s reputation rests. He may fairly be considered the best of our modern English song-writers. He died Oct. 4, 1874. *Bryan Waller P., an Autobiographical Fragment, with Biographical Notes*, appeared in 1877.—His daughter, ADELAIDE ANNE P., well known as a poetess, was born in 1825, and died in February 1864.

PRO'CTOR (formed by contraction from Lat. *procurator*, one who cares for another) is the name given to the practitioners in Courts of Admiralty, and in the Ecclesiastical and Prerogative Courts. It corresponds to attorney or solicitor in the other courts. By a recent statute, which abolished the exclusive jurisdiction of the Admiralty and Prerogative Courts, now the Probate Court, all proctors were put on the same footing as attorneys and solicitors, and the power to practise in the new courts indifferently was given to each; and at the same time compensation was given for

the loss of their monopoly. The mode by which one becomes a proctor is therefore the same as that by which one becomes an Attorney or Solicitor (q. v).

PROCTORS, officers in the universities of Oxford and Cambridge (two in number in each), whose duties are to preserve the peace of the university, to repress disorders among the students, and inflict summary academical punishment. They have the command of the academical constabulary force, and have also an extensive police jurisdiction in the town. The proctors must be Masters of Arts, and are chosen by the colleges according to a certain rotation. They nominate two pro-proctors to be their deputies and assistants. The summary authority of the proctors extends both to undergraduates and Bachelors of Arts. They have also a legislative authority as assistants to the heads of houses, and vote in the election of some of the professors and other officers.

PRO'CURATOR-FI'SCAL, a legal practitioner in Scotland of some consequence, owing to his being the public prosecutor for a local district. He is generally a local procurator, or law-agent, and is appointed by the sheriff of the county, or in cities and towns by the magistrates. His business is to take the initiative in the prosecution of crimes. There being no coroner's inquisition in Scotland, he does the work which that functionary does in England. Whenever he has reason to believe a crime has been committed, his duty is to apply for a warrant to arrest the alleged criminal, or to summon him before the sheriff, when the witnesses are cited, and are precognosced—that is, they give what evidence they are in possession of. All the inquests and examinations of the procurator-fiscal are conducted privately; neither the press nor the public being allowed to be present. This arrangement, as tending to huddle up that which should be fully known—as, for example, the cause of catastrophes attended with loss of life—has latterly been the subject of earnest remonstrance. If the procurator-fiscal is informed of a crime which he thinks was either not committed, or of which there is no evidence satisfactory, he gives his concurrence merely to the private party who suggests it, but does not himself initiate the proceeding. When the procurator-fiscal takes the precognitions of the witnesses, he sends a copy of them to the crown counsel, of whom the Lord Advocate is the chief; and if these counsel think the evidence is strong enough, and warrants more than suspicion, the prosecution is proceeded with to trial. The procurators-fiscal are now paid by salaries according to the population of the district.

PRO'DIGY. See OMEN.

PRODU'CTION OF DOCUMENTS is often required in legal proceedings, or in the course of a suit, in Scotland, as well as in other countries; but it depends on the nature of the suit when and under what conditions the documents must be produced. As a general rule, whenever a right is founded on a document, that document must be produced or shown to the court which has to determine the nature of the right.

PRODUCTIVE, and UNPRODUCTIVE, LABOR. See LABOR.

PROFE'SSOR, an officer in a university whose duty it is to instruct students, or read lectures on particular branches of learning. In the early times of universities, the degrees conferred on students were licenses to act as public teachers; and the terms Master, Doctor, and Professor were nearly identical in signification. As, however, the body of graduates ceased in the course of time to have any concern in public teaching, a separate class of recognized teachers sprang up, paid sometimes with salaries, in other instances by fees. These were called professors; and in the German and Scottish universities became the governing body, and sole recognized functionaries for the purpose of education. In the universities in which collegiate foundations prevailed, as Oxford and Cambridge, they became, on the other hand, only secondaries or auxiliaries, attendance on their lectures not being generally deemed indispensable, and the necessary business of instruction being carried on by the functionaries of the several colleges.

The word professor is occasionally used in a loose way to denote generally the teacher of any science or branch of learning, without any reference to a university. It has been assumed as a designation not only by instructors in music and dancing, but by conjurors.

PRO'FILE, the outline of a section through a cornice or other series of mouldings,—The outline of a capital when drawn geometrically; the outline of the human face in a section through the median line; &c.

PROGNO'SIS (from the corresponding Greek word) is the term employed in medicine to indicate the opinion or decision of the physician regarding the probable course and issue of a disease. The physician is guided in arriving at his decision by his knowledge of the course which the disease usually follows; and as some diseases almost always end in recovery, and others almost invariably terminate fatally, the final result may often be predicted with great confidence. In forming a prognosis, the physician must, however, not only take into his consideration the natural history of the individual disease, but numerous modifying influences, such as age, sex, mode of life, previous state of health, &c.

PRO'GRESS OF TITLES, in Scotch Law, means the series or chain of conveyances by which a proprietor of lands establishes his right to property. As these titles are the sole evidences of property, the progress of titles—i. e., a short statement of the nature of each conveyance, in their historical order—is first given to a purchaser, to show that the vendor is able to sell. See SALE OF LAND.

PROGRE'SSION, in Arithmetic, is the succession, according to some fixed law, of one number after another. A series of numbers so succeeding one another is said to be 'in progression.' Progression may be of various kinds, but the three forms of most frequent occurrence are *Arithmetical Progression* (q. v.), *Geometrical Progression* (q. v.), and *Harmonical Progression*. The conditions of the harmonical progression of a series are frequently stated as follow: *three numbers are in harmonical progression, when the first has to the third the same ratio that the excess of the first over the second has to the excess of the second over the third*, i. e., a, b, c are in harmonical progression when $a : c :: a - b : b - c$; but a much simpler conception of it is obtained by means of one of its properties, viz., that if the terms of a harmonical series be inverted, they form a series in arithmetical progression; thus, 1, 2, 3, 4, 5, 6, &c. is an arithmetical progression; and 1, $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{1}{6}$, &c. is a harmonical progression; 1, $\frac{1}{2}$, 0, $-\frac{1}{2}$, -1, &c. is an arithmetical progression; and 1, 2, ∞ (infinity), -2, -1, &c. is a harmonical progression. This series is principally important in connection with the theory of music, in determining the length of the strings of instruments. See MUSIC.

PROGRESSION, MUSICAL, the regular succession of chords or movements of the parts of a musical composition in harmony, where the key continues unchanged, is called Progression; where a new key is introduced, it is not progression, but Modulation (q. v.). Musical compositions move from note to note either by degrees, when the interval does not exceed, or by skips where it does exceed a whole tone. Motion in music of two parts is of three kinds: oblique, when one part repeats or holds on the same note, while the other moves up or down; direct, when both parts move in the same direction; and contrary, when one moves up, and the other down. In progressing from chord to chord, it is in general desirable to retain every note common to both chords in the same part in which it appeared in the first chord, and to assign every new note to that part in the second chord which is nearest to it. There are certain chords which require to be followed by certain others in order to resolve them (see RESOLUTION); and there are certain progressions which must in ordinary cases be avoided, more particularly consecutive fifths and consecutive octaves, the latter being, however, admissible when employed to strengthen a part.

PROHIBI'TION. Prohibitive duty refers to a practice, obsolete in this country, of prohibiting the importation of goods, with the view of encouraging native industry. See FREE TRADE.

PROHIBITION is a writ in England proceeding out of a superior court of law to prohibit or prevent an inferior court from proceeding to hear or dispose of a suit or matter over which it has no jurisdiction.—In Scotch law, the same word means a technical clause in a deed of entail by which the heir of entail is prohibited from selling the estate, or contracting debt, or altering the order of succession under pain of forfeiture, which forfeiture is declared by another supplemental clause called a resolutive clause.

PROJE'CTILES, THEORY OF, is the investigation of the path or *trajectory*, as it is called, of a body which is projected into space in a direction inclined to that of gravitation. A body thus projected is acted upon by two forces, *the force of projection*, which, if acting alone, would carry the body onwards forever in

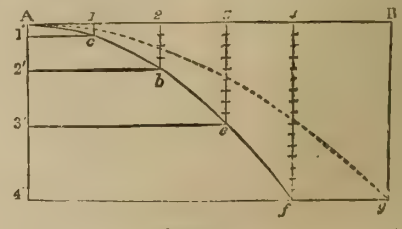


Fig. 1.

the same direction and at the same rate; and *the force of gravity*, which tends to draw the body downwards towards the earth. The force of projection acts only at the commencement of the body's motion; the force of gravity, on the contrary, continues to act effectively during the whole time of the body's motion,

drawing it further and further from its original direction, and causing it to describe a curved path, which, if the body moved in a vacuum, would be accurately a parabola. This is readily seen by considering fig. 1, in which A represents the point from which the body is projected (suppose the embrasure of a fort); AB the direction of projection (horizontal in this instance); A1 the distance which would be passed over by the projectile in unit of time if gravity did not act; 1—2, the distance which would similarly be described in second unit of time; 2—3, 3—4, &c. the distances corresponding to the third, fourth, &c. units of time—all these distances being necessarily equal, from the impulsive nature of the force of projection; A1′, again, represents the distance which the projectile would fall under the action of gravity alone in the first unit of time; 1′—2′ the distance due to gravity in the second unit of time; 2′—3′ the distance due to the third unit, &c., the distances A1′, A2′, A3′, &c., being in the proportion of 1, 4, 9, &c. (see FALLING BODIES); hence, by the well-known principle of the *Composition of Forces and Velocities* (q. v.), we find at once, by completing the series of parallelograms, that at the end of the first unit of time the body is at *c*, at the end of the second at *b*, at the end of the third at *e*, &c. Now as the lines 1′*c*, 2′*b*, 3′*e*, &c. increase as the numbers 1, 2, 3, &c., and the lines A1′, A2′, A3′, &c. as the numbers 1^2, 2^2, 3^2, it follows that the curve A*cbe* is a Parabola (q. v.).

As, by the second law of motion, each force produces its full effect undisturbed by the other, it follows that the projectile reaches *f* in the same time as it would, without being projected, have taken to fall to 4′. A greater velocity of projection would make it take a wider flight; but at the end of four seconds, it must still be at some point in the same horizontal line—at *g*, for example.

In order to determine exactly the motion of a projectile, and to find its range, greatest altitude, and time of flight, it will be necessary to examine its nature more technically—for which some slight knowledge of algebra and trigonometry is requisite. Let the body in this instance be projected obliquely to the direction of gravity, from the point A (fig. 2) in the direction AT, and let the velocity

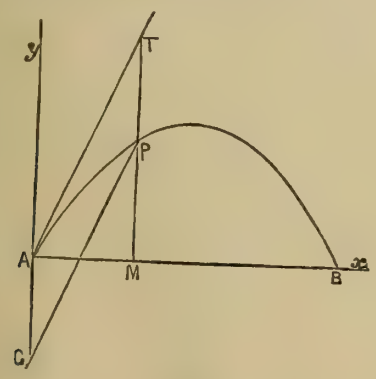


Fig. 2.

of projection *v* be sufficient, if gravity were not to act, to carry it to T in *t* units of time, and let the force of gravity, if allowed to act upon it at rest, carry it to G in the same time; then, as before, the body, under the action of both forces, will be found at P (which is found by completing a parallelogram of which AT and AG are the sides) at the end of *t* units of time, having fallen through a distance equal to TP (not at once, but in a constant succession of minute deflections, as indicated in fig. 1) in that time. Let *t* represent the time of flight, *v* the velocity due to projection, *g* the accelerating force of gravity, and let A be the angle of elevation TAB; then AT = *vt*, TP = $\frac{1}{2}gt^2$, TM = *vt* sin. A; and consequently PM (or *y*) = *vt* sin. A.—$\frac{1}{2}gt^2$(I.), and AM (or *x*) = *vt* cos. A.

Now, if we find from the last two equations the values of *t*, and equate these values, we obtain, by an easy algebraic process, the equation $y = x \tan. A - \frac{gx^2}{2v^2 \cos.^2 A}$; and if the height through which the body must fall to acquire a velocity equal to the velocity of projection be called *h*, then $v^2 = 2g \cdot h$, $h = \frac{v^2}{2g}$, $4h = \frac{2v^2}{g}$, and $\frac{1}{4h} = \frac{g}{2v^2}$, substituting which in the equation, we obtain $y = x \tan. A - \frac{x^2}{4h \cdot \cos.^2 A}$ (II), as the equation to the path of a projectile, where *x* is the horizontal distance, and *y* the corresponding height above the level of the point of projection.

Suppose, now, that we wish to find the *time of flight* on the horizontal plane, it is evident that at the end of its flight the projectile will be at B, and *y* will be equal to zero; hence, putting *y* = *o* in equation I., we obtain $t = \frac{2v \text{ sin. } A}{g}$. The *range* or distance AB is similarly found by putting *y* = *o* in equation II., when *x* is found to be equal to 4*h* sin. A cos. A, or 2*h* sin. 2A. The *greatest altitude* is evidently the point which the projectile has attained at the end of half the time of flight, or after it has traversed half its horizontal range, hence, by putting $x = 2h$ sin. A cos. A in equation II., or $t = \frac{v \text{ sin. } A}{g}$ in equation I., we obtain $y = h$ sin.^{2}A. A slight examination of the expression for the range will show that it is greatest when the body is projected upwards at an angle of 45° to the horizon, and that a body projected at a greater angle than 45° has the same range as one projected at an angle correspondingly less (fig. 3).

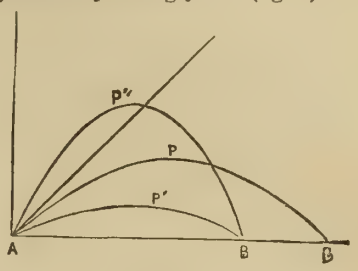


Fig. 3.

These results, however, do not correspond to the actual circumstances of the case, except when the projectile possesses considerable density and its motion is slow, for in all other cases, the resistance of the air, which increases in a rapid ratio with the velocity of the projectile, causes it to deviate very considerably from a parabolic orbit, especially during the latter half of its course (fig. 4). The problem of the motion of a projectile thus

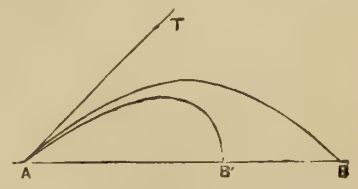


Fig. 4.

complicated becomes of considerable difficulty; partly because our knowledge of the law of resistance of the air is imperfect (it was supposed by Newton to be proportioned to the square of the velocity), and partly because the law varies with every minute change in the form, size, and density of the body projected, so that, under these circumstances, the beautiful and simple theory sketched above is practically useless. The chief illustrations of the theory of projectiles are the motion of missiles thrown by the hand, or arrows impelled from a bow, in both of which cases the resistance of the air is comparatively ineffective, the velocity being small: in the far more important case of ball-practice, whether with fire-arms or heavy ordnance, its effects are so powerful as to render the laws of gunnery mere deductions from experience. See RIFLE AND RIFLED ORDNANCE, and GUNNERY.

PROJE'CTION is the representation on any surface of objects or figures as they appear to the eye of an observer. It thus includes Perspective (q. v.), and is most simply illustrated by the shadow of an object thrown by a candle on a wall; the shadow being the projection, and the place of the light the position of the eye. The theory of projections is of great importance, both in mathematics and geography, being, in the former case, perfectly general in its application; while in the latter only the projection of the sphere is required.

Projections of the sphere are of various kinds, depending upon the position and distance of the eye from the sphere, and the form of the surface on which the projection is thrown; thus, we have the *orthographic*, *stereographic*, *globular*, *conical*, and *cylindrical or Mercator's* projections, all of which are treated of under the article MAP. Another projection frequently employed is the *gnomonic*. In the gnomonic projection, the eye is supposed to be situated at the center of the sphere, and the surface on which the projection is thrown is a plane surface which touches the sphere at any one point (called the *principal point*). It is evident that a map constructed on the gnomonic projection is sensibly correct only for a circular area whose circumference is at a small angular distance

from the principal point. From the position of the eye in the gnomonic projection, it follows that all great circles, or portions of great circles, of the sphere are represented by straight lines, for their planes pass through the eye. The distance of two points on the sphere, when measured along the surface, is least if they are measured along a great circle; and as the distance of the projections of these points on the plane is represented by a straight line, which is the shortest distance btween two points on a plane, this projection, if employed in the construction of mariners' charts, would at once show the shortest course. Maps of the earth's surface have been projected by the gnomonic method, the surface of projection being the interior surface of a cube circumscribing the sphere, and the complete series consequently amounting to six maps; but it is not fitted for the construction of maps of large portions of the earth's surface. The gnomonic projection derives its name from its connection with the mode of describing a gnomon or Dial (q. v.). The orthographic, and stereographia projections were employed by the Greek astronomers for the construction of maps of the heavens; the former, or *analemma*, being the best known and most used. The stereographic, called *planisphere* by the Greeks, is said to have been invented by Hipparchus, and the gnomonic is described by Ptolemy. The others are of modern invention.

In Mathematics, the theory of projections is general in its application, and has been employed within the last few years to generalize the ancient geometry, and as a powerful aid to algebra. Its basis is the investigation and determination of those properties which, being true of a figure, are also true of its projections, such properties being necessarily dependent, not on the 'magnitude,' but on the 'position' of the lines and angles belonging to the figure. These properties are generally denominated *projective properties*. For instance, the three conic sections, the parabola, ellipse, and hyperbola, are merely various projections of a circle on a plane, and all 'positional' properties of the circle are at once, by this theory, connected with similar properties of the three conic sections. The theory is also largely employed in demonstrative mechanics.—See, for further information, Mulcahy's *Modern Geometry*, Salmon's *Conic Sections*, Monge's *Géométre Descriptive*, Poncelet's *Propriétés des Figures Projectives*, and Poisson's *Traite de Mécanique*.

PROLA'PSUS A'NI is a common affection of the termination of the intestinal canal, and consists in an eversion of the lower portion of the rectum, and its protrusion through the anus. It may depend on a naturally relaxed condition of the parts, as in infancy, or may be caused by violent straining, in cases of costiveness, piles, &c. Whenever it occurs, the parts should be washed, and, if possible, replaced by careful pressure with the hand; and if they do not easily return, the forefinger should be oiled, and pushed up into the anus, and it will convey the protruded intestine with it, after which the patient should retain the recumbent position for some hours. If it cannot be returned by the above means, surgical assistance should be at once sought. In order to remove the tendency to prolapsus, the patient should regulate his bowels so as to avoid costiveness, should sponge the parts after every evacuation with cold water or soap and water, and if necessary, use astringent injections, as, for example, a weak solution of sulphate of iron, one grain to the ounce. Dr. Druitt (in his *Surgeon's Vade Mecum*) recommends a plan first suggested by Dr. M'Cormac—namely, that when the stools are passed, the skin near the anus should be drawn to one side with the hand, so as to tighten the orifice. If, after the adoption of these means, the bowel continues to descend, certain surgical means must be resorted to, as destroying a small portion of the relaxed mucous membrane by the application of nitric acid, or pinching up a few folds of the protruded membrane with the forceps, and applying ligatures to them.

PROLA'PSUS U''TERI—known also as PROCIDENTIA or DESCENSUS UTERI, by writers on the diseases of women; and as 'falling down of the womb,' or 'bearing down,' among non-professional persons—consists essentially in a depression of the womb below the natural level in the pelvis. It is a common affection amongst all ranks, and is most frequent in women beyond the middle age who have borne large families. It has, however, been met with in women who have not borne children, in virgins, and even (although very rarely) in children. It may occur in every degree, from the case in which the mouth of the womb is a little lower than its natural level, to that in which the womb itself projects externally, and forms a protruding tumor as large as a melon. In the latter case, it displaces by its traction the bladder, rectum, and other important structures. The prolapse is termed *imperfect* as long as there is no external protrusion, and *perfect* when the womb is protruded externally. The causes of these different degrees of prolapse are the same, and the symptoms differ only in intensity. The immediate causes are, according to Sir C. Clarke: (1.) Relaxation of the ligaments of the uterus; (2), a want of due tone in the canal leading from the uterus to the external surface. The latter is probably the chief cause. After many child-bearings, it remains dilated, and its walls lose their resisting power. Similar effects result from repeated uterine hæmorrhage, leucorrhœa, (popularly known as the *Whites*), and general debility. Under these conditions, a very slight downward force will depress the womb; and this force is supplied by the increased weight of the organ itself, if the patient sit up or walk soon after delivery, by violent vomiting or straining (when the bowels are constipated), by the endeavor to lift heavy weights, &c.

The symptoms arise partly from the pressure of the womb on other organs, partly from the simultaneous displacement of adjacent parts (as the bladder, rectum, &c.), and partly from reflex action (see NERVOUS SYSTEM). Patients with only a slight displacement usually complain of a sensation of fulness in the pelvis, of weight and bearing down, of dragging from the loins, often amounting to pain in the back, these symptoms being aggravated when the upright position is assumed. Strangury (q. v.) is occasionally present, and if the womb descend low or protrude, there is always more or less difficulty in evacuating the contents of the bladder and rectum. The digestive organs soon become affected through reflected nervous influence. It is a remarkable fact, that the general health is often much worse in those cases in which there is a slight depression, than in those in which the prolapse is complete, and the womb forms an external tumor.

The treatment varies with the degree of displacement. In the milder cases, medicine should be administered with the view of giving tone to the mucous membrane of the relaxed canal; while in the severe cases, mechanical support is requisite. In comparatively mild cases, prolonged rest in the horizontal position should be enforced, and cold water (from half a pint to a pint) should be slowly injected, night and morning, into the canal leading to the uterus, by means of an elastic bottle, the patient being in the recumbent position as she receives the injection. If this treatment is insufficient, astringent injections, as decoction of oak-bark or of galls, or a solution of alum (an ounce to the pint of water), should be tried. If, however, there is any congestion or inflammation of the parts, astringents must be avoided. In a case of complete prolapse, the first duty of the practitioner is to attempt to restore the womb to its natural position. It is sometimes necessary to place the patient in a warm bath, or to apply fomentations or leeches to the tumor before it can be replaced; and occasionally, irreducible cases occur, in which it may be necessary to remove the organ altogether. But suppose it returned to its position, a repetition of the prolapse has to be prevented. The ordinary method is by the introduction of a pessary—an instrument of an oval or globular form, and usually made of box-wood, which mechanically supports the uterus in its normal position. See the works of Churchill, West, and others *On the Diseases of Women*. In some cases, a compress and bandage will afford sufficient support; while in other cases a surgical operation similar to that which is performed for *Prolapsus Ani* (q. v.) is expedient.

PROLÉTAIRES, a term used by the French (from whom it has been partially adopted by recent English and German writers) to denote the lowest and poorest classes of the community. It is derived from the Latin *proletarii*, the name given in the census of Servius Tullius to the lowest of the centuries, who were so called to indicate that they were valuable to the state only as rearers of offspring (*proles*).

PROME'THEUS (Forethought), the son of the Titan Iapetus and of Clymene, brother of Atlas, Menœtius, and Epimetheus (Afterthought)—or, according to other legends, the son of Iapetus and Asia, or of Uranus and Clymene, or of Eurymedon and Here—the father of Deucalion, Hellen, Lykus, and Chymœrus. The myth of P. is one of the oldest of Greek antiquity, being mentioned by Hesiod, and is briefly as follows:—Once, under the reign of Zeus, men and gods were disputing with one another at Mecone; P., with a view to outwit Zeus, cut up a bull, and divided it into two parts, hiding the meat and the intestines in the skin, and putting a bad piece (the stomach) at the top of it; while he laid in another heap the bones, which were covered with fat. Zeus pointed out the unequal division, but was asked to choose, whereupon he guessed the deceit practised, and selected the good portion; but irate at the stratagem, he avenged himself on the mortals by withholding from them the fire necessary for the cooking of the meat; whereupon P. stole it in a hollow staff, and brought it to them. Zeus, to punish the mortals, caused Hephæstus to mould a virgin of rapturous beauty, Pandora, whom Epimetheus was unwise enough to receive as a present from Hermes; and thus brought, through her box, all imaginable ills that flesh is heir to upon humanity. P. himself was chained to a rock, and an eagle sent to consume his liver in daytime, while Zeus caused it to grow again at night. Herakles, however, killed the eagle, and, by the permission of Zeus, delivered the suffering Prometheus. Thus far Hesiod's legend.

Æschylus, in his tragedy with the name of the hero, has per-

petuated another view of the myth. P., according to him, is an immortal god, a friend of the human race, who does not shrink even from sacrificing himself for their salvation. He is the long-suffering hero, who, although overcome by Zeus's superior might, yet does not bend his mind. He at first assists Zeus against his own kindred, the Titans, and even opens his head at the birth of Minerva. But when Zeus, having come to the throne, conceived evil plans against mankind, wishing to destroy them entirely, in order to create a new race, P. throws himself into the breach; and while taking from them the evil gift of foreseeing the future, gives them the two infinitely superior gifts of hope and of fire. He is the inventor of architecture, astronomy, writing, figures, medicine, navigation, the mystery of prophecy, the arts of working in metal, and all other arts which embellish and adorn life. For these boons conferred on the human race, he is, by Zeus's order chained to a rock in Scythia by Hephæstus, who fulfils this task reluctantly. Here he is visited by the Oceanides, by Io, who tells him of her own miserable wanderings, and by Hermes, who endeavors to find out that which P. only knows, viz., who will be the son of Zeus and his successor. Refusing to devulge this secret, he is struck by Zeus's lightning, and hurled into Tartarus, whence he only re-issues after a time to undergo new sufferings. He is now fastened to Mount Caucasus, and the eagle, an offspring of Earth and Tartarus, comes to torment him daily.

Cheiron, the Centaur, at last offers himself to supply P.'s place in Hades—for on no other condition was he to be liberated than that some other immortal should offer himself in his stead. Cheiron, incurably wounded by Herakles, is accepted by Zeus.—Other legends give varying accounts. One makes P. the creator of man out of earth and water.—Zeus having, after the flood of Deucalion, ordered both him and Here to make man out of the mud left, and the winds to breathe life into them; and at Panopeus, in Phocis, a piece of that creative earth was in after times shown to the wonder-struck multitude. It was also at his suggestion that Deucalion and Pyrrha built the vessel that bore them safely through the floods. P. had a sanctuary at Athens, and torch-races took place in his honor. Many have been the explanations of this myth, one of which is, that it represents the human mind, which, in the consciousness of its own power, refuses to obey implicitly the will of Zeus; another, that it embodies the first struggles between the ancient (Pelasgian) powers of nature and the awaking of the mind, as represented by Zeus and the Olympians, &c. The subject is fully discussed in works on Prometheus by Welcker (1824), Weiske, Schömann, and Lasaulx (1845).

PROMISE, in English Law, is often used to denote one side of a contract or agreement, either by word of mouth or in writing which is not under seal. In England, an action cannot be brought on a promise unless some consideration was given for it; but in Scotland, a consideration is not necessary, provided the promise was made in earnest and with deliberation. A promise of marriage means a mutual promise, each being an equivalent for the other; and accordingly, if one breaks the promise, the other can sue for breach of it. See MARRIAGE.

PRO'MISSORY-NOTE is a contract by which A, the promiser, agrees to pay B, the promisee, a sum of money, either on request or on a future day. A is called the maker of the note, and B the payee of the note. The law affecting notes is substantially the same in all respects, and is always treated as part of that of Bills of Exchange (q. v.).

PROMO'TION, a term which has been applied to the granting of a degree by a university. The practice of conferring the title of doctor by authority and after examination, seems to have originated in the university of Bologna, in the middle of the 12th century. Degrees were at first conferred by *coöptation*, i. e., admission by the common consent of the body of doctors; but in the beginning of the 13th c., Honorius III. placed promotions under the control of the archdeacon of Bologna.

PROMOTION, in the ARMY AND NAVY. The efficiency of any body of men depends upon the energy of the individuals composing it: the root of that energy is emulation; and emulation can only be secured by maintaining a proper current of promotion. The efficiency of a service is thus dependent on the system of promotion adopted; and so important, consequently, does promotion become, that in the present article it is purposed to glance at the rules observed in the principal armies of the continent, before describing the system which obtains in the British service.

In the *Army of France*, it is a common saying, that every conscript has a marshal's *bâton* in his knapsack. Speaking of the times of the revolutionary war, this was doubtless true, for battalions chose their chief officers from their own ranks—a conscript of one year was often a lieutenant-colonel the next, and perhaps a brigadier-general the following. In the quieter times of recent years, however, progress is slower; and although promotion is open to all, and a considerable proportion of the officers do rise from the ranks, yet it is very rarely indeed that an officer, who has so risen, ever attains a higher grade than that of captain. Junior commissions are—if the rule of the service were strictly followed—given, one-third to men from the ranks, one-third to cadets from the military schools, and one-third by government patronage. In practice, it appears that in the Artillery and Engineers, two-thirds of the first commissions are given to pupils from the Polytechnique, and the remainder to men from the ranks; while in the Line, two-thirds of the officers rise from the ranks, and one-third come from the Military school of St. Cyr. Before officers can be promoted, certain service in each rank is required, viz., as 2d lieutenant, two years; as lieutenant, two years; as captain, four years; as major, three years; and as lieutenant-colonel, two years. These periods are, however, curtailed in time of war. Promotion takes place in the regiment up to the rank of captain, two-thirds by seniority, and one-third by selection. From captain to major (*chef d'escadron ou de bataillon*), promotion is divided equally between seniority and selection; while to all higher ranks it falls exclusively to selection. The selection is made on reports by the inspectors-general of the several arms—their reports being founded on personal observation, and the testimony of senior regimental officers.

To maintain rapidity of promotion there is a fixed age at which officers *must* retire—viz., lieutenant-general, 65; major-general, 62; colonel, 60; lieutenant-colonel, 58; major, 56; captain, 53; and lieutenant, 52. These ages do not prevent the officers of a regiment from being the opposite of youthful.

In *Austria*, all officers are at first cadets; but a large proportion of these cadets are nominated from men in the ranks by their comrades. Promotion goes by seniority, and in the regiment, with occasional selection from other regiments.

Tho organization and officering of the German army are both peculiar. Every German subject, of whatever rank, is bound to serve from the age of 20 to 25; but in practice, this service is reduced to a year in the case of professional men. Every officer must serve in the ranks; but not necessarily for more than a day. Young gentlemen intended for officers enter the ranks as *aspiranten*. They do duty as common soldiers for from six to nine months, and pass two examinations. Afterwards they remain nine months at a Division School, or twelve months at an Artillery and Engineer School. They then become eligible for appointment as officers when vacancies occur, which, however, they cannot obtain unless recommended by the officers of their respective regiments. Two-thirds of the first commissions are given to these aspiranten, and one-third to pupils from the cadet schools.

In the *Italian* army, one-third of the sub-lieutenants are promoted from the ranks. Of subsequent promotion, two-thirds go by seniority, and one-third by selection.

It is always urged against the *British* system of army promotion that it is too exclusive, and confines the commissions to the upper classes of society; and there is no doubt that promotion from the ranks is much rarer than in almost any other army. But, on the other hand, it is argued, the constituents of the force are very different. Soldiers in Britain are not conscripts, who necessarily comprise men of all classes and all degrees of education, but are taken as a rule, from an extremely low and very uneducated class of society. Again, Britain has a true middle class, which is wanting in almost every continental nation. Its army is not, therefore, necessarily aristocratic because it is not officered from the ranks. Lastly, the habits of the different classes of society differ so greatly, that unless the soldier be very superior to his comrades, promotion to a commission is a small boon.

With regard to the actual system of promotion which obtains: in the ranks, promotion from private up to company-sergeant takes place in the company, and is made by the regimental officers. The promotion of company-sergeants to be staff-sergeants is made throughout the regiment. All these promotions are by selection entirely. Of the commissioned officers, the quarter-masters and riding-masters are appointed almost exclusively from the ranks; but they have no further promotion to look forward to—sergeants and sergeants-major are occasionally gazetted to ensigncies or lieutenancies. The junior combatant officers acquire their commissions either by a competitive examination open to the whole nation, or by previous service in the militia as officers, or in the ranks of the army as non-commissioned officers. The Artillery and Engineers are officered entirely by cadets from the Royal Military Academy, whose subsequent promotion is by seniority only. In the Cavalry, Guards, and Line, vacancies are, since the abolition of the purchase system in 1871 (see PURCHASE SYSTEM), filled by 'seniority tempered by selection,' the selection becoming more strict as the higher ranks are reached.

The promotion of officers, up to the rank of captain, is mainly regimental, and is, at the same time, by seniority; but seniority is in this case qualified by what has been called negative selection—that is, in other words, the exclusion of those officers who do not prove their fitness for promotion at the periodical inspections and examinations. Above the rank of captain, for *substantive* or *regimental* rank, seniority is little regarded, and selection is more absolute; but officers may hold at the same time *army*

or *brevet* rank, conferred for distinguished service, or for mere seniority, in the general list of the whole army. This brevet rank does not affect the position in a regiment, and adds but a small sum to the officers' pay; but it is of great importance, inasmuch as colonels rise by seniority alone to be general officers, and colonel is almost exclusively a brevet rank (the only exceptions being in the Artillery and Engineers, where colonel is regimental rank). Under these rules, it sometimes happens that an officer who has never held higher regimental rank than captain, may become successively, for good service, brevet-major, brevet-lieutenant-colonel, and brevet-colonel, until he succeeds, in his turn, to the rank of major-general. See also STAFF.

In the Navy, the promotion of sailors to be petty officers is made by the captain of the ship; petty officers are appointed to be warrant-officers by the admiral of the station, subject to Admiralty confirmation. The commissioned officers are appointed and promoted by patronage solely. When a ship is first commissioned, the captain is allowed to nominate one cadet, the Admiralty name the rest. Promotions are made by selection by the Admiralty, except death vacancies which occur abroad; these are filled up by the admiral commanding on the station from the officers of his fleet. Above the rank of captain, all promotions take place by absolute seniority. There is no purchase of commissions in the navy.

PRONA'OS, the area or space before the cell of a temple, through which it was entered.

PRONG-HORN, or PRONG-HORNED ANTELOPE (*Antilope furcifera Dicranocerus furcifer*, or *Antilocapra Americana*), a species of antelope inhabiting the great western prairies of North America. It is the *Cabrit* or *Cabree* of the Canadian voyageurs, is also called *Goat* by the fur-traders, and sometimes receives the name of *Spring buck*. It is common between the Saskatchewan and the Missouri, and also on the Columbia, and is found in plains and on low hills, where there is no wood, or only scattered clumps of trees; never in mountainous districts, nor in forests. Its size



Prong-horned Antelope (*Antilope furcifera*).

is nearly that of the roe; in its general form and gait it resembles the chamois. In summer, the hair of the P. is smooth and flexible, but as winter approaches it lengthens; each hair becomes thick, its interior becomes white and spongy, and it loses its flexibility, at last becoming brittle, so that its point is easily rubbed off; but this singular fur forms a very close and warm covering for the animal. The P. is generally seen in small herds, sometimes solitary. It is very curious about any strange object, and advantage is sometimes taken of this by Indian hunters, who crouch, run a few yards, and stop again; the prong-horns wheeling around them, coming nearer, and becoming still more curious, till they are within shot.

PRO'NOUNS, one of the classes of words or parts of speech, possessing a special interest both logical and philological. '*I* am sick.' '*Thou* knowest the truth.' 'John was here, but *he* went away again.' 'Peter struck the boy, *who* had done *him* no harm.' '*What* do *you* want?' The words in italics in these sentences are called *Pronouns*, because they stand *for* (Lat. *pro*) nouns, or names of persons and things; and they are generally said to be used to prevent the too frequent repetitions of the nouns. Yet the pronoun and the noun are not exact equivalents for each other. No noun can be an exact substitute for *I*, *thou*, or *who*. Pronouns are symbols, names, or highly-generalized marks, applied to objects to signify, not any inherent attribute, but merely *their relations to the act of speaking*. They might therefore be called *relational names*. *I*, for instance, is a name applied to all subjects that can be conceived as speaking. In such a sentence as '*I* am sick,' in which the state 'sick,' is affirmed about some one, the exact force of *I* may be thus expressed: The person of whom 'sick' is affirmed is one with the person making the affirmation. Who the individual person is, the pronoun *I* gives no indication; it is implied that this is known from some other source. Those present learn it by hearing whence the sound comes; in a book, it is gathered from the context.

In like manner, *thou* is a generalized name for all persons spoken to. What it means or *connotes* is—with reference to the example above given—that the person affirmed to know the truth, and the person to whom the affirmation is addressed, are one and the same. What particular person it *denotes*, must be learned, as before, from circumstances. If the clause '*he* went away again,' stood by itself, what person is denoted by *he* would be still more vague than in the case of *I* and *thou*. *He* merely implies that a person, neither the speaker nor the spoken to, but one known in some way, is the subject of the assertion. Who it is, is determined, in the example, by *John*, with which *he* stands in close relation. *Who* designates some person already named, referring us back to that name (the *antecedent*) for determining the individual. *What* connotes that the subject is unknown.

Pronouns are usually divided into Personal and Relative.

1. *Personal Pronouns*.—The several objects concerned in a speech or sentence stand in one or other of the three relations of speaker (First Person), object spoken to (Second Person), object spoken about (Third Person). Pronouns expressive of these relations are called Personal Pronouns. They are (in the nominative case), 1st person, *I*, *we*; 2d, *thou*, *ye* or *you*; 3d, *he*, *she*, *it*, *they*.

Along with the personal pronouns, and most nearly related to the pronouns of the third person, may be classed the words *one* and *that* in certain constructions. In phrases like '*One* cannot be sure of that,' *one* is an indefinite pronoun, designating any person whatever. It is distinct from the numeral adjective *one*, being derived from the French *on*, which is a corruption of *homme*, man. When we say, 'I like peaches, but let me have a ripe *one*, or ripe *ones*,' we have now the numeral used as another indefinite pronoun. The first of these indefinite pronouns is applied only to persons; the second, both to persons and things.

When we say, 'Give me *this*, and keep *that*,' *this* and *that* may be considered as demonstrative adjectives, with some noun understood—this (thing). But in the expression, 'He mistook his own room for *that* of the stranger,' *that* appears to be as much a pronoun as *one*.

2. *Relative Pronouns* (including *Interrogative*).—Relative Pronouns, besides standing for nouns, have the power of conjunctions. They join sentences and clauses, by relating or referring back directly to something just named. The relatives in English are three—*who*, *which*, and *that*. See RELATIVE PRONOUNS.

What is used for *that which*, thus embracing both relative and antecedent. In phrases like 'such a storm *as* now bursts on them,' *as* is used with the force of a relative pronoun. Perhaps the full expression would be 'such a storm as (the storm that) burst.'

3. *Interrogative Pronouns* are those used in asking questions; they are *who*, *which*, and *what*.

These are the *simple* pronouns. But a variety of compounds are formed by joining these simple pronouns with other words, such as *himself*, *whatever*, *any one*.

Pronouns, as we have seen, express the most abstract relations in language. They are, in fact, the most attenuated and colorless signs of thought conceivable—the highest effort, apparently, of man's generalizing powers. Accordingly, in the days of purely *à priori* speculation on the origin and growth of language, it was held to be indisputable that pronouns must have been the latest product of the language-making faculty; and they have been appealed to as a conclusive argument against the theory that the meaning of all words, when they are traced to their origin, is grounded on sensible properties and relations of material things. The philologist, on the contrary, pursuing his investigations on the historico-comparative method, sees irresistible proof that pronouns, in the Aryan family of languages at least, were among the earliest words in use. In fact, besides their independent use, the same elements are found as suffixes forming the inflections (see INFLECTION) of the predicative roots, and first making them real words capable of entering into a sentence. In the beginning, however, they were far from being the impalpable abstractions they afterwards became, and really form the strongest proof of the theory they were supposed to upset. They were, in fact, simply demonstrative particles, indicating palpable relations of space or position ('that' or 'there,' 'this' or 'here,' 'what' or 'where?'). We can easily see how the indication of the vocal sign would at first be helped out and made precise by gesticulation; or more probable still, the gesticulation was at first the fundamental sign, and the word a natural involuntary utterance accompanying it, and in process of time taking its place.

Of the various demonstrative radicals still traceable in the Aryan tongues as pronouns and suffixes, one of the most universal and outstanding is the sound *ta* or *sa* for 'that' or 'this,' 'there.' It is seen in the Sanscrit *sa* (mas.), *sâ* (fem.), *tad* (neut.);

Lat. (is)*te*, (is)*ta*, (is)*tud;* Gr. *ho, he, to;* Goth. *sa só, thata;* A.-S. *se, seó, thæt;* as also in the numerous allied adverbs, e. g., Lat. *tam, tunc;* Ger. *dann;* Eng. *so, as, then, thus.* Another demonstrative radical, *ma*, seems to have been used to call attention to the speaker—to point to the immediate or central 'here;' in short, to the 'me.' Besides occurring in the oblique cases of the first personal pronoun, the element *ma* or *m* enters largely into the suffixes of the first person of verbs in the older languages, such as Greek and Latin. The only remnant of it in English is in *I am.* The nominative case of the first person pronoun in Sanscr. is *ahám*, which is conjectured to be a mutilation of a fuller form *ma-gha-m;* in Gr. and Lat. *ego*, Goth. *ik*, Ger. *ich*, A.-S. Eng. *I*, Ital. *io*, Fr. *je*, the *m* has completely disappeared. In the oblique cases it has been better preserved. The root of the 2d pers. pron. seems to have been the syllable *tu* or *tva*, indicating a position intermediate between the central 'here' and the more distant and contrasted 'there.' The form of this pronoun is more constant throughout the allied languages than that of any other; Sansc. *tvám*, Lat. *tu*, Gr. *ty* or *sy*, Ger. *du*, Eng. *thou*, Fr. *tu*, Ital. *tu.*

The pronouns of the first and second person are invariable in respect of gender, and are never used as adjectives; the pronouns of the third person not only take the form of adjectives in respect of gender, but are often—especially in the older languages—joined to nouns, in which case they are rather demonstrative (or relative) adjectives than pronouns; as Lat. *ille homo*, Eng. *that book.* It is difficult to trace any etymological relations between the singular and the plural in the first and second pronouns—e. g., between Lat. *tu* and *vos*, or Eng. *thou* and *you;* but this is not to be wondered at when we reflect that 'we' is not equal to 'I' and 'I,' but to 'I' and 'he,' or 'I' and 'thou;' and that 'you' is as much 'thou' and 'he' as 'thou' and 'thou.' The plurals must therefore have been compounded of several elements, which, by coalescence and abrasion, have become irrecognizable.

The declension of the English personal pronouns is to be found in any elementary grammar. That of the third person is made up of fragments of several Anglo-Saxon words. The Anglo-Saxon pronoun was thus declined:

Sing. Nom.	*he* (he, heó (she),		*hit* (it)
Gen.	*his*	*hire*	*his*
Acc.	hine	hi	*hit*
Dat.	*him*	*hire*	him
Plur. Nom. Acc.		hi	
Gen.		hira (heora)	
Dat.		him (heom)	

The cases marked in italics are still used in modern English, only that *him* and *her* do duty in the accusative as well as dative. *His*, as the genitive of the neuter, has been supplanted in recent times by the secondary genitive *its*, a word which does not occur once in the English version of the Bible. *She* does not represent the Anglo-Saxon *heó*, but *seó*, the feminine of the article. The modern plurals *they, their, them*, have no direct etymological connection with the singular *he* (she, it); they are taken from the demonstrative or article *thæt* (that, the), which has, in the plural, nominative and accusative *thá*, genitive *thára*, dative *tham. Them*, like *him*, was thus originally a dative case. Is it a lingering memory of the demonstrative origin of *them* that keeps alive the vulgar error of 'them things?'

Such being the arbitrary, or rather chance way in which the English pronominal system has been built up out of the wrecks of the Anglo-Saxon, there is no good reason why *them, him, her*, should not have been used in the nominative as well as in the accusative; and, in fact, in certain connections, these forms, together with *me*, are habitually so used, although grammarians have hitherto refused to sanction the usage. Such expressions as, 'It is me;' 'better than him, than them,' &c., are not confined to the uneducated; in familiar conversation, the most cultivated use them habitually, and in preference to what are considered to be the correct forms, which are felt somehow to be stiff and pedantic. This usage has the analogy of the French in its favor (e. g, *c'est moi*), and some English philologists have begun to defend it on principle. See Alford, *The Queen's English.*

From politeness and other rhetorical motives, various substitutes take the place of the usual personal pronouns. The English language departs little from the normal usage, except in *you* for *thou*, and in the regal and editorial *we*. A French shop-keeper, instead of 'What do you wish to see?' says: 'What does the gentleman (or lady) wish to see?' All modern languages use such substitutions as, 'Your Majesty, Your Excellency, wishes;' but the Italian, in speaking further of the Excellenza, says: 'It (*ella*, she) wishes.' The Germans use regularly *they* (*sie*) for *you*, and one never hears *you* except from the pulpit. In Hebrew, politeness took the form of saying: 'Thy servant said,' for 'I said.' Similarly, the Chinese use: 'little man, subject, thief, blockhead,' for 'I;' and an American backwoodsman speaks of himself as 'this 'oss,' or 'this here child.'

PROOF. See EVIDENCE.

PROOF OF FIRE-ARMS. Guns of all descriptions are proved before being issued for service. Muskets are tested by being fired with heavier bullets and larger charges of powder than they will in the ordinary way be required to carry. Cannon are subjected to a series of tests. First, they are gauged to ascertain that the dimensions are correct, the utmost variation permitted being ·3 inch externally, and ·033 in the diameter of the bore, but the position of the bore may deviate ·25 inch from the line of the piece's axis. The next trial is by firing twice with heavy charges—the bore being subsequently minutely examined, to detect flaws or crevices in the metal. A cavity exceeding in depth ·2 inch, if behind the first reinforce ring, or ·25 if before that ring, condemns the piece. After the proof by firing, water is forced at a great pressure into the bore, in order that it may permeate any honeycombs or flaws: the next day, the bore is examined by means of a mirror, which casts a strong light into it. Flaws are then easily detected; for while the rest of the bore is thoroughly dry, water will continue for some time to weep or run from the holes, and will stand over them in drops. This operation completes the proof. When a gun bursts in proof, the remainder of the guns of the same sort then in proof are subjected to another round.

In the case of guns of hitherto untried form, some are tested to bursting, as specimens of the power and endurance of the whole number. For Proof of Powder, see EPROUVETTE.

PROPAGA'NDA (Lat. *De Propaganda Fide*, Regarding the Propagation of the Faith), the name of a Congregation, and also of a College, in Rome, the object of which is to direct and forward the propagation of the Catholic religion, especially among the heathen; although Christian dissenters from the Roman Church are also included in the sphere of its operations. The institution was originated by Pope Gregory XIII. (1572—1584); but it was fully organized by Gregory XV., who, by a bull of June 22, 1622, established a special Congregation for this purpose, which his successor, Urban VIII. extended and endowed, and to which he annexed a college for the education of missionaries to the several countries; one great feature of which has been to provide for such work natives of the several countries, who are conveyed to Rome at an early age for the purpose of being specially educated in all the necessary learning of a missionary. The Congregation consists of a number of cardinals appointed for life, one of whom is prefect, and who are assisted by a secretary, and by a number of consulters, clerks (*minutanti*), and other officials. This Congregation conducts the affairs not only of the missionary countries, properly so called, but also of those—as England, the northern kingdoms, &c.—in which the hierarchical organization is not, or has not been full and formal. The Catholic Church in these kingdoms is directly subject to the P. in all the details of its government. The College of the P. is a noble institution, containing nearly 200 pupils of all countries, tongues, and complexions, who are not only maintained and educated gratuitously from a very early age, but are equipped and sent forward to their several destinations at the charge of the institution.

The operations of both College and Congregation have been somewhat embarrassed by diminution of funds, consequent on the appropriation of ecclesiastical property to public purposes in the kingdom of Italy; but the want is in a great measure supplied by voluntary offerings. The P. College contains a most valuable library and museum, and a polyglot printing-press. Its great festival is the Epiphany of our Lord, or of His 'manifestation to the Gentiles;' and this feast is celebrated by an exhibition of exceeding interest and curiosity, in which are delivered recitations in every language represented in the College or its missions, amounting often to 50 or 60. Of this festival, the celebrated Cardinal Mezzofanti (q. v.) used to be the guiding spirit. It continues to be one of the chief literary sights of the Roman winter.

PROPAGA'TION OF THE FAITH, ASSOCIATIONS FOR ROMAN CATHOLIC. The earliest and the highest in dignity of these has been already described under the head PROPAGANDA (q. v.). But the present century has produced several private associations, the resources of which arise almost entirely from voluntary annual contributions, and the organization of which is most complete and most extensive. The first of these is that founded at Lyon in 1822, under the title 'Œuvre de la Propagation de la Foi,' with a branch at Paris, and subordinate branches in the other Catholic kingdoms. It is under the direction of a council at Lyon and Paris, which communicates as well with the local associations through which the funds are supplied by small weekly, monthly, or yearly contributions, as with the missions to the aid of which the fund so raised is applied, by an apportionment regulated according to the necessities of each, especially for the supply of missionaries. The piety of contributors is stimulated by the exhortations of the popes, and the granting of indulgences to those who,

with the other requisite dispositions, shall aid in the work. The journal of the society, entitled *Annales de la Propagation de la Foi*, is a very interesting bi-monthly collection of letters and reports in French from the different missions connected with the central body. The annual receipts of this association are about 5,000,000 francs, mostly raised in France; but some later years' returns have been even more considerable.

Spain, once the great propagator of the Gospel in the New World, contributes very little; but it is to be observed that Spain maintains for her own missionary enterprises a large and liberal establishment in connection with the mission to the Philippines and the South Sea.

Other associations connected with the Propaganda of Rome are the 'Leopoldiner-Verein,' established at Vienna in 1829; and that established in Bavaria as an offshoot of the Lyon association, under the name 'Ludwigs Missions-Verein.'

PROPER, in Heraldry. A charge borne of its natural color, is said to be proper. An object whose color varies at different times and in different examples, as a rose, which may be white or red, cannot be borne proper.

PROPERTIUS, SEXTUS AURELIUS, a Roman elegiac poet of the Augustan Age, was born in Umbria, about 50 B.C., lived at Rome in the brilliant circle of Mæcenas, and died 16 B.C. His poems are a collection of elegies which have reached us in an incomplete and corrupt form. Though his addresses to 'Cynthia,' of which most of his poems consist, are marked by intensity of feeling and warmth of passion, P. is a distinctively learned poet; his verse is even rendered highly obscure, and at times for us almost unintelligible, by his wealth of mythological lore and multiplicity of remote allusions. It has often been debated whether P. or Tibullus was the greater poet. In his versification P. was much influenced by Greek models. There are modern editions of the text by Hertzberg, Keil, Haupt, and Müller (1870). There are English translations by Moore (1870) and Cranstoun (1875). See Davies' *Catullus Tibullus and P.* (1877), and Munro's *Papers on Propertius*.

PRO'PHECY (Gr. *propheteia*) is a word of pregnant signification. According to its usual acceptation in modern English, it implies *prediction*—the telling of events about to happen beforehand. But neither according to the original meaning of the word prophet in Hebrew (*nabi*) or in Greek (*prophetes*), nor according to historical usage of the verb *prophesy* in English, can such a meaning be considered exclusive. The etymological force of the Hebrew word, according to the best authorities, denotes 'a person who, as it were, bursts forth with spiritual utterances under divine influence, or simply one who pours forth words.' The *Nabi* is the medium of special divine communication—according to some, the man inspired by God to whom divine communications are made; but more distinctively, according to others, the man who delivers the burden of the divine thought imparted to him, who makes known the declarations of God. Besides the more authoritative expression *Nabi*, there are two other expressions (*Roèh* and *Chozeh*) used in the Hebrew original with something of the same meaning, and which are translated in our English version 'seer.' The exact meaning of the several words in their relation to one another has been much disputed. The best view, upon the whole, seems to be that which considers *Nabi* to denote specially the official function of the prophet, the *order* to which he belonged; and the other expressions to point peculiarly to the nature of the prophetic gift—the intuition or vision of the divine. The one may stamp more the objective function of the prophet as a *teller* or *utterer* of the divine, the other more his subjective capacity as a seer of the divine.

The original and proper import of the word *prophecy*, therefore, may be said to be the utterance of the divine. The prophet is the 'interpreter of the divine will.' He is expressly called 'the interpreter and the messenger of Jehovah.' The idea of prediction is not of course excluded; but this idea is not a radical and necessary part of the meaning of the word, nor was it at all necessarily an element of the prophetic office. This is apparent from the use of the word even in our English Bibles and our older theological literature. The sons of Asaph, for example, it is said (1 Chron. xxv. 3) 'prophesied with a harp, to give thanks and to praise the Lord,' in the sense of merely singing or uttering God's praise under the dictate of the divine Spirit. It is said also of Philip the Evangelist (Acts xxi. 9) that he had 'four daughters, virgins, which did prophesy,' in the sense merely or mainly of declaring the gospel. In like manner, Bacon speaks in his day of 'an exercise commonly called *prophesying*,' which consisted in the exposition of a portion of Scripture by successive ministers at a meeting appointed for the purpose; and the well-known title of one of Jeremy Taylor's books, *The Liberty of Prophesying*—i. e., the liberty of preaching—recalls the same use of the word.

Prophecy among the Jews was a distinct office or function constituted under the divine sanction. The prophets were an *order* instituted, or at least reformed and more thoroughly organized by Samuel. There were prophets, indeed, before; Abraham is called a prophet (Gen. xx. 7), and Moses also (Deut. xviii. 15; xxxiv. 10); Aaron is the 'prophet of Moses' (Ex. vii. 1), and Miriam is 'a prophetess' (Ex. xv. 20); but it was Samuel who first established the office as a systematic part of the Jewish religion. For this purpose, he gathered together companies of young men of promising spiritual attainments, who were trained under his superintendence for various religious duties—the exposition of the theocratic law, and the conduct of the theocratic worship, especially of its elaborate musical departments (1 Sam. x. 5; 1 Chron. xxv. 6).

The use of the psaltery and tabret, pipe, harp, and cymbal, was the peculiar business of the prophets. The young men were set apart to make proficiency in these instruments; they were placed under an elderly head or president, who received the name of father, and they were called his sons. They were 'all under the hands of their father for song in the house of the Lord, with cymbals, psalteries, and harps, for the service of the house of God' (1 Chron. xxv. 6). The prophetic institutions have been called by modern divines 'Schools of the Prophets;' but this name does not occur in Scripture, nor even in our authorized version. 'Sons of the Prophets' is the only collective name applied to the separate companies into which they were formed by Samuel. These companies were located in special spots: in Ramah, the birthplace and residence of Samuel; in Bethel, Gilgal, Jericho, and ultimately Jerusalem. They lived in huts made of the branches of trees; wore a simple, characteristic dress; had their meals together, and were found in numbers sometimes of 50, sometimes even of 400. For a prophet not to have been trained in one of these institutions, was deemed, as Dean Stanley says (*Jewish Church*, vol. i. p. 429), 'an exceptional case.' Some, like Isaiah, in Jerusalem, or Elisha in Samaria, lived in great towns, in houses of their own. The higher prophets had inferior prophets or servants attendant upon them, whose duty it was to pour water upon their hands, and secure provisions for them (2 Kings, iii. 11; v. 22). Thus, Moses had Joshua and others; Elijah had Elisha; Elisha had Gehazi. Many of them were married, and had families; for example, Moses, Samuel, Deborah, David, Hosea, Isaiah, Ezekiel. The wife was sometimes, as in the case of Isaiah, called 'the prophetess.'

The prophets, according to this description, were a peculiar order of teachers among the Jews; prophecy, a distinctive part of the divine economy, by which God trained and educated the chosen people. Beginning in a definite, though still unorganized form, with Moses (for it is only incidentally that Abraham is called 'a prophet'), it assumes a regular organization in the hands of Samuel, just when the earlier form of the theocratic government was passing away, and the monarchy was established. It grew up alongside the older institution of the Levitical priesthood without any professed or formal opposition to the latter, but playing a part distinct, and often practically opposed to it. The priests ministered at the altars of sacrifice, and discharged all the official rites of purification enjoined by the Jewish law. They were only secondarily teachers of the people. The prophets, again, while joining in the rites of the tabernacle were primarily and mainly teachers. Their function was moral, and not ritual; they upheld the ethical, spiritual, and eternal side of religion, apt to be obscured under the hardening tendency and ambitious officialism of an influential priesthood. They were the great preachers of a righteous government of the world, and of future retribution amidst the confusions and evils of their time; and prophecy was the ever-renewing and reforming element in the constantly corrupting and decaying policy of Judaism. More particularly, the prophets were both the national historians and poets of the Jewish people, the narrators of its past deliverance, the heralds of its coming glories. The books of Joshua, Judges, Samuel, and Kings, are included among the prophetical books of the Old Testament in the Jewish canon; while the acts of David by Gad and Nathan, of Solomon and Jeroboam by Nathan and Iddo, along with other historical and biographical pieces, have unhappily perished. It is needless to point to the splendid collection of the later prophetic books, beginning with Joel, as containing, along with much direct historical matter also, the most exalted specimens of poetry to be found in any language.

But that which by many has been supposed to be the distinctive character of prophecy, and the special function of the prophets, remains to be noticed. According to the general view of theologians in modern times, prophecy is peculiarly *predictive*, and the essential characteristic of the prophet is supposed to be the power of *foretelling future events*. This view is not warranted, we have seen, either by the etymology of the word, or a comprehensive survey of the facts; but it is nevertheless, undeniable that the Hebrew prophets directed their attention especially to the future, and 'made predictions concerning the fortunes of their own and other countries, which were unquestionably fulfilled.' 'There can be no reasonable doubt, for example,' writes one of

the most liberal of modern theologians, 'that Amos foretold the captivity and return of Israel, and Micah the fall of Samaria, and Ezekiel the fall of Jerusalem, and Isaiah the fall of Tyre, and Jeremiah the limits of the captivity. It was the distinguishing mark of the Jewish people,' adds the same writer, 'that their golden age was not in the past, but in the future; that their greatest hero (as they deemed him to be) was not their founder, but their founder's latest descendant. Their traditions, their fancies, their glories, gathered round the head, not of a chief, or warrior, or sage that had been, but of a king, a deliverer, a prophet, who was to come. Of this singular expectation, the prophets were, if not the chief authors, at least the chief exponents.'* The reality of a succession of Messianic predictions, is admitted by even very advanced theologians; and the more usual opinion, it is well known, regards these predictions from the time of Moses to the time of Malachi as admitting of no question, from the supposed clearness, fullness, and particularity, with which they announce a deliverer, and describe his functions.

'That salvation should come through the family of Abraham, Isaac, Jacob, Judah, David; that at the time of the final absorption of Jewish power, Shiloh (the tranquillizer) should gather the nations under his rule; that there should be a great prophet typified by Moses, a king descended from David, a priest for ever typified by Melchizedek; that there should be born into the world a child, to be called Mighty God, Eternal Father, Prince of Peace; that there should be a righteous servant of God on whom the Lord should lay the iniquity of us all; that Messiah, the Prince, should be cut off, but not for Himself; that an everlasting kingdom should be given by the Ancient of Days to one like the Son of Man. It seems impossible to harmonize so many apparent contradictions. Nevertheless, it is an undoubted fact, that at the time seemingly pointed out by one or more of these predictions, there was born into the world a child of the house of David, and therefore of the family of Abraham, Isaac, Jacob, and Judah, who claimed to be the object of these and other predictions; who is acknowledged as Prophet, Priest, and King, as Mighty God, and yet as God's righteous servant, who bears the iniquity of all; who was cut off, and whose death is acknowledged not to have been for His own, but for others' good; who has instituted a spiritual kingdom on earth, which kingdom is of a nature to continue for ever, and in whose doings and sufferings on earth a number of specific predictions were fulfilled. Then we may say that we have here a series of prophecies which are so applicable to the person and earthly life of Jesus Christ, as to be thereby shown to have been designed to apply to Him; and if they were designed to apply to Him, prophetical prediction is proved.'—Smith's *Dictionary of Bible*, art. Prophecy.

Such is the common view of phrophecy. It has, indeed, been maintained by certain writers, that *literal prediction* has no place in prophecy; that Isaiah did not foretell the Babylonian Captivity, or the fall of Tyre, nor Jeremiah the Seventy Years' Captivity, nor Nahum the ruin of Nineveh; and that the Messianic prophecies were merely 'ardent hopes and poetical descriptions' of a glorious future, into which the prophetic mind naturally projected itself. Such delineations were 'in essence nothing but *forebodings*—efforts of the spiritual eye to bring up before itself the distinct form of the future: to make such presentiments into *historical declarations*, is to mistake their character.'—Davidson's *Introduction*, vol. iv. But this is not the ordinary theory of prophecy, either among Jews or Christians. Both alike recognize the reality of the predictive element, however differently they may interpret and apply the prediction. They contend not only for a special spiritual elevation in the prophet—an intenser degree of the same divine intuition which God gives to all who worship Him in love and reverence—but for a gift of life vouchsafed to him different from any ordinary endowment. Prophecy is not merely the effluence of the divine Spirit enriching and exalting all the natural faculties, but it is the direct communication of God Himself, to the prophet unveiling the future for the guidance of His church, and the glory of His name.

The further study of the subject may be pursued by readers in numerous volumes, amongst which the following may be recommended: John Smith, *Select Discourses on Prophecy*; Lowth, *De Sacra Poesi Hebræorum;* Davison, *Discourses on Prophecy;* Butler, *Analogy of Religion;* Horne, *Introduction to Holy Scripture;* Eichhorn, *Die Hebräischen Propheten;* Ewald, *Die Propheten des Alten Bundes;* Hengstenberg, *Christology of the Old Testament;* Fairbairn, *Prophecy;* Davidson, *Introduction to the Old Testament;* Stanley, *Lectures on the Jewish Church.*

PRO'POLIS, a substance used by bees in the construction of their combs, to give to the fabric a strength which it could not have if made of wax alone. See BEE. It is also used for closing up chinks of the hive. It is a resinous unctuous substance of a reddish-brown color, a somewhat bitter taste, and an agreeable aromatic odor, and is collected from the buds of trees. Huber found bees eagerly to appropriate the viscous exudation which abounds on poplar buds. P. probably differs a little in chemical composition according to the tree it is obtained from, but it consists chiefly of resin. It is brought to the hive on the legs of bees, and adheres to them so strongly that the assistance of other bees is necessary for its removal. The name is from the Greek *pro*, before, and *polis*, a city; because the most exposed parts of a bee-hive exhibit this substance in greatest abundance. Foreign bodies introduced into a bee-hive, and which the bees are unable to remove, are covered with propolis.

* Dean Stanley, *Jewish Church*, vol. i. p. 466.

PROPO'RTION, in Arithmetic and Geometry, is a particular species of relation subsisting between groups of numbers or quantities. Notwithstanding that the idea of proportion is found to exist in perfection in the mind of every one, yet a good definition of it is a matter of extreme difficulty. The two definitions which, on the whole, are found to be least objectionable are that of Euclid, and the ordinary arithmetical definition. The latter states proportion to be the 'equality of ratios,' and throws us back on the definition of the term *Ratio* (q. v.); which may most simply be considered as the relation of two numbers to each other, shown by a division of the one by the other. Thus, the ratio of 12 to 3, expressed by $\frac{12}{3}$, or 4, denotes that 12 contains 3 four times; and the ratio of 8 to 2 being also 4, we have from our definition a statement that the four numbers, 12, 3, 8, and 2, are in proportion, or, as it is commonly expressed, 12 bears to 3 the same ratio that 8 does to 2, or 12 : 3 : : 8 : 2. In the same way, it is shown that 3 : 8 : : $13\frac{1}{2}$: 36; for $\frac{3}{8}$ expresses the ratio of the first to the second, and $\frac{13\frac{1}{2}}{36} = \frac{27}{72} = \frac{3}{8}$. It will be gathered from the two arithmetical proportions here given, and from any others that can be formed, that '*the product of the first and last terms* (the *extremes*) *is equal to the product of the second and third terms* (the *means*);' and upon this property of proportional numbers directly depends the arithmetical rule called 'proportion,' &c. The object of this rule is to find a fourth proportional to three given numbers—i. e., a number to which the third bears the same ratio that the first does to the second, and the number is at once found by multiplying together the second and third terms, and dividing the product by the first. Proportion is illustrated arithmetically by such problems as, 'If four yards cost six shillings, what will ten cost?' Here, 15 being the fourth proportional to 4, 6, and 10, fifteen shillings is the answer.

The distinction of proportion into *direct* and *inverse* is not only quite unnecessary, but highly mischievous, as it tends to create the idea, that it is possible for more than *one* kind of proportion to subsist. *Continued proportion* indicates a property of every three consecutive or equidistant terms in a 'Geometrical Progression' (q. v.)—for instance, in the series 2, 4, 8, 16, 32. . . , 2 : 4 : : 4 : 8, 4 : 8 : : 8 : 16, &c., or 2 : 8 : : 8 : 32, &c. In the above remarks, all consideration of *Incommensurable Quantities* (q. v.) has been omitted.—The definition given by Euclid is as follows: Four magnitudes are proportional, when any equimultiples whatever being taken of the first and third, and any whatever of the second and fourth, according as a multiple of the first is greater, equal to, or less than that of the second, the multiple of the third is also greater, equal to, or less than that of the fourth—i. e., A, B, C, D are proportionals, when if mA is greater than nB, mC is greater than nD; if mA is equal to nB, mC is equal to nD; if mA is less than nB, mC is less than nD; m and n being any multiples whatsoever. The apparent cumbrousness and circumlocution in this definition arise from Euclid's endeavor to include incommensurable quantities; throwing them out of account, it is sufficient to say that four magnitudes are proportional, if, like multiples being taken of the first and third, and like of the second and fourth, when the multiple of the first is equal to the multiple of the second, the multiple of the third is equal to the multiple of the fourth. Abundance of illustrations of the general definition will be found in the Fifth Book of Euclid, and of the particular one in the notes appended to some of the later editions of the same work; it will be sufficient here to give an arithmetical instance of the working of the particular definition. Taking the four numbers of a previous example—12, 3, 8, 2; of 12 and 8 take multiples by 4, and of 3 and 2 by 16, then 12×4 (the multiple of the first) $= 3 \times 16$ (the multiple of the second), and 8×4 (the multiple of the third) $= 2 \times 16$ (the multiple of the fourth). In this example, the two multiples were so taken that the multiple of the first would be equal to the multiple of the second, and when it was found that the multiple of the third was also equal to the multiple of the fourth, the proportionality of the four numbers was established.

PROPOSI'TION. This is the technical name for the final constituent, or ultimate element, of whatever we call knowledge—what we can believe or disbelieve. 'Fire melts wax;' 'the harvest is good;' 'Rome stands on the Tiber;' 'the moon is not inhabited'—are propositions. All information, whether historical, scientific, or practical, may be resolved at last into simple statements such as these; and all such statements are propositions. In every proposition, there are two parts: something spoken about, called the Subject; and something said, affirmed, or declared of what is spoken about, called the Predicate. In the first example given, 'Fire' is the subject, 'melts wax' is the predicate or affirming part, to which a verb is necessary. In the second example, 'Harvest' is the subject, 'is good' the predicate. But sometimes this last part is resolved further into Predicate (good) and Copula (is). The predicate then simply means the quality or fact affirmed, while the copula gives the affirmation. In the previous case, the copula is contained in the predicate (melts).

Propositions are *affirmative* or *negative*, according as we declare that a thing is, or that it is not: 'the moon is (not) inhabited.' As some propositions contain the form of a condition, and some the form of an alternative, these are called *hypothetical*, in opposition to which the rest are called *categorical*. If A is B, C is D, is the *conditional* form of the hypothetical class. Either A is B, or C is D, is called the *disjunctive* form.

Propositions are further divided, according to their quantity, or according to the extent of the subject, into *universal*, *particular*, *singular*, and *indefinite*; '*all* the moving powers are originally derived from the sun' (universal); '*some* men are wise' (particular); '*Socrates* is wise' (singular). The 'indefinite' means the uncertain or ambiguous in form, as 'wine is good;' many of this form are known to be universal, as 'man is mortal.'

In inquiring into the ultimate import or meaning of propositions, Mr. John Stuart Mill came to the conclusion that they fall under five classes, distinguished according to the nature of the quality predicated. The five universal and comprehensive predicates are—Existence, Co-existence (sometimes taking the form of Order in Place), Succession (Order in Time), Causation, Resemblance. Every fact, or piece of information, consists in the affirmation of some one of these five general attributes. Existence by itself expresses a very limited class, since we usually specify circumstances of time, place, &c., in the same assertion: 'There is an ether for conveying light and heat,' is a proposition of Existence; but it would be more usually stated as having locality (Order in Place, or Co-existence); 'an ethereal medium is diffused over all space.' Existence is the only one of the five attributes that can be affirmed of one thing; all the rest require at least two things.

The attribute of Co-existence appears in a very large number of propositions: all geographical statements and local descriptions; all the natural conjunctions of properties (the animal frame consists of digestive organs, a nervous system, &c.), affirm co-existence. The attribute of Succession is seen in history, and in all the changing aspects of things. The attribute of Causation is a special case of Succession, so important as to be raised to the rank of a first-class predicate. The facts of physical and mental science involve not merely succession, but cause and effect: 'Heat expands bodies;' 'practice improves the human faculties.' The concluding attribute—Resemblance—is of very wide occurrence. The propositions of numerical or mathematical science all involve some assertion of equality or inequality, proportion or disproportion: 'Twice three is (equal to) six;' 'triangles in the same base and between the same parallels are *equal*.' Throughout all our knowledge, the affirmation of likeness, or of unlikeness, is a fundamental fact; but, in mathematics, it constitutes the characteristic predicate, or the sole affirmation.

PROROGA'TION the continuance of parliament from one session to another. Parliament is prorogued by her Majesty's command, signified in her presence by the Lord Chancellor, or Speaker of the House of Lords, to both Houses, or when her Majesty is not personally present, by writ under the Great Seal, or by Commission. Prorogation not only suspends all business, but quashes all proceedings pending at the time, except impeachments by the Commons, and writs of error and appeals before the House of Lords. A bill must be renewed after a prorogation, as if it had never been introduced. A prorogation for a single day has sometimes been resorted to, to enable a bill to be brought in a second time, it being a rule that no second bill of the same substance with a prior one can be introduced in the same session. Thus parliament was prorogued by William III. from the 21st to the 23d of October 1689, in order to renew the Bill of Rights, regarding which a difference had arisen between the Upper and Lower House that was fatal to it. By 37 Geo. III. c. 127, after parliament has been prorogued to a particular day, her Majesty may, by proclamation, call it together on any other day, not less than 14 days distant, to which day parliament then stands prorogued. See PARLIAMENT.

PROSECU'TION, though often used in a general sense, as applicable to all kinds of litigation, is also used technically to denote the institution of criminal proceedings against a party. There are two ways in which a prosecution commences in England. One is to summon, or, in the graver cases, to arrest and bring the offender before a justice of the peace, when the witnesses are examined, and if the justice thinks a *primâ facie* case is made out, he commits the offender for trial. Another way is without any such preliminary inquiry before a justice, for the prosecutor to go with witnesses before a grand jury, and in all cases this is a step in the prosecution. The grand jury hear the witnesses, and if they think there is a *primâ facie* case, they find a true bill; if otherwise, they ignore the bill. The bill means an indictment. When the indictment is found, the prisoners are arraigned at the bar, and asked by the judge whether they plead guilty or not guilty; and in general they plead not guilty. A jury of twelve are then sworn, and try the case, and find a verdict of guilty or not guilty, whereupon the judge sentences the prisoner to punishment, which varies according to the enormity of the offence. In general, a new trial cannot be held in criminal cases, though, if an error is committed, the conviction is often quashed.

PROSE'CUTOR is the person who takes the initiative in punishing crimes. In England, the time-honored custom is that there should be no public prosecutor, and that the prosecution of crimes should be left to the spontaneous action of the injured party. Hence many crimes have gone unpunished, from its not being anybody's business to attend to this part of the public interest. It is true that the attorney-general is sometimes the prosecutor on behalf of the public, but this only happens in rare and exceptional cases. In 1879, however, an 'act more effectually providing for the prosecution of offences in England,' was passed, enacting that the secretary of state may from time to time appoint an officer to be called the Director of Public Prosecutions, whose duty it shall be, under the superintendence of the attorney-general, to institute, undertake, or carry on criminal proceedings. Also the Director may have six assistants allotted to him. It was provided that this act should not interfere with the right of any person to institute criminal proceedings. Ordinarily, it has been left to the uncontrolled discretion of anybody to commence a prosecution. The injured person or his friends may have sufficient motive to prosecute; but a stranger will not readily undertake a prosecution. When there is no public prosecutor, he who prosecutes does so more or less at his own expense, and in the first instance must always do so. He must employ his own attorney and counsel, who, of course, require to be paid for their services. It is true that the expenses of prosecuting most crimes are supposed to be ultimately repaid by the county in which the trial takes place; but this allowance is a wretched pittance, and is seldom one-fourth of the real expenses incurred by the private prosecutor. Hence, in the end, the prosecutor finds that he loses a great deal of money as well as time in carrying on a prosecution. Indeed, in practice, the result is, that no person to whom his money is of much consequence ever prosecutes a second time, and the first time he almost invariably does so in ignorance of the pecuniary result, there being a vague kind of popular belief that the expenses are repaid. Few people, indeed, fail to repent of embarking in such a litigation; and the prudent and experienced are in the habit of remarking, that prosecutions are only kept going by the unbroken succession of young and inexperienced persons who do not know better.

A person who prosecutes a small larceny of five shillings may incur expenses of from five to fifteen pounds, which is money out of pocket when his attorney's bill is paid. But not only is there great expense and loss in the mere prosecution itself; there are far more grievous consequences. If it happen—and it seems in about half of the cases it really does happen—that the prisoner is not found guilty, or the case breaks down from defective evidence or otherwise, the first thing that the prisoner does is to bring an action for false imprisonment or for malicious prosecution, against the prosecutor. It is said that attorneys infest all the police courts and petty sessions, by keeping an organized service of watchers to pick up cases of this kind, which are called speculative actions. The speculative attorney promises to take the chance of gaining the action, and, of course, as it costs the prisoner nothing, he readily lends his name, and, out of revenge, joins keenly in the attempt to recover large damages. It is true that in all such cases the prosecutor ought not in theory to lose the verdict, if he acted under a reasonable and honest belief that a crime had been committed; but however plausible this defence may be in theory, it is a very different thing to establish it in practice. At the trial of the action, counsel on such occasions enlarge on the monstrous oppression of having given an innocent man into custody, blasting his character and reputation for life, and attributing the prosecution to spite or malice; and as the presumption is always in favor of innocence, it is astonishing how easily a jury may be led away by a spurious sympathy in favor

of the quondam prisoner. It is thus entirely a lottery in such cases how the verdict will go, and verdicts of ten, fifty, or a hundred pounds of damages are often obtained, simply because of the accidental defect of some conclusive piece of evidence, with which the defendant in the action had probably no more to do than any other person. When the quondam prosecutor is a person of substance and position—and, of course, a speculative attorney will not sue those who are not so—he often finds it prudent to compromise the action by paying a lump sum, rather than run the risk of a trial.

Many attorneys in the metropolis and large towns of England carry on a large and lucrative business by systematically bringing these speculative actions against unsuccessful prosecutors. The evils of this state of the law have been often complained of, but the remedy has long been delayed, probably because other systems of prosecuting crime are open to objections.—In Scotland, a well settled system of public prosecutors has long been in operation, which avoids most of the evils already described. The Lord Advocate is *ex officio* the public prosecutor, and there are counsel called advocates-depute who assist him, besides a local functionary called a Procurator-Fiscal (q. v.) in all parts of the country. The public prosecutor's duty and business is to act on all reasonable suggestions that a crime has been committed, but he is not compelled to prosecute. If he refuse to do so, a private party may at his own risk, with the concourse of the Lord Advocate, insist on the prosecution; but he may be called on to find caution or give security. The usual course is for the procurator-fiscal to take the precognitions; i. e., the examination of witnesses before the sheriff, a copy of which is laid before the crown-counsel, and if they are satisfied that a *primâ facie* case is made out, the proceeding is carried on to trial; but if there is not sufficient evidence, the prisoner is ordered to be at once discharged. The entire expense of prosecuting crime in Scotland, whether at the higher or local tribunals, is borne by the public; the persons specially injured having nothing whatever to do in the matter except appear as witnesses when called upon. This system has worked for three centuries with entire satisfaction.

PRO'SELYTES (Gr. *pros-elytos*, one who comes from without, a stranger; Hebr. *Gerim*) was the name given by the Jews to those heathens who became converts to Judaism. There were two kinds of proselytes distinguished: 'Proselytes of the Gate,' that is, heathen strangers, who, in order to be allowed to reside in Palestine, had undertaken to submit to the 'Seven Commandments of the Sons of Noah, that prohibit blasphemy, idolatry, murder, incest, theft, disobedience to the authorities, and the eating of flesh with the blood in it: commandments which probably had grown out of certain restrictions originally put upon the 'strangers' by the Mosaic Law (Exodus, xii. 19; xx. 10, &c.). These 'Proselytes of the Gate,' or 'Sojourners,' could not claim all the privileges of an Israelite, could not redeem their first-born, and, at a later period, were not allowed to live in Jerusalem; yet they were permitted to offer whole burnt-offerings, and otherwise contribute towards the religious wants of the commonwealth. The second class of proselytes was formed by the *Gere hatsedek* (Pious Proselytes), or *Gere haberith* (Proselytes of the Covenant). These accepted all the dogmas and customs of Judaism to their fullest extent, and were called 'Complete Israelites.' The new candidates were first strictly asked for their motives, and the classification of those who were not to be admitted runs as follows: those whose motive is love (husband for the sake of following his wife's faith, or *vice versâ*); Proselytes of the Tables of the Kings (i. e., those who covet court favor); Esther-Proselytes (who wish to escape some threatening danger, cf. Esther viii. 7); and Lion-Proselytes (those who, from a superstitious fear, wish to enter Judaism like the Samaritans, 2d Kings, xvii, 26). If, on the other hand, the motives were satisfactory, the candidate was further cautioned against attaching himself to a persecuted people, and warned that sufferings of all kinds would be his lot in this life. If all this did not deter him, he was 'brought under the wings of God.' He was fully instructed in the religion and history of the people, and shown the special Providence that guided them and watched over them. If a male, he was circumcised, and, in case of his being circumcised already (for instance, if he belonged to another nation practising this rite), a few drops of blood were drawn 'from the blood of the covenant,' a special prayer was said for him, and a new name was given to him, while for that of his father, Abraham was substituted.

After the healing of the wound, Baptism (Tebilah) followed, and he had further to offer up a Sacrifice (Korban). Females had likewise to undergo baptism and to bring a sacrifice. All natural relations were then cancelled, the Proselyte was considered like 'a new-born child,' and the Holy Ghost was supposed to come upon him.

The desire to proselytize, which became strong among the political leaders during the Maccabean period, and which led to the 'bringing into the Congregation' of entire nations, such as the Idumæans under John Hyrkan, the Ituræans under Aristobulos, contrasted strongly and most characteristically with the utter contempt in which the new-comers were held by the people, and with the suspicion with which they were regarded, and their (after all) limited social rights and ambiguous position. The Talmud speaks of them in no measured terms, and there is no doubt that, on the whole, they must have acted a very dubious part. They were called the Leprosy of Israel; it was the Proselytes and other reprobates who stood in the way of the coming of the Messiah; and up to the twenty-fourth generation were they to be distrusted. Yet, notwithstanding all this, conversions were very frequent, especially among the better classes—and here, again, among women principally—in Damascus, Greece, Asia Minor, Rome; so much so, that even the Roman legislation was compelled, in the 1st c. B.C., to provide for cases of Judaisers. It is a curious fact, worth remembering, that one of the main features of the times of the Messiah was to be, according to Jewish tradition, the utter abolition of proselytism, and the entire ceasing of all distinctions of an opprobrious nature among men. The evil repute into which the term Proselyte had fallen in the times of Christ also caused the early converts to Christianity to adopt the name of Neophytes (newly planted) instead.

PROSE'RPINA, the Latin form of the Greek PERSEPHONE (also PERSEPHATTA, PERSEPHASSA, PHEREPHASSA, in Homer, PERSEPHONEIA), was, according to the common myth, the daughter of Zeus and Demeter (Ceres) or of Styx. The story of her abduction by 'gloomy Dis,' while gathering flowers on the plains of Enna, in Sicily, in company with Artemis and Athena, does not occur in Homer, who simply represents her as the wife of the king of Hades, and as the majestic queen of the Underworld—a subterranean Hera (Juno). It is first given by Hesiod, and is manifestly an allegory of the seasons. See CERES. In the mystical Orphic Hymns, P. appears as the all-pervading goddess of nature, who produces and destroys everything, and she has been mixed up and identified with other mystical goddesses, Rhea, Artemis, Hekate, &c. She was generally worshipped under the name of *Kore*, 'maiden,' along with her mother Demēter. The chief seats of her worship were Sicily and Magna Græcia; but she had also temples at Corinth, Megara, Thebes, and Sparta. In works of art, P. is represented sometimes as the grave and earnest spouse of Pluto, sitting on a throne beside her sombre husband, with a sceptre and a little box; but more frequently as a blooming virgin, the picture of her mother, in the act of being carried off to Hades.

PRO'SODY (Gr. *prosodia*, literally belonging to song or hymn') is the name given, both by the ancients and moderns, to that part of grammar which treats of the rules of rhythm in metrical composition. See METRE, RHYME, BLANK VERSE.

PROSPECT, in Roman Law, was recognized as a legal incident of a house, or an urban servitude, so that no adjoining owner was entitled to obstruct the prospect or view of a man's house. But if this meant more than that the light should not be sensibly obstructed, it is not recognized in English or Scotch law. See LIGHT.

PRO'SSNITZ, a manufacturing town of Austria, in Moravia, in the fruitful plain of Hanna, stands on the Rumza, 12 miles southwest of Olmütz. It has manufactories of woollen cloths, cashmeres, linen and cotton stuffs, distilleries, and breweries. Pop. (1880) 18,417.

PRO'STITUTES, LAW AS TO. It is not an offence, in this country, for a person to carry on a course of prostitution in his or her own person; but when others are incited, or forced to that course, it may become so, in certain circumstances. Thus, for a person to keep a disorderly house, is an indictable offence, which is punishable by fine and imprisonment, and the parish officers in England are bound to institute the prosecution, the expenses of which are paid out of the poor-rates. It is, however, only the person who keeps the house who is punishable, and no punishment can be imposed on the frequenters of the house in any circumstances. The law may be said to be passive so far as the mere fact of prostitution or immoral intercourse is concerned, and gives neither party any remedy against the other, civil or criminal, arising out of that state of the relations between man and woman. Thus, if a man give a woman a bond, providing her an annuity in consideration of her living with him in concubinage, the law will not enforce it, because it is an immoral consideration. So, if a woman take lodgings, or buy dresses, for the purpose of carrying on a course of prostitution, the law will not enforce the payment of rent, or the price of the goods sold, because the tendency is immoral. In some countries, as in France, the law takes direct cognizance of the fact of prostitution, and deals with prostitutes for various sanitary purposes. In this country no legislative action of this kind was taken till 1864–68, when acts were passed, applying only to certain naval and military stations—viz., Portsmouth, Plymouth, Woolwich, Chatham, Sheerness, Aldershot, Colchester, Shorncliff, the Curragh, Cork, and Queenstown,

but not to Scotland. In those places a justice of the peace may now, on information, order a woman to be taken to a certified hospital for medical examination; and if she is found to have a contagious disease, she may be detained in the hospital for medical treatment during not more than three months. A woman who refuses to submit to examination, or leaves the hospital without being duly discharged, is liable to be imprisoned for one or two months. A resolution by Mr. Stansfeld was adopted by the House of Commons in 1883, condemning compulsory examinations, and asking government to legislate in a sense consistent with that resolution. In India, where the same act was in force, it was repealed by the Governor-General. See CONTAGIOUS DISEASES ACTS.

PRO'STYLE. A temple with a portico in front. When it had a portico at both ends, it was termed amphi-prostyle.

PROTA'GORAS, the Greek Sophist, was a native of Abdera, where he was born of humble parentage, probably about 480 B.C. He was the first who took the name of 'Sophist,' or taught for pay. When he went to Athens, is not precisely known; but he is conjectured to have gone thither about the middle of the century, and he seems to have enjoyed the friendship of Perikles. Accused of atheism by one of his own scholars, he was banished from Athens, and his writings were ordered to be publicly burned. He died, probably in 411 B.C. The basis of his speculation is the proposition, that 'man is the measure of all things,' which was developed by him in a way that involved the most thorough-going scepticism. The *Theætetus and Protagoras* of Plato are devoted to a refutation of P.'s doctrines, which, as delineated by the great philosopher, appear shallow, confused, and untenable. All P.'s works are lost, though some were extant as late as the time of Porphyry.

PROTEA'CEÆ, a natural order of exogenous plants containing about 650 known species of shrubs and small trees, chiefly natives of South Africa and of Australia, and forming a remarkable feature of the vegetation of these regions. Some of them, as species of *Protea* and *Banksia* (q. v.), are frequently cultivated in gardens and greenhouses, being prized for their singular and elegant appearance, and their curious and often beautiful flowers. They have usually umbellate branches; their leaves are evergreen, and remarkably hard, dry, and woody, divided or undivided, and without stipules. The perianth is four-leaved or four-cleft; the stamens, four, one of them sometimes sterile, perigynous, opposite to the segments of the perianth; the ovary superior, consisting of a single carpel, with one, two, or many ovules; the style simple, the stigma undivided; the fruit dry or succulent, and opening or not opening, many fruits often collected in a kind of cone. The timber of some of the larger species is used for various purposes; others supply much of the firewood of the Cape of Good Hope and Australia. The nuts or seeds of some are eaten, as those of *Brabejum stellatum* in South Africa, and of *Guevina Avellana* (also called *Quadria heterophylla*) in Chili. Those of the latter are much esteemed, and are called *Avellans* and *Nebu*.

PROTE'CTION—PROTECTIVE DUTY, in Political Economy, terms applied to a practice, now in disuse in Britain, of discouraging, by heavy duties and otherwise, the importation of foreign goods, under the notion that such a practice increased the prosperity of the country at large. See FREE TRADE.

PROTECTOR, a title which has sometimes been conferred in England on the person who had the care of the kingdom during the sovereign's minority. The Earl of Pembroke was Protector in 1216, in the minority of Henry III. Humphrey, Duke of Gloucester, held the same office in the minority of Henry VI., from 1422 to 1447. Richard, Duke of Gloucester, was Protector in 1483, prior to his ascending the throne as Richard III. The Duke of Somerset, one of King Henry VIII.'s sixteen executors, was in 1548 constituted Protector during the minority of Edward VI., with the assistance of a council, consisting of the remaining fifteen executors; a dignity, however, which he enjoyed but a few months. Oliver Cromwell, in December 1653, took the title of Lord Protector of the Commonwealth of England, Scotland, and Ireland. In 1658, his son Richard succeeded to his title and authority, but was never formally installed in the Protectorate, which he resigned in the following year.

PRO'TEIN AND THE PROTEIN BODIES. Under the term *Protein Bodies*, chemists include the following substances: Albumen, Fibrin, Syntonin or Muscle-fibrin, Casein, Globulin, and Hæmato-crystallin. Albumen, fibrin, and casein are common both to the animal and vegetable kingdom; while the three others occur only in the animal kingdom (namely, in muscular tissue, in the crystalline lens of the eye, and in the blood-cells). The most careful analyses have shown that in their composition, these substances are almost identical, and that they all contain about 53·6 per cent. of carbon, 7·1 of hydrogen, 15·6 of nitrogen, and 22·1 of oxygen, with a varying quantity of sulphur not exceeding 1·6 per cent. These substances are as similar in many of their properties, and in the products or their decomposition, as in their ultimate composition, and hence chemists were naturally led to entertain the view that they possessed a common radical.

Mulder (q. v.) announced, in 1838, that he had discovered this radical, which, from its importance, he named PROTEIN (Gr. *proteuo*, I hold the first place), and that he had found that albumen, fibrin, casein, &c. (which at that period were known as the *albuminous bodies*, the *albuminoid group*, or the *albuminates*), were combinations of this protein with sulphur and phosphorus, or simply with sulphur. The composition of this protein is represented according to the discoverer, by the formula $C_{40}H_{35}N_4O_{10}2HO$. Liebig and several of his pupils have, however, shown that Mulder's protein always contains a small but variable amount of sulphur; and they deny, on what are generally deemed sufficient grounds, the existence of protein as a separate body. The term *protein bodies*, or *protein compounds*, is, however, commonly retained both by physiologists and chemists, as being the most convenient one for representing a class of compounds, which, whether Mulder's theory is correct or not, deserve their name from their constituting the group which form the most essential articles of food.

The PROTEIN BODIES may be generally described as nearly colorless, neutral, nitrogenous bodies, soluble in potash solution, and not yielding gelatin when boiled with water. They all present two modifications, differing essentially from one another; in one of which they are soluble, and in the other nearly or quite insoluble. They exist naturally only in the soluble modification, although not necessarily in a state of solution. Most of them are transformed into the insoluble state by boiling, by the mineral acids, and by numerous salts; and one of them, fibrin, undergoes this modification on simple removal of the blood, or other fluid containing it, from the organism. This passage from the soluble into the insoluble form, is termed *coagulation*, but we do not know what chemical change takes place in the process.

The *soluble protein bodies*, in their dried state, form pale yellow, translucent masses, devoid of smell and taste, which are soluble in water, but insoluble in alcohol and ether. They are precipitated from their watery solutions by alcohol, by the mineral acids, by tannic acid, but not by the vegetable acids generally; and by many mineral oxides and salts. The *insoluble protein bodies*, when freshly precipitated, are of a white color, in flakes or small clots, or viscid and glue-like: when dried, they may be reduced to a whitish powder.

The products of the decomposition of the protein bodies are very numerous, and the study of these products is of great importance, as tending to elucidate the changes which the tissues undergo in the body during their disintegration.

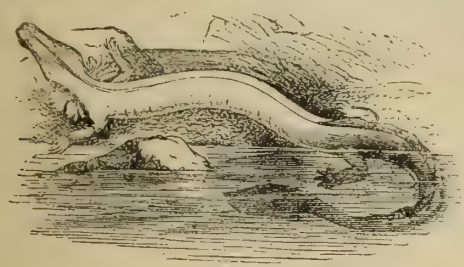
PRO'TEST is in law a legal document, drawn up by a notary-public, giving notice of some act of a public nature, as the protest of a bill of exchange.

PRO'TESTANT, a term first applied to the adherents of Luther, from their protesting against the decree passed by the Catholic states at the second diet of Speier in 1529. This decree had forbidden any further innovations in religion, and enjoined those states that had adopted the Reformation so far to retrace their steps as to reintroduce the Mass, and order their ministers to avoid disputed questions, and to use and explain the Scriptures only as they had hitherto been used and explained in the church. The essential principles involved in the protest, and in the arguments on which it was grounded, were: 1. That the Catholic Church cannot be the judge of the Reformed churches, which are no longer in communion with her. 2. That the authority of the Bible is supreme, and above that of councils and bishops. 3. That the Bible is not to be interpreted and used according to tradition or use and wont, but to be explained by means of itself —its own language and connection. As this doctrine, that the Bible, explained independently of all external tradition, is the sole authority in all matters of faith and discipline, is really the foundation stone of the Reformation, the term Protestant was extended from those who signed the Speier protest, to all who embraced the fundamental principle involved in it; and thus Protestant churches became synonymous with the Reformed churches. The essence of Protestantism, therefore, does not consist of holding any special system of doctrines and discipline, but in the source from which, and the way in which it proposes to seek for the truth in all matters of faith and practice; and thus a church might, in the progress of research, see reason to depart from special points of its hitherto received creed, without thereby ceasing to be Protestant. The Symbols or Confessions of the Protestant churches were not intended as rules of faith for all time, but as expressions of what was then believed to be the sense of Scripture. When, at a later time, it was sought to erect them into unchangeable standards of true doctrine, this was a renunciation of the first principle of Protestantism, and a return to the Catholic principle; for, in making the sense put upon Scripture by the Reformers the standard of truth, all further investigation

of Scripture is arrested, the authority of the Reformers is set above that of the Bible, and a new tradition of dogmas and interpretation is created, which differs from the Catholic tradition only in beginning with Luther and Calvin, instead of with the apostolic fathers. See REFORMATION.

PRO'TEUS, in the Homeric or oldest Greek mythology, appears as a prophetic 'old man of the sea' (*halios geron*), who tends the seal-flocks of Poseidon (Neptune), and has the gift of endless transformation. His favorite residence, according to Homer, is the island of Pharos, off the mouth of the Nile; but according to Virgil, the island of Karpathos (now *Skarpanto*), between Krete and Rhodes. Here he rises at mid-day from the floods, and sleeps in the shadow of the rocky shores, surrounded by the monsters of the deep. This was the time when those who wished to make him prophesy sought to catch him. But it was no easy task. P., unlike most vaticinal personages, was very unwilling to prophesy, and tried to escape by adopting all manner of shapes and disguises. When he found his endeavors hopeless, he resumed his proper form, and then spoke out unerringly about the future.

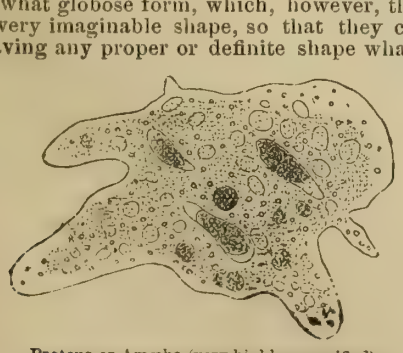
PROTEUS, a genus of perennibranchiate Batrachia (q. v.), having a long, smooth, naked, eel-like body; four small and weak legs; the fore-feet three-toed—the hinder, four-toed; the tail compressed and forming a kind of fin; the head lengthened and flattened; the eyes extremely small, and covered by the skin; the ears concealed in the flesh; the gills external and permanent,



Proteus (*P. anguinus*).

reddish, very conspicuous, between the head and the fore-legs. Notwithstanding the permanent external gills, there are also lungs in the form of simple slender tubes, terminated by a vesicular dilatation. The only known species, *P. anguinus*, is found in subterranean lakes, in the great limestone caverns in Carniola. It seems to live chiefly in the mud which forms the bottom of the lakes or pools; but almost nothing is known of its habits. It is of a pale rose or flesh color, 10 or 12 inches long, seldom above half an inch in thickness. Specimens have been kept alive in confinement for several years, in a darkened aquarium, apparently without food. One which ate a worm died soon after. The blood-corpuscles of the P. are extremely large.

PROTEUS, a name given by many naturalists to certain animalcules remarkable for changefulness of form; on which account also, as the name P. has been otherwise appropriated in science, they now receive the generic name *Amœba* (Gr. vicissitude). They are *Protozoa*, and ranked among the *Rhizopoda*. See these heads. They are found in fresh water, and are generally from $\frac{1}{800}$th to $\frac{1}{600}$th of an inch in diameter, when they assume a somewhat globose form, which, however, they exchange for almost every imaginable shape, so that they cannot be described as having any proper or definite shape whatever. They



Proteus or Amœba (very highly magnified).

consist of a transparent gelatinous substance (*sarcode*), or protoplasmic matter, which is divisible into two layers, an outer (*ectosarc*) and an inner (*endosarc*). The ectosarc is highly contractile, and can be protruded into blunt finger-like processes called *pseudo-podia* (false-feet), by which the animal is enabled to move along, and by which it procures its food, such as adiatom, which it draws into its substance, there being no mouth; and the effete matters are ejected from any part of its circumference. These pseudo-podia can be protruded from any part of the surface, and can be again retracted, at the will of the animal. The only organs present in these animals is the *nucleus*, a dark, solid, refractive body, whose function is unknown; the *contractile vesicles*, which are spaces filled with fluid, and pulsate rhythmically; and other spaces called *food vacuoles*.

Reproduction takes place either by fission; or a single pseudopodia separates and becomes a fresh amœba; or by the separation of a little mass of sarcode from the interior, the animal having become quiescent, and the nucleus and contractile vesicles disappearing. These little masses develop themselves into ordinary amœbæ.

PROTOCO'CCUS (Gr. first-grain), a genus of *Palmellaceæ* (q. v.), to which Red Snow (q. v.) is commonly referred.—Another species is *P. pluvialis*, not unfrequent in stagnating rain-water. It passes through various stages of growth, in which it has been described under various generic and specific names. In some of its stages, in which it moves by means of two long cilia, it has often been mistaken for an animalcule. Its color is usually green, but sometimes red; and the red matter often appears as a mere central nucleus, which has been mistaken for the *eye* of the animalcule. In its ordinary form, it consists of a mass of colorless *protoplasm* (see CELLS), with red or green granules diffused in it, surrounded by a *primordial utricle* (see CELLS), and undergoing division into halves, which are soon surrounded by separate envelopes, and undergo division again; the new cells thus formed, and they are formed with great rapidity, being sometimes set free by the dissolution of the original enveloping membrane, more frequently remaining imbedded in a gelatinous substance formed from it. The new cells often send forth two vibratile filaments or cilia, which spring almost from one point, often a kind of beak; and move with considerable rapidity; and in this state also, they multiply by binary subdivision; or they rest, become *encysted*, and divide into four. If slowly dried, the *P. pluvialis* retains life, and resumes its functions when again moistened.

PRO'TOCOL (Gr. *protos*, first, and *kolla*, glue), a word used in two senses: 1. The rough draft of an instrument or transaction; and more particularly the original copy of a government dispatch, treaty, or other document. 2. A record or register. In Scotland, every notary, on admission to office, formerly received from the Clerk-register a book called his proctocol, in which he was directed to insert copies of all the instruments which he might have occasion to execute, to be preserved as in a record. At one time, these protocols were attempted to be made available as records of sasines, but many causes operated to prevent their being thus used; they have, however, often been found serviceable, when regularly kept, to supply the loss of a missing deed.

PRO'TOGNE (Gr. first-born), a granitic rock, composed of the same ingredients as true granite, except that the mica is replaced by talc. It received its name because it was supposed to have been the *first-formed* granite. It abounds in the Alps, and is found also in Cornwall. The clay produced by its decomposition is greatly valued for the manufacture of china.

PROTO'GENES, a celebrated painter of ancient Greece, was born at Kaunus in Caria, and practised his art at Rhodes. Very little is known concerning him, except that he was a contemporary of Apelles, who was the means (see APELLES) of first drawing the attention of the Rhodians to his extraordinary merits. Pliny says that when Demetrios Poliorke'tes was endeavoring to conquer Rhodes, he took the utmost precautions to prevent any injury from happening to the studio of P., who then lived in a little cottage (*casula*) on the outskirts of the city, and even stole away at times from the turmoils of the siege to visit the painter, quietly and earnestly pursuing his work amid 'the din of arms and the thunder of the battering-engines.' P. died about 300 B.C. He was a careful and elaborate painter, sparing no pains to secure a brilliant, natural, and finished piece of workmanship; and was apparently held in the highest estimation by the ancients. Cicero says that his pictures were perfect in every respect. The principal were 'A Satyr resting and holding his Pipes;' 'The *Paralos* and *Ammonias*' (or sacred ships of the Athenians, executed for the Propylæ at Athens); and 'The Thesmothetæ' (for the Athenian Senate-house of the Five Hundred).

PROTO-NOTARY (Gr. *protos*, first, and Lat. *notarius*, notary), the name given to a notary appointed by the Holy See. Among the officials of the court of Rome, is a body, twelve in number, called the College of Notaries, who are to be distinguished from honorary or extraordinary apostolic notaries. The former are said to date from a very early time, and are charged with the official registration of all the solemn acts of the pope, whence they have a very special duty in relation to canonization of saints, &c. Their number was fixed by Sixtus V. at twelve, and they enjoy many privileges. An apostolic notary-extraordinary, although called proto-notary, does not enjoy the same privileges. The proto-notary extraordinary may be named not only by the

pope, but also by a LEGATE (q. v.), and under certain restrictions, by the Roman College of Notaries.

PRO'TOPHYTES (*Protophyta*, Gr. first plants), a name now frequently employed to designate the lowest or simplest organisms in the vegetable kingdom, corresponding to the *Protozoa* of the animal kingdom. They are regarded as among the *Algæ* (q. v.). Many of them are mere simple cells, which multiply by division, although perhaps they may yet be found to have also another mode of reproduction; others consist of cells united by a gelatinous substance, and the aggregate in some is a shapeless mass; in others, a plant-like structure, the form resulting from the mode in which the division of cells takes place. In none of them do the cells assume determinate characters in any part of the structure, so as to constitute different organs; in which they differ from all higher plants. It is sometimes very difficult to distinguish P. from *Protozoa;* and perhaps the surest distinctive character is the nature of their food. Some of the *Protozoa*, having no mouth, as the *Proteus* or *Amœba*, might be regarded as plants rather than animals; but they subsist by consuming organic particles, vegetable or animal, whilst P. live by appropriating inorganic substances, chiefly from the air or water around them. Among the P. are *Palmellaceæ* (q. v.).

PRO'TOPLASM. See CELLS.

PROTOZO'A (Gr. *proton*, first, and *zoön*, animal), constitute the lowest animal subkingdom, and include a large number of animal beings of the lowest and simplest type of organization. Their bodies consist either of a simple cell or of an aggregation of cells, each of which seems to retain its independent existence. In none of the P. can a nervous system, or organs of sense, be detected; and except in one group (the *Infusoria*), there is no trace of a mouth. Excepting the sponges, they are generally of very minute size, and only to be observed with the microscope; and excepting a few that inhabit the bodies of other animals, all are aquatic animals. They generally present the appearance of a transparent gelatinous cell, containing a nucleus; in addition to which, one or more clear pulsating spaces, termed *contractile vesicles*, may be frequently seen. Excepting the infusoria, none present true reproductive organs, reproduction being usually accomplished by fissure. They may be divided into the following groups or classes: (1) *Monera*, (2) *Rhizopoda*, (3) *Foraminifera*, (4) *Steliozoa*, (5) *Radiolaria*, (6) *Infusoria*, (7) *Gregarinidæ* (see these articles). The sponges formerly, as *Spongiæ*, ranked amongst the P., are now usually made an independent division and called *Porifera* (see ZOOLOGY).

PROUD-FLESH is the popular term for coarse and too luxuriant Granulations (q. v.) springing up on wounds or ulcerated surfaces. Such granulations must be treated with nitrate of silver or sulphate of copper, either in the solid form or in strong solution.

PROUDHON, PIERRE JOSEPH, a noted French publicist and speculator on social and political subjects, was born July 15, 1809, at Besançon, in which town his father was a poor cooper. Through the good offices of charitable friends, he received the rudiments of his education at the college of his native place, and from the first gave great promise of talent. While still very young, however, he quitted the institution in order to aid his family, which had fallen into great distress, and sought employment in a printing establishment. Here he was noted for the most punctual discharge of duty; and in the hours not occupied in work, he contrived, by a rare exercise of resolution, to complete and extend his education. In 1830, he declined an offer of the editorship of a ministerial journal, preferring an honorable independence as a workman, to the career of a writer pledged to the support of authority. He became a partner in 1837 with MM. Lambert and Maurice in the development of a new typographical process; was engaged on an edition of the Bible, to which he contributed notes on the principles of the Hebrew language; and in 1838, published an *Essai de Grammaire Générale;* in approval of which, a triennial pension of 1500 francs was awarded to him by the Académie de Besançon. On this accession of funds, he paid a visit to Paris; and subsequently contributed to the *Encyclopédie Catholique* of M. Parent Desbarres the articles Apostasie, Apocalypse, and others. In 1840, he issued the work entitled *Qu'est ce-que la Propriété?* which afterwards became so famous. The nature of the doctrine announced in it is sufficiently indicated in its bold paradox, soon to be widely popularized—*La Propriété, c'est le Vol.* At the moment, it attracted little notice; and the sole results to its author were the withdrawal of his pension by the Academy, on the score of his noxious opinions, and the threat of a prosecution, which, however, was departed from, at the instance of M. Blanquin, the political economist, to whom reference in the matter was made. In 1842, for a repetition of offence in his *Avertissement aux Propriétaires*, he actually *was* prosecuted before the Cour d'Assises of Besançon, but succeeded in obtaining an acquittal. From 1843 to 1847, P. was employed at Lyon, under MM. Gauthier, in the superintendence of a scheme of water-transport on the rivers Saône and Rhône; publishing during this time at Paris the two works entitled *De la Création de l'Ordre dans l'Humanité* and *Système des Contradictions Economiques.*

With the outburst of the Revolution of February 1848, the opportunity of P. had arrived. He instantly repaired to Paris, and on the 1st of April, he came before the public as editor of the *Représentat du Peuple*, instantly, by his fierce and vigorous advocacy of extreme democratic and socialistic opinions, making his mark as a leading figure of the hour. His paper was suppressed in August following; but meantime, on June 4, no less than 77,-094 enthusiastic admirers had voted him into the Constituent Assembly as representative of the department of the Seine. His career as senator, if brief, brought him at least notoriety. *La Propriété, c'est le Vol*, though a maxim much commending itself to the moral sense of the hungry masses, naturally failed to find like acceptance with an audience mostly with some sous in the pocket. P. soon ceased to address the Assembly, for, so soon as he ascended the tribune, the indignant roar which saluted him rendered audible speech impossible. Under these circumstances, P. once more betook himself to his pen, and, as editor of three daily journals in succession, avenged himself on the adversaries who declined *vivâ voce* to listen to him, the chief victims of his savage personalities being MM. Ledru Rollin, De Lamartine, Louis Blanc, Considerant, Cavaignac, &c. All three papers—*Le Peuple* (November 23, 1848—April 1849), *La Voix du Peuple* (October 1849—May 1850), *Le Peuple de* 1850 (June 15—October 13)—were in turn suppressed as anarchic and obnoxious. During their continuance, he was repeatedly subjected to fines, which were defrayed for him by popular subscription.

In January 1849, he attempted a reduction of his theories to practice by the institution of a *Banque du Peuple*. This project, which had for its object *la suppression du capital*, speedily experienced at the hands of 'capital' the fate it had intended to inflict. The bank was closed by authority, and its originator fled to Geneva, to escape threatened imprisonment. In June, however, he returned, and his next three years were passed in the prison of St. Pelagie. While shut up there, he married. During his imprisonment, he gave to the world the works entitled *Confessions d'un Révolutionaire* (1849), *Actes de la Révolution* (1849), *Gratuité du Credit* (1850), and *La Révolution Sociale démontrée par le Coup d'Etat* (1852); the last of which is remarkable, in the light of subsequent events, for the clearness with which it states the alternative of *l'anarchie ou le Césarisme*, as pressed on Louis Napoleon, then president. In June 1852, he was set at liberty; and quitting Paris, no longer a desirable abode for such unquiet spirits, went to Belgium, where he continued to publish from time to time on his favorite subjects of speculation. He died in obscurity at Paris, January 19, 1865.

Monstrous as are the social theories with which, in the history of his time, the name of P. remains connected, his power as a writer is not to be denied. It may be questioned how far he was at any time the dupe of his own paradoxes, or blind to the utter insufficiency of the premises from which, with a show of scientific rigor, he evolved his portentous results. It is related that in the negotiation of his marriage, he was very sharply solicitous as to the disposal of certain property possessed by the lady; and that on her notary venturing some surprised allusions to the famous *La Propriété, c'est le Vol*, the philosopher gravely replied: 'Be pleased, my dear sir, on such an occasion as the present, to be, if possible, a little serious.'

PROUT, SAMUEL, painter in water-colors, was born at Plymouth in 1783. He evinced a strong love for nature at an early age. Mr. Britton, when about to collect materials for his *Beauties of England and Wales*, engaged his professional aid; and his drawings made for Britton's works attracted so much notice in London, that he was induced to take up his residence in that city. In 1818, having been advised, on account of his health, which had always been delicate, to try a change of air, he went to Rouen by Havre; and the picturesque street-architecture and fine Gothic remains there made so strong an impression on his mind, that afterwards, his principal works were those in which architecture had a prominent place; and from time to time, in his after-career, he made excursions, ransacking every corner of France, Germany, the Netherlands, and Italy, for picturesque architectural remains. P.'s name is dear to all the artists and amateurs of this generation, for there are few who have not been incited or instructed by his numerous elementary drawing-books, in the slightest of which, talent and feeling for art are conspicuous. His water-color drawings are characterized by decision in handling, great breadth, and clear and pleasing coloring; good specimens are highly valued. He died at Camberwell on February 9, 1852. His character was amiable, and he was highly respected by his professional brethren.

PROVENCE, formerly a maritime province of France, in the extreme south-east of the country, was bounded on the S. by the

Mediterranean, and comprised the modern departments of Bouches du Rhone, Var, Basses-Alps, and the east part of Vaucluse. It included a portion of the territory belonging to the Roman province of Gaul generally called simply *Provincia* ('the Province'), whence it derived its name.

PRO'VERBS (Lat. *proverbium*, a common saying or word, Gr. *paroimion*, a way-side saying, corresponding to Eng. byeword) are pithy, practical, popular sayings, expressive of certain more or less general convictions. The definitions of the proverb are almost as numerous as its own varieties of form. Aristotle speaks of them as 'remnants, which, on account of their shortness and correctness, have been saved out of the wreck and ruins of ancient philosophy.' Agricola considers them 'short sentences, into which, as in rules, the ancients have compressed life.' Erasmus holds them to be 'well-known and well-used dicta, framed in a somewhat out-of-the-way form or fashion.' Cervantes explains them as 'short sentences drawn from long experience.' Johnson talks of them as 'short sentences frequently repeated by the people.' Less definitions of, than general opinions on the proverbs, are sayings like that of Howell, that 'sense, shortness, and salt' form their component parts. They are 'the genius, wit, and spirit of a nation,' according to Bacon. 'The wisdom of many, and the wit of one,' according to Earl Russell. In them, it has been said, is to be found an inexhaustible source of precious documents in regard to the interior history, the manners, the opinions, the beliefs, the customs of the people; and their use has been strikingly pointed out by George Herbert, who entitled his collection of proverbs *Jacula Prudentium* (Darts or Javelins of the Wise), a term probably derived from Plato's *Protagoras*.

Yet there have, on the other hand, not been wanting those who, like Lord Chesterfield, have deprecated their use in polite society, on account of their occasional vulgarity, and recommended stilted sentences à la Larochefoucauld instead. Of these solitary voices, however, no more notice was ever taken than they deserve. From the earliest historical times, proverbs have been household words, not merely among the people at large, but among the greatest and wisest of men. The prodigious amount of sound wisdom and good common sense they contain, the spirit of justice and kindliness they breathe, their prudential rules for every stage and rank, their poetry, bold imagery and passion, their wit and satire, and a thousand other qualities, have, by universal consent, made them the most favorite mode of imparting hints, counsels, and warnings.

Being emphatically sayings originated within or commonly adopted by the people, and handed down, in most cases, from the remotest antiquity, the question as to their origin and age is an exceedingly difficult one. Some of their sources have been pointed out in the responses of oracles, in the allegorical symbols of Pythagoras, in the verses of the ancient poets, in mythological tales, in historical events to which they allude. That they existed to a great extent before the times of which written records have reached us, is clear from the number of them which lie imbedded —as a kind of well-known quotations—in these records themselves; and what tends still further to increase the difficulty of giving them a kind of fixed habitation within a certain country or age, is the circumstance that the same proverbs are found, as it were, among all nations and at all ages. From the East they were for the most part imported into Hellas, thence to Rome, and from thence they were scattered all over Europe, and partly brought back again, slightly altered, to the East. Even certain Jewish proverbs quoted by Christ and the apostles, which hitherto did not seem to offer any analogy in other languages, might be traced back to India, where they had existed for many long centuries before they found their way into the popular speech of Palestine and Babylonia, and thence into the Talmud. That the names of their authors should, as a rule, be lost, is not surprising; yet we do meet with single instances in which either the author of a proverb is well known, or others whose nationality and birthplace are easily recognized. In the former case, it is generally some memorable event in a celebrated man's life which is remembered in close connection with a certain striking sentence he then uttered. In the latter, the scenery, the circumstances, the history of a special country, may so unmistakably be pointed, that they leave no room for any doubts on the birthplace of the special proverb; and more than that, even the special period which gave it birth, may be recognized by some trace of its character, manners, fashions, and occupations.

'What is nearest and dearest to the heart of a nation, the aspect under which they contemplate life, how honor and dishonor are distributed among them, what is of good or of evil report in their eyes,' as a recent writer has it, will surely be apparent in their national proverbs. Thus, for instance, the Greek proverbs may be designated as being fraught with a thorough knowledge of their own mythology, poetry, and history, bearing testimony to the high intellectual training that ran through all classes. The Roman ones—fewer in number, as far as they are the genuine growth of their own soil—have much less poetry about them, and are also deficient in the refinement and delicacy which were indigenous to Hellas. On the other hand, the character of the people comes well out in the constantly reiterated lessons of frugality, patience, perseverance, independence they inculcate; the practical hints as to marriage, education; and the various pursuits of the busy, vigorous, energetic nation—and among which agriculture played a prominent part. Of the proverbs now in use among European nations—calculated at about 20,000—the Spaniards are supposed to have a very large, if not the largest proportion. They may be recognized by a certain *grandezza*, a stateliness and thoughtfulness, blended though they be with humor and irony; and by the spirit of chivalry, honor, and freedom with which they are filled. The Italian proverbs, which come next as to quantity, are, to a certain extent, replete with a certain shrewdness and selfishness; and while they are fraught with unbridled passion, teach doctrines of cynicism and general distrust; yet, on the other hand, there are many of the noblest stamp, of a delicate refinement of beauty, of a subtle wisdom, teaching honor and honesty, plain-dealing and uprightness. In the same way, the French, the German, the English, as well as the Chinese and the Hindus, and every nation under the sun, impart a certain distinctive type and stamp to their homely sayings, which tells a distinct tale respecting their own inner life and national peculiarities. Of the Scotch proverbs, of which Kelly collected 3000, it has been said that there is a shrewdness, although deficient in delicacy, about them; that they are 'idiomatic, facetious, and strike home.'

Of the general utility of the proverb, it is needless to speak, after what we have said; we will only adduce the well-known frequent use made of them for ethical purposes in Scripture, which contains an entire book of them, ascribed, for the greater part, to the Wise King himself; in the Midrash and Talmud, which contains, likewise, a whole collection of pithy sayings of the 'Fathers,' or Mishnan teachers, and out of which several later collections have been compiled; in the patristic and later theological writers, who like Luther, drew very largely upon these popular treasures.

Erasmus lays claim to be the first modern collector of proverbs, although Polydore Vergil, and not without a certain amount of truth, accuses him of plagiarism. His *Adagia* (Par. 1500) fired the learned in Europe with a desire to collect and to publish proverbs of their own countries. F. Nunez and the Marquis of Santellana edited Spanish *Refranos;* Florio, an Italian, *Giardino di Ricreatione* (1591); which was followed by the Italian collections of Angelus Monozini and Julius Varini. Ondin published French proverbs as *Curiosités Françoises.* The first real German (Nether-Saxon) collection is due to Johann Agricola, whose *Gemeine Sprikwöerde* appeared in 1528. In England, Camden, Herbert, Howell, Fuller, Ray, Kelly, Bohn, and others; in Germany, Weber, Sailer, Nopitzsch, &c., have issued national collections. Freytag and Burkhardt published *Arabic Proverbs;* Dukes, a small collection of Neo-Hebrew proverbs, &c. Thus, it may easily be seen, there is by no means a lack of material; and yet very little has been done towards the investigation and elucidation of the numerous points of interest connected with this subject. Disraeli's *Curiosities of Literature* contain a valuable essay on the 'Philosophy of Proverbs,' from which (as also from Eiselein's *Sprichwörter und Sinnreden*, 1840) Archbishop Trench has derived a great deal of information for his excellent little book, *On the Lessons in Proverbs.* Freytag's introduction to his collection of *Arabic Proverbs*, and that of Le Roux de Lincy to his French collection, make honorable exceptions to the general run of vapid prefaces to most modern collections.

PROVERBS, The Book of (Heb. *Mishle*, LXX. *Paroimia Salomontos*, Vulg. *Proverbia*), a canonical book of the Old Testament, containing an anthology of gnomes and sentences, the fruit of reflections on the Mosaic law and on the divine guidance of the people of the Israelites. It is also called the 'Book of Wisdom,' in as much as it embraces the doctrines of the old covenant crystallized into religious maxims of thought, will, and action. Practical piety is enjoined under the name of 'Life,' while 'Death' represents sin throughout. The form of these proverbs is manifold—similes, enigmas, theses and antitheses, wise sayings, gnomes, comparisons, &c., vary constantly. The book is divided into three sections, to which the two last chapters form an appendix. The first sections (chaps.—i. ix.) contains a description and a recommendation of Wisdom as the highest good obtainable, and is further subdivided into three portions. The second (x.—xxiv. 34) is equally in three portions, in the first of which the sentences are very loosely strung together; while, in the second, they are joined into more continuous utterances, sometimes running through several verses; and the third, which has the inscription: 'These, too, are of the wise men,' contains, again, some single sentences, principally in the form of commandments and prohibitions. The third section (xxv.—xxix.) is inscribed: 'These are

also proverbs of Solomon, which the men of Hezekiah king of Judah copied out,' and is somewhat different from the former by the more predominant form of theses and antitheses, catch-words by which an association of ideas is produced, and similes. The first chapter appended (xxx.) contains the proverbs of Agur, which, in a very artificial garb, teach the true wisdom and its practice in life; the second (xxxi.), inscribed: 'Words of King Lemuel, the prophecy that his mother taught him,' contains from verses 1—9 wise maxims for a king anent chastity and temperance, and from 10—31, the praise and properties of a good wife, in the form of an alphabetical song.

Tradition has ascribed the authorship of this book to Solomon, 'the wisest of men;' but although neither the language, nor the structure, nor—as has principally been urged—the contents, are of a nature to convince us of the absolute necessity of assuming various authors and various epochs, there is no doubt a strong presumption in favor of this hypothesis. Who the Agur was that is mentioned as the author of the last chapter but one, is not easily conjectured. Equally unsatisfactory are the results of the speculations about the reputed author of the last chapter, Lemuel, by some supposed to be the brother of Agur. Probably it is nothing more than a symbolical name. The last section (xxxi. 10—31)—an alphabetical acrostic—probably belongs to the 7th c. B.C., and by its language and form, does not appear to belong to the author of the preceding part of the chapter. The nucleus of the book is formed by the second section (x.—xxii. 16), to which the first (i.—ix.) was added by way of introduction, and the third as the concluding portion. Whether that first anthology (from the 3000 proverbs of Solomon mentioned 1 Kings, iv. 32) was collected and redacted (into section two) during Solomon's life-time, is very doubtful; so much, however, is certain, that the learned men at the time of Hezekiah undertook their additional collection with a view to a then already-existing portion. It may not be surperfluous to add, that Jerome, misled by 1 Kings, iv. 32, erroneously states our Book of Proverbs to contain the 3000 proverbs there ascribed to Solomon. The canonicity of the book is matter of controversy in the Talmud; there seems to have been at one time an objection to receive it among the number of sacred books, on account of certain contradictions contained in it; this objection, however, was overruled, and it occurs in the order of the Hagiographa (Kethubim) of the Masoretic Code, generally between Job and Ecclesiastes. The order followed in the Authorized Version had been adopted already in the time of Jerome.—Principal writers on P. are Ewald, Bertheau, Hitzig, Elster, Rosenmüller, Hirzel, Umbreit, M. Stuart, and Dr. Noyes.

PRO'VIDENCE, a city, semi-capital, and seaport of the state of Rhode Island, U.S., situated at the head of navigation, on an arm of Narraganset Bay, known as Providence River 35 miles from the ocean, 43 miles S.S.W. from Boston, and 160 N.E. of New York. It is the second city in New England, covering nearly 15 sq. miles on both sides of the river, which, above its two bridges, expands into a cove, a mile in circuit, on the borders of which is a handsome park, shaded with elms. It is a city of large commerce, manufactures, and wealth, abounding with beautiful villas and gardens. Two small rivers afford water-power to extensive manufacturing establishments. There are 10 daily and other papers, the oldest of which was established in 1762; 76 churches, among them the oldest Baptist church in America, established in 1638 by Roger Williams; hospitals and asylums; a state prison, which had, in 1874, 67 convicts, making cabinet-work and shoes, and earning 3000 dollars a year over their expenses. Among its institutions are: Brown University; an Athenæum, with a library of 34,000 volumes; a liberally-endowed college of the Society of Friends; a Roman Catholic Institute; Franklin Lyceum; 4 grades of free schools; 45 banks; 20 insurance companies; 10 railways, all but two uniting in one central station; several lines of steam-boats; 50 cotton factories, 25 woollen; numerous iron-works; several bleaching and calendering mills; 5 large screw-mills, making 5000 tons a year; and 150 manufactories of gold and silver ware and jewelry. P. was settled in 1636, by a colony of refugees from Mass. under Roger Williams. Pop. (1875) 100,675; (1880) 104,857.

PROVI'NCIAL OF AN ORDER is the superior of all the houses, and all the members of a monastic order, within any particular province. The office is generally held for a stated term of years, and in most orders the appointment to it rests with the General (q. v.).

PROVINS, an old town of France, in the department of Seine-et-Marne, 59 miles E.S.E. of Paris, occupies a valley irrigated by two streams, the Dartein and the Voulzie, whose waters are employed to turn 50 or 60 corn-mills in the district. It is surrounded by ancient walls, flanked by ruined watch-towers, and is divided into the high and low towns. In the former, is an ancient tower built during the middle ages, but vulgarly called the *Tour de César*. The vicinity was long famous for its roses, still cultivated to a considerable extent. Pop. (1876) 7176.

PROVI'SION (Lat. *provisio*, from *providere*, to provide), in Church Law, means the bestowing an ecclesiastical benefice, and involves two stages—the designation of the person on whom it is bestowed, and the actual collation (Lat. *collatio*) of the benefice, which is completed by his taking possession. Both these acts fall properly to the ecclesiastical authority; but by usage of a very early date, the state, and often individuals, are admitted to a share in the provision of ecclesiastical benefices. In the medieval church, the claim of the sovereign to the provision of vacant bishoprics, was often the subject of contention with the popes (see INVESTITURE), but at all times the right of final and complete provision was admitted to belong to the pope. In later times, this claim has commonly been regulated by concordat. In most Roman Catholic countries, the crown elects to bishoprics, and the pope is bound to confirm the nominee of the crown, unless canonical cause of rejection should appear. In the Russo-Greek Church, the candidates are presented by the Holy Synod, and the czar names the bishop from among them. In Protestant countries, the election to benefices and dignities in the Roman Catholic Church is generally by the chapters; but in some of them, as in Holland, Prussia, Hanover, a qualified veto is permitted to the crown. In the Church of England, the bishop is nominally elected by the chapter; but, in reality, the members of the chapter are only permitted to name the particular person whom the crown presents to them for election with the *congé d'élire*. In the Roman Catholic Church of England and of Ireland, the parochial clergy, together with the canons, recommend three candidates, one of whom is commonly, although not necessarily, appointed by the pope. The conditions and usages of provision to parochial and other benefices, have been explained under the head INSTITUTION (q. v.). The completing act of provision is the installing in possession, which is described under the head INDUCTION (q. v.).

PROVI'SIONAL ORDER is an order granted under the powers conferred by an act of parliament, by a department of the government, by the Secretary of State, or by some other authority, whereby certain things are authorized to be done, which could be accomplished otherwise only by an act of parliament. The order does not receive effect, however, until it has been confirmed by the legislature. Till that time, it is purely provisional; and even after it has been so confirmed, and is in reality an independent act, it retains the title of a provisional order.

Provisional orders have been in operation in England for many years, and have been found most useful in facilitating the modification or extension of the provisions of general acts, so as to adapt them to the special necessities of particular districts. A general statute, dealing with an extensive subject like police or sanitary improvement, could only embrace provisions suited to the requirements of the country generally, and could not be so framed as to meet exceptional circumstances. When these had to be provided for, private legislation was necessary; but the cost and delay attendant upon the promotion of local acts in the usual way were so great as in many cases to be practically prohibitory. What was needed, therefore, was a ready and inexpensive mode of obtaining local legislation, and the system of provisional orders was devised to meet that want. The general act embodied legislation generally applicable, and gave power to some board or officer to issue provisional orders, whereby the general act might be better applied to special districts or under peculiar circumstances. Such powers were by the Public Health Act, 1858 (11 and 12 Vict. c. 63), conferred on the General Board of Health thereby constituted, but were by the Local Government Act, 1858 (21 and 22 Vict. c. 98), transferred to the Secretary of State.

The Turnpike Trusts Act, 1851 (14 and 15 Vict. c. 38), empowered the same functionary to grant orders in reference to the objects of that act; while the Piers and Harbors Act, 1861 (24 and 25 Vict. c. 45), authorized the Board of Trade, with the sanction, in certain cases, of the Admiralty and Commissioners of Woods and Forests, to issue provisional orders dealing with a variety of important matters connected with the construction of piers and harbors, and the levying of dues and rates. The Lands Drainage Act, 1861 (24 and 25 Vict. c. 133), gave power to the Enclosure Commissioners to issue orders for the purposes specified in that act; and the Merchant Shipping Amendment Act, 1862, gave, relatively to its objects, corresponding powers to the Board of Trade.

All these acts were in full and beneficial operation in England when the General Police and Improvement (Scotland) Act, 1862 (25 and 26 Vict. c. 101), was passed, and it conferred extensive powers on the Secretary of State in relation to the granting of provisional orders for police and sanitary purposes. Subsequently, the Irish Drainage and Improvement of Lands Acts of 1863 and 1864 (26 and 27 Vict. c. 88, and 27 and 28 Vict. c. 72), enabled the Commissioners of Public Works, and the Oyster and Mussel Fisheries Act, 1866 (29 and 30 Vict. c. 85), enabled the Board of Trade, to issue orders in relation to the subjects of these acts respectively.

Nothing can be more diversified than the objects to be attained by provisional orders under the several acts above alluded to, and yet the course of procedure in relation to them all is substantially the same. A petition to the proper authority, specifying what is wanted, and supported by such evidence as can accompany the application, is made the subject of inquiry by a qualified person commissioned for the purpose. After due inquiry has been made, and the result has been reported to the authority to which the application is addressed, the petition is disposed of, either by giving or refusing what is asked, or by giving it in a modified form.

When a provisional order is granted, steps are taken on behalf of the government to have it confirmed by parliament. In the case of orders issued under the General Police and Improvement (Scotland) Act, for example, the requisite Confirmation Bill is framed, under instructions from the Secretary of State, by the Lord Advocate, who takes charge of the measure through its various stages. When unopposed in parliament, ten days or a fortnight usually suffice for the passing of the requisite Confirmatory Act, which has all the facilities of a government measure. Of course, the whole expense connected with the preparation and passing of the order, and the relative Confirmation Act, is defrayed by the applicants; but the advantages of provisional orders, compared with ordinary private bills, are nevertheless considerable. A provisional order may be got with greater expedition and at much less cost than a private bill. It is exempted from the tedious and costly formalities of complying with standing orders and making deposits, with all the formidable fees of the House, and other incidental charges. When opposition is offered, the opponents are fully heard by the commissioner appointed to make the requisite inquiries; and the grounds of opposition are deliberately weighed, first by him, and afterwards by the superior authority to whom he makes his report. The opponents have thus the satisfaction of knowing that their case has been considered, with probably the same result as if it had been submitted at much cost to a parliamentary committee. There is, therefore, little inducement in ordinary circumstances to appeal directly to the legislature; and, as a consequence probably, an opposition to a provisional order in parliament is exceedingly rare. No doubt, if an opposition on feasible grounds were offered to a provisional order in parliament, the whole subject would be referred to a select committee, who would probably proceed as in the case of an opposed private bill; but that, as has been observed, is of so rare occurrence, that it does not detract from what has been said in regard to the advantages of the system as a rule.

PROVI'SORS. STATUTE OF. The object of this statute, 25 Edward III. st. 6, was to correct, and put an end to, the abuses which had arisen in the exercise of the papal prerogatives as to the disposal of benefices in England. See BISHOP; PATRONAGE.

PRO'VOST (Lat. *præpositus*, set over), in Church Law, the chief dignitary of a cathedral or collegiate church, from which use the title has also been transferred to the heads of other similar bodies, whether religious, literary, or administrative. Properly, however, the name is given to the highest dignitary in the metropolitan or diosecan chapter, and is often held conjointly with the archdeaconry. The provost is next in dignity after the archbishop or bishop, a position which is also the right of a provost of a collegiate chapter. The name is also given to the superiors of certain religious houses of lesser rank, and the relation of which to the more important houses is analogous to that of the priory to the abbey. It was also given to certain lay officials, whose duties, in relation to the church and maintenance of its material condition, were similar to those of the modern churchwarden. In the Protestant Church in Germany, the name provost is sometimes used as synonymous with that of dean or arch-priest; and occasionally, where several minor churches or chapels are attached to one chief church, the minister of the latter is called 'provost.'

In England, the heads of several colleges in the university of Oxford, and the head of King's College, Cambridge, are designed provost. The head of Eton College is also so called. The Provost of the Mint is a judge appointed to apprehend and prosecute false coiners.

In Scotland, the chief municipal magistrate of a city or burgh is called Provost, the term corresponding to the English word mayor. The provost presides in the civic courts along with the bailies, who are his deputies. The chief magistrates of Edinburgh and Glasgow are styled Lord Provost, and the claims of the Provosts of Aberdeen and Perth to the designation of Lord, although at one time contested, are now held to be fully established. The right to this distinction does not seem to depend on anything peculiar in the nature of the constitution of these municipalities, but on its being expressly conferred by the crown, or sanctioned by royal usage. The Lord Provost of Edinburgh is entitled to the prefix 'Right Honorable,' which may be attached not merely to the name of his office, but to his Christian name and surname, a usage which probably originated in the circumstance, that the Lord Provost of Edinburgh was *ex officio* a member of the old Scots Privy Council. Within the city and liberties of Edinburgh, the Lord Provost takes precedence next after members of the royal family. The Lord Provost of Glasgow is generally styled the 'Honorable,' a prefix, however, which belongs only to his office, and cannot be attached to his name.

In France there were formerly various descriptions of inferior judges, known under the name of provost (*prévôt*). The Grand Provost of France had jurisdiction in the king's house and over its officers.

PROVOST-MARSHAL, in the *Navy*, is a person appointed to have charge of a prisoner before a court-marshal, and until the sentence of the court is carried into execution. In the *Army*, the provost-marshal is an officer, with the rank of captain, appointed to superintend the preservation of order, and to be, as it were, the head of the police of any particular camp or district. He has cognizance of all camp-followers, as well as of members of the army. His power is summary, and he can punish an offender, taken *flagrante delicto*, on the spot, according to the penalties laid down in the Mutiny Act.

PROW (from the Latin *prora*) means, generally, the fore-part of a ship, or more especially the beak or pointed cut-water of a galley, polacre, or xebec.

PRO'XY (contracted for Procuracy), the agency of one person who acts as substitute for another. Every member of the House of Lords can (by license, in theory supposed to be obtained from the sovereign) appoint another Lord of Parliament his proxy to vote for him in his absence. A spiritual lord can, however, only be proxy for a spiritual lord, and a temporal for a temporal lord, and no peer can hold more than two proxies at the same time. Proxies cannot be used in judicial cases, or where the House is in committee, nor can a proxy sign a protest.

PRUDE'NTIUS, AURELIUS CLEMENS, a Christian poet of the 4th c., was a native of Spain, and was born 348 A.D. Nothing is known regarding him except what he has himself told in a poetical autobiography prefixed to his works. From this we learn that he received a liberal education, was admitted to the Roman bar, practised as a pleader, discharged the functions of civil and criminal judge, and was ultimately appointed to a high office at the imperial court. The year of his death is not known. In his youth, P. was fond of pleasure, and very dissipated; but as he grew old, he became very devout, and his writings (which are all in Latin verse) reflect the latter phase of his character. The principal are—1. *Cathemerinon Liber* (Book [i. e., of hymns] for Daily Use), being a series of twelve hymns, the first half of which were reckoned by the author suitable for devotional purposes at different parts of the day; 2. *Apotheosis* (a defence of the doctrine of the Trinity against heretics); 3. *Hamartigeneia* (On the Origin of Evil, a polemic, in verse, against the Marcionites); 4. *Psychomachia* (The Triumph of the Christian Graces in the Soul of a Believer); 5. *Contra Symmachum, Liber* 1 (a polemic against the heathen gods); 6. *Contra Symmachum, Liber* 2 (a polemic against a petition of Symmachus for the restoration of the altar and statue of Victory cast down by Gratian); 7. *Peri Stephanon Liber* (14 poems in praise of Spanish and other martyrs for the faith); 8. *Diptychon* (48 poems of four verses each, on Scriptural incidents and personages). Bentley calls P. 'the Horace and Virgil of the Christians,' which may be true enough if the critic only meant to say that P. is the first of the early Christian verse-makers; but is ridiculous if he intended to hint at a comparison with these two masters of poetic elegance and grace.

PRUD'HOMMES, COUNCIL OF (from Latin *homo prudens*), municipal tribunals, which existed first in the middle ages at Marseille, Lyon, and perhaps elsewhere in France, exercising an equitable jurisdiction as arbiters of disputes between masters and workmen. Similar tribunals, under the same name, were reintroduced by Napoleon I. in 1806, and have been found of great practical utility. They now exist—or recently existed—in Lyon and Paris. They were instituted in the former town in 1806, in favor of the silk-trade and other trades immediately connected with it. The council consists of manufacturers, mercers, master-workmen, foremen, dyers, and common workmen, elected among themselves. The council is empowered to dispose finally of all differences between manufacturers and their workmen, or between master-workmen, companions, and apprentices, where the sum in dispute does not exceed 200 francs; and it may also take cognizance, subject to an appeal to the Tribunal of Commerce or Tribunal of First Instance, of similar disputes, whatever their amount. Other functions of a miscellaneous nature belong to the Council of Prud'hommes, including the inspection of the workshops, in order to obtain information regarding the number of looms and of workmen, and the giving an opinion, when required by the administrative authorities, on any question submitted to it. In 1844, a Council of Prud'hommes was established in Paris in

favor of the metal trade, and all trades connected with it; and three new councils of the same kind were instituted in Paris in 1847—one connected with the manufacture of tissues of all kinds, another with the manufacture of chemicals, and a third having jurisdiction in all other trades.

PRUNE'LLA, a genus of plants of the natural order *Labiatæ*, having the upper lip of the calyx 3-toothed, the lower lip bifid; the upper lip of the corolla arched and nearly entire; the lower lip 3-lobed; and four filaments, each with two teeth at the extremity, of which one bears the anther. Several species are natives of Europe; one only is found in Britain, *P. vulgaris*, popularly known as SELF-HEAL, a plant very frequent in moist and barren pastures, as it is also throughout most parts of Europe, Central Asia, North America, and New Holland. It has oblong-ovate stalked leaves, and violet-blue flowers, very densely whorled, so as to form an imbricated oblong spike. It was at one time in considerable repute as febrifuge. It is mildly aromatic and slightly astringent.

PRUNES are dried fruit of the plum-tree (*Prunus domestica*), of the variety called *Juliana*, which is so largely cultivated in France, that not only is that country supplied, but Britain also imports from thence over 400 tons per annum. They are much used in the manufacturing districts of England by the operatives, who make puddings and pies of them when fresh fruit is out of season. The very fine kind which are sold in highly ornamental boxes are called French Plums or Table P.; these are a much finer variety, viz., *Catherinea*, which are much larger, and when ripe, are much sweeter. They are more carefully prepared, being gathered by hand and separately dried. They are used chiefly as a dessert fruit. The imports of these into Britain amount to upwards of 200 tons per annum.

PRUNING, the removal of branches from fruit or forest trees, in order to the greater production of fruit, the improvement of the timber, or purposes of ornament. In pruning for ornamental purposes, taste must chiefly be consulted, but reference must be made to what has been too little regarded in pruning of every kind—the nature or habit of the tree itself. Some trees will bear clipping into fantastic forms which would be utterly destructive of others. Such forms, once esteemed as the finest ornaments of a pleasure-ground, or the neighborhood of a mansion, are rejected by the simpler taste of the present age, and the *topiarian art* has few admirers. Much may be done, however, by the removal of branches, to give a finer form to ornamental trees; but in this, as in the pruning of trees grown for the sake of their timber, a great mistake is very generally committed in permitting branches to grow to a considerable size before they are cut off. It may be accepted as a general rule, that the branches removed should be small in proportion to the whole bulk of the tree. The removal of twigs and bad branches is attended by no bad effects, and may be beneficial; but the removal of large branches is dangerous. The leaving of stumps or snags is an aggravation of the evil. They rot away, and spoil the timber of the stem; indeed, a hole is not unfrequently formed. But as to forest trees, pruning may with great advantage be in great part avoided, by taking care to plant at proper distances, and thinning out the plantations sufficiently in early periods of their growth. In this way, better timber is obtained, and a greater produce from the land. Pines and firs scarcely ever require pruning, and are probably in almost all cases the worse of that which they get, except in the removal of those lower branches which have actually begun to decay. In other trees, it is sometimes of importance to watch for branches that would divide the trunk, and to prevent the division, causing the main stem to ascend higher before it forms a crown; but to be of any use, this must be done whilst the branches are still very young. Plantations should therefore be examined with a view to pruning, at intervals of not more than two years, after they are six or eight years old.

In orchards and fruit-gardens, pruning is necessary, the object being not to produce timber, or the utmost luxuriance of trees, but fruit in the greatest perfection and abundance. The habits of each kind must be studied. Even in the pruning of gooseberry and currant bushes, regard must be had to natural diversities, the gooseberry and black-currant producing fruit chiefly on young wood, whilst the red and white currant produce fruit chiefly on spurs from older branches. And so it is amongst trees; apricots, for example, producing fruit chiefly on young wood; cherries mostly on spurs, whilst plums produce both in the one way and in the other. The object of the gardener in pruning is to bring the tree into the condition best suited for producing fine fruit and in the greatest abundance; and to this the training of Wall Trees (q. v.) must also be accommodated. Sometimes, in order to produce particularly fine fruits for the improvement of the variety by seed, or for the sake of a prize at a horticultural exhibition, the gardener diminishes the number of branches likely to bear fruit, beyond what would otherwise be desirable.

The general seasons of pruning are winter and spring; but some trees, particularly cherries, are advantageously pruned in summer, as they then throw out less gum.

Pruning instruments are of various kinds—knives, axes, saws, bills of very various forms, &c., and the *averuncator*, which may be described as a pair of scissors, one blade hooked or crooked, attached to a long handle, and working by a cord and pulley. It is scarcely used except for standard trees in gardens and orchards.

PRU'NUS. See PLUM.

PRURI'GO is a non-contagious affection of the skin, in which intense itching is the most prominent symptoms. Sometimes the parts affected present no marked deviation from the normal type, but most commonly they are covered with papulæ, which are nearly of the same color as the skin. Hence P. has been placed among the papular diseases of the skin. William makes three varieties of this disorder—viz., *P. mitis*, *P. formicans*, and *P. senilis*. This affection seldom affects the whole surface; its favorite seats being the neck, the shoulders, the back, the outer surface of the limbs, the anus, &c. In *P. formicans* there is not only intense itching, but patients complain of a feeling like the creeping of ants (hence the specific name) or the stinging of insects, or as if hot needles were thrust into the skin. All the forms of this disease are aggravated by exposure to the air, and by heat, and the sensations are often so distressing after the patient has become warm in bed, as to prevent sleep for many hours. *P. senilis*, occurring, as its name implies, in old persons, is characterized by the extreme severity and permanence of the itching, and by the obstinacy with which it resists every kind of treatment. The different varieties of this disorder may probably be often traced either to disease of the digestive system, or to want of personal cleanliness; but in most cases their origin is obscure.

In the treatment of this disease, attention should be paid to the diet. All stimulating condiments and drinks should be forbidden, and only a plain, easily digested food allowed. Internal remedies are seldom of use excepting opium, which in severe cases is required in free or large doses, in order to procure rest. The local applications that have been recommended are very numerous. Lotions of spirit, diluted vinegar, solution of acetate of ammonia, glycerine, prussic acid, &c., and ointments containing creasote, iodide of sulphur, aconitine, &c., have been advocated by various physicians of eminence. Unless, however, the greatest attention is paid to personal cleanliness, no remedy is likely to be of permanent benefit.

PRU'SSIA (Germ. *Preussen*), a kingdom embracing nearly the whole of Northern Germany. It is bounded N. by the German Ocean, Jutland, and the Baltic; E. by Russia and Poland; S. by Austria, Saxony, Saxe-Altenburg, Saxe-Weimar, Gotha, and others of the smaller German States, Bavaria, Hesse-Darmstadt, and Alsace-Lorraine; W. by Belgium and the Netherlands. P. owns besides the detached domains of Hohenzollern (q. v.) and Jaade or Jahde on the North Sea, which lie between the boundaries of other German states.

The following table gives the area and population (1880) of the 13 Prussian provinces:

	Area in sq. m.	Pop. in 1880.
1. East Prussia	14,100	1,933,936
2. West Prussia	10,016	1,405,898
3. Brandenburg	15,401	3,389,155
4. Pomerania	11,628	1,540,034
5. Posen	11,177	1,703,397
6. Silesia	15,558	4,007,925
7. Saxony	9,743	2,312,007
8. Schleswig-Holstein	7,224	1,127,149
9. Hanover	14,855	2,120,168
10. Westphalia	7,799	2,043,442
11. Hesse-Nassau	6,021	1,554,376
12. Rhenish Prussia	10,413	4,074,000
13. Hohenzollern	441	67,624
Total	134,376	27,279,111

The duchy of Lauenburg, with an area of 452 square miles, and a population (1875) of 48,808, was incorporated with the province of Schleswig-Holstein in July 1876, and is included in the estimate given.

In 1819 the total population of P. was 10,981,934. In 1858 it was 17,739,913. In 1867 the kingdom increased from an area of 107,757 English sq. m. to its present size, had a population of 24,106,847. The census of December 1871 gave a total of 24,689,252.

Physical Character, &c.—The larger portion of P. is a part of the great plain stretching from Holland to the Ural Mountains, and, except in the south of Hanover and Silesia, is an almost unbroken level. The Sudetic Mountains, whose northern ranges, known as the Riesengebirge (q. v.), lie between the Oder and the Elbe, divide P. from Bohemia; while the Thüringerwald intersects the line dividing it from Saxony and some of the lesser German states.


PRUSSIA
AND
NORTH GERMANY.
Geographical Miles, 60 = One Degree
0 5 10 15 20 40 60 80 100 120
English Miles, 69 = One Degree
0 5 10 15 20 30 50 75 100
Railways thus
See also Map of German Empire
Longitude East from Greenwich
SWEDEN
DENMARK
NORTH SEA
BALTIC SEA
JUTLAND
ZEALAND
FUNEN
FALSTER
MOEN
BORNHOLM
HOLSTEIN
MECKLENBURG
HANOVER
BRUNSWICK
OLDENBURG
WESTPHALIA
HESSE CASSEL
HESSE DARMSTADT
NASSAU
FRANKFORT
SAXONY
THURINGIA
BAVARIA
WURTEMBERG
BADEN
HOHENZOLLERN
PRUSSIA
POMERANIA
BRANDENBURG
POSEN
SILESIA
WESTPHALIA
RHENISH PROVINCES
BOHEMIA
AUSTRIA
Kiel Bay
Gulf of Dantzic
Frische Haff
Kurische Haff
Gulf of Finland
Aland Is.
Gothland
Oland
Bornholm
Ringkiobing Fd.
Nissum Fd.
Lim Fd.
Blaavands Pt.
Skagen
Anholt
Laholms B.
Stettin B.
The Sound
Elsinore
Helsingborg
Copenhagen
Malmo
Ystad
Kioge & B.
Falsterbo Pt.
Faxoe B.
Darsor Pt.
Arkona C.
Rugen
Stralsund
Greifswald
Wismar
Rostock
Travemunde
Lubeck
Kiel
Eckernforde
Flensburg
Tondern
Sylt
Romoe
Amrum
Heligoland (To Britain)
Nordeney
Borkum
Emden
Leer
Papenburg
Oldenburg
Bremen
Bremerhafen
Cuxhaven
Stade
Hamburg
Altona
Harburg
Luneburg
Ratzeburg
Schwerin
Gustrow
Parchim
Ludwigslust
Wismar
Rostock
Doberan
Warnemunde
Grevismuhlen
Neu Strelitz
Templin
Prenzlau
Pasewalk
Anklam
Demmin
Stettin
Swinemunde
Usedom
Wollin
Greifenhagen
Pyritz
Stargard
Cammin
Treptow
Kolberg
Rugenwalde
Stolpmunde
Lauenburg
Lupow
Leba
Lupitzow
Pollnow
Schlawe
Stolp
Parpart
Baerwalde
Neustettin
Dramburg
Arnswalde
Deutsch Krone
Friedeberg
Woldenberg
Landsberg
Soldin
Konigsberg
Custrin
Zorndorf
Zellichau
Schwiebus
Crossen
Frankfurt
Muskau
Spremberg
Sagan
Sprottau
Glogau
Grunberg
Freistadt
Lissa
Rawicz
Fraustadt
Bentschen
Meseritz
Birnbaum
Schwerin
Zielenzig
Landsberg
Driesen
Schneidemuhl
Deutsch Krone
Filehne
Bromberg
Nakel
Inowrazlaw
Gnesen
Wreschen
Schrimm
Schroda
Posen
Kosten
Lissa
Krotoschin
Pleschen
Kalisch
Rawicz
Fraustadt
Steinau
Tschirnau
Wartenburg
Militsch
Trachenberg
Schildberg
Wierzbnik
Lublinitz
Tarnowitz
Beuthen
Gleiwitz
Pless
Ratibor
Rybnik
Loslau
Troppau
Jagerndorf
Neisse
Glatz
Habelschwerdt
Reichenbach
Frankenstein
Silberberg
Strehlen
Ohlau
Brieg
Oppeln
Cosel
Neustadt
Leobschutz
Ratibor
Tarnowitz
Rosenberg
Kempen
Krotoschin
Ostrowo
Schildberg
Wreschen
Gnesen
Inowrazlaw
Thorn
Culm
Strasburg
Soldau
Neidenburg
Osterode
Allenstein
Mohrungen
Preussisch Eylau
Braunsberg
Heiligenbeil
Friedland
Insterburg
Gumbinnen
Angerburg
Goldap
Lotzen
Johannisburg
Stuhm
Marienburg
Elbing
Dirschau
Pr. Stargard
Neustadt
Putzig
Hela
Pillau
Brusterort Pt.
Memel
Schwarzort
Polangen
Libau
Windau
Mitau
Kalkuhnen
Tilsit
Ragnit
Gumbinnen
Pillkallen
Darkehmen
Lyck
Oletzko
Bialla
Prasnysch
Ostrolenka
Pultusk
Plock
Mlawa
Soldau
Neidenburg
Strasburg
Thorn
Culm
Graudenz
Marienwerder
Konitz
Tuchel
Berent
Schlochau
Flatow
Deutsch Krone
Arnswalde
Friedeberg
Soldin
Land

The Harz Mountains (q. v.) of Hanover are now within the limits of Prussian territory. None of these ranges rise, even in their highest summits, above 5000 feet. In the east, the surface of the great plain of P. is marked by two distinct tracts of more elevated land, one of which belongs to the elevation which, running generally parallel to the Baltic, may be traced from the mouth of the Elbe to the source of the Volga, and which in P. rises about 400 feet above the sea-level. This tract is diversified with numerous lakes, none of which is more than 20 square miles in extent, but which altogether occupy an area of more than 300 square miles. The soil, consisting chiefly of loose sand interspersed with a large number of erratic blocks of granite, is sterile, covered in many places with heaths and belts of stunted pines. On the northern slope, terminating on the shores of the Baltic, there are several fertile districts, more especially along those rivers which have been carefully embanked, as the Niemen and the Vistula. The southern elevation of the Prussian plain, running between the Polish mountains of Sandomir in the south-east, and the Elbe between Magdeburg and Burg in the north-west, attains a height of about 1000 feet near Breslau on the Oder, where it is known as the Trebnitz Heights. Its general character is more fertile than the northern elevation; while the country between the two is, for the most part, extremely sterile. It includes the sandy waste in which Berlin, the capital, is situated. South of this tract, and in Silesia and Prussian Saxony, the country if fertile, including some of the most productive grain-growing districts of Prussia. Hanover has much the same character. Great marshes of peat-moors cover the north and north-west districts; but the valleys that lie among the Harz Mountains in the south are often fertile, and well adapted for agriculture. The coasts are low, and require to be protected from the overflowing of the sea by embankments and dikes. Slesvig-Holstein, the recently annexed territory north of the Elbe, is in part sandy and healthy, like the plain of Hanover, but it has also numerous marshes. The great plain of Northern P. is watered by five large rivers—the Wesser, Elbe, Oder, Vistula, and Niemen; the numerous affluents of which, together with many smaller streams, contribute largely to the facilities of intercourse throughout the country, as many of them are navigable for vessels of several hundred tons.

The western and south-western parts of P., comprising Rhenish Prussia, Westphalia, and Hesse-Nassau, are quite distinct in their physical character from the rest of Prussia. They are divided by the Rhine into two portions, each of which has an elevated and a low plain. On the west bank of the river, the level land terminates in the northern extremity of the Vosges, or, as they are here called, the Hardt, Mountains, and extends northward as far as Aix-la-Chapelle. This table-land is broken along the banks of the Moselle by ranges of the Hochwald and the Soonwald, the highest summit of which, Walderbsenkopf, attains an elevation of about 2700 feet. The plain north of the Moselle, which is known as the Eifel and the Hohe Veen, has a mean elevation of 1600 feet, with a few higher hills. The level country between the Rhine and Maas, bordering the Eifel, is extremely fertile. On the east side of the Rhine, the table-land, rising along the banks of that river and the Maine, terminates in the ridge of the Taunus, whose highest summit, the Feldberg, attains a height of more than 2800 feet. In the north, the plain ends in the Westerwald between the Lahn and the Sieg, and in the Sauerland between the Sieg and the Ruhr. The Teutoburgerwald and the Harz Mountains cut off this region from the sandy and heathy wastes of Northern Prussia. The soil is generally poor in these districts, which, however, possess special sources of wealth in their iron and coal mines. But Hesse-Cassel, which forms part of the central plateau of Germany, is particularly fruitful, cereals of all kinds growing abundantly.

The narrow valley of the Rhine is noted as one of the most picturesque and beautiful parts of Germany. The Rhine (q. v.) is navigable throughout its entire course in P., which it traverses from south to north, receiving numerous other rivers—as the Lahn, Wied, Sieg, Wupper, Ruhr, Lippe, Berkel, and Vechte on the right; and on the left, the Ahr and the Moselle, the latter of which is navigable for more than 150 miles within the Prussian dominions. The Weser, the Elbe, the Oder, and the Vistula, as also the Spree and the Havel, affluents of the Elbe, are of high importance for the inland navigation of P., and are each discussed in special articles. The great rivers of North Germany are connected by an extensive system of canals, such as the Seckenburger, the Friedrichsgraben, the Finow, Bromberger, and Friedrich Wilhelms, and the Plauensche.

Climate, Products, &c.—The climate of P. presents great differences in the eastern and western provinces—the former being exposed to heavy snowstorms in the winter, and great drought in the summer, and with a mean annual temperature of 43°, has a summer mean temperature of 61°, and winter, 26° F.; while the latter, which have milder winters, and a larger fall of rain, have a mean annual temperature of 49°·5—summer, 63°, and winter, 35° F.

Agriculture and the rearing of cattle constitute the principal sources of employment and wealth of the rural population of the entire monarchy, and the state has hitherto directed its unremitting attention to the furtherance of the one, and the improvement of the other; abrogating onerous land-taxes, advancing money to landowners, encouraging agricultural institutions, introducing approved breeds of animals, and improved farm instruments, &c. About one-half, or 12,000,000, of the population of the kingdom are engaged in agriculture as their sole or chief occupation. Large estates, as a rule, are only to be found in the eastern and least populated provinces of the monarchy. A survey taken in 1858, gave 1,099,000 land-owners, possessing each less than 5 morgen, or 3¼ acres. Wheat, rye, oats, barley, peas, millet, rape-seed, maize, linseed, tobacco, flax, hemp, hops, chicory, are extensively cultivated, and largely exported. The finest grain districts are the Börde, near Magdeburg, the low lands on the Wartha and Netze, and on the Plöne and Madüe lakes, the north-eastern parts of Pomerania, the island of Rügen, the valleys of the Oder in Silesia, of the Saale, Moselle, Saar, and parts of Hesse-Nassau. Potatoes have of late years been largely grown. Western P. is noted for its excellent fruits and vegetables, and its provinces stand pre-eminent for their wines. Nassau is specially famous for its Rhine wines, Hochheimer, Johannisberg, Rudesheimer, and Aswannshaüser. The forest-lands, which are chiefly in East P., Posen, Upper Silesia, Westphalia, Southern Hanover, and Hesse-Nassau, are of great value and considerable extent, occupying an area of 10,000,000 English acres.

The mineral products of P. include coal, iron, lead, zinc, copper, cobalt, antimony, manganese, arsenic, sulphur, alum, nickel, black lead, baryta, gypsum, slate, lime, freestone, salt, amber, agate, jasper, onyx, &c. All metals, salt, precious stones, and amber belong to the crown. The latter substance is found almost exclusively along the Prussian coast from Danzig to Memel, where it is fished, dredged for, or dug up near the shore. P. has upwards of 100 mineral springs, of which the most noted and efficient are the sulphur baths of Aix-la-Chapelle and Ems, the iron springs of Schwalbach, Wilhelmsbad, Driburg, and the hot and saline baths of Reinerz, Landeck, Flinsberg, Freienwalde, Lauchstedt, Wiesbaden, Schlangenbad, and Selters.

East P. is noted for its royal studs, and the excellent breed of horses which it now raises, and of which large numbers are annually exported. Westphalia enjoys a special reputation for the excellence of its hams and pork, Pomerania for its smoked geese, and Brandenburg and Hanover for honey and wax.

Fish of all sorts are abundant in the rivers and numerous lakes; seals are taken in the Baltic. The wooded districts abound in game of every kind; pheasants, partridges, and wild-geese being often found in enormous quantities. Besides stags, fallow-deer, wild boars, foxes, otters, weasels, polecats, martens, badgers, hares and rabbits, the lynx, bear, eagle, and beavers are occasionally met with.

Manufactures, Commerce.—The principal manufactures are linens, for which certain districts of Silesia, Prussian Saxony, and Brandenburgh enjoy a European celebrity; while of late years, the cotton manufactories, worked by steam, have maintained a successful rivalry with the older linens, worked by hand-looms. Besides these, there are numerous manufactories of silk, wool, mixed cotton and linen fabrics; including fine shawls and carpets in Brandenburg, stockings and ribbons in the Rhenish provinces, where, as well as in Westphalia and Hesse-Nassau, the flax, hemp, and silk and cotton thread is mainly prepared for the manufacturers. These districts, moreover, stand foremost in regard to the preparation and manufacture of iron, steel (the steel and gun works of Krupp, at Essen, being world-famous), and the metallic wares, paper, leather, soap, oil, cigars, and tobacco, and for the number of their distilleries and breweries; while Saxony and Silesia have the largest number of chicory, starch, beet-root, gunpowder, and glass works. Berlin and Elberfeld rank as the two most important centers of manufacture in the continent. The region of the Harz in Hanover is famous for its mining industries. In 1878, there were altogether in P. 1875 mines, producing coal, lignite, and iron, zinc, lead, and copper ores, and employing 225,500 persons, the value of the produce being estimated at £13,933,559. In the same year the smelting-works and foundries amounted to 1083, employing 100,870 persons, the value of the produce being £22,401,310.

The commerce of P. is materially facilitated by her central European position, and the network of river and canal navigation, which makes her territories the connecting medium between several of the great European states, and which, with 12,000 miles of railway, 22,000 miles of public roads (all, or nearly all, formed since the time of Frederick the Great), and a sea-line of 700 miles on the Baltic, and 200 on the German Ocean, give her a free outlet to the rest of the world. The Prussian mercantile marine, in 1875, numbered 3103 vessels, of 496,337 tons. The chief ports are Memel, Pillau, Königsberg, Danzig, Colberg, Swinemünde, Stettin, Wolgast, Stralsund, Kiel, Flensborg, Altona, Harburg,

Geestemünde, Leer, and Emden. The principal commercial towns are Berlin, Königsberg, Breslau, Barmen, Elberfeld, Danzig, Stettin, Cologne, Magdeburg, Aix-la-Chapelle, and Frankfurt-on-the Maine. Annual fairs are still held at Breslau, Magdeburg, and Frankfurt-on-the-Oder.

The money, measures, and weights of P. are those in use throughout the German Empire. In accordance with the law of 1872, the *mark* is the unit of reckoning, and have gradually displaced Thalers (q. v.) and silbergroschen. The Prussian or Berlin Bank, founded in 1765, with numerous branches in the provinces, is the most important of those banks which possess the right of issuing notes.

Religion, &c.—The dominant religion is Protestantism, and since 1817, the Lutheran and Reformed Churches have been united under the head of one common evangelical church. Everything connected with the external administration of church matters is under the control of the minister of public instruction and ecclesiastical affairs, but every religious community manages its own internal concerns; the Protestant churches acting in conjunction with consistories or boards appointed by the government, one of which exists in each province, under the direction of the upper president, or provincial governor, and clerical superintendent-generals, who in Posen and Pomerania bear the title of bishop; while the Roman Catholic Church is directed by the two archbishops of Posen and Gnesen, and Cologne, under whom stand the four bishoprics of Culm, Münster, Paderborn, and Treves.

The two episcopal sees of Breslau and Ermeland are directly under the jurisdiction of the pope, while the district of Glatz, in Silesia, belongs to the archbishopric of Prague, and Katscher, in Upper Silesia, to that of Olmütz. The results of the census of 1880, as regards the numbers of the religious bodies, are as follows: the Protestants of P. numbered 17 645,462; Roman Catholics, 9,205,136. This gives a percentage of 64·7 of the population to Protestantism, and of 33·1 to Roman Catholicism. The Protestants were in the predominance in the new provinces annexed in 1866. The higher Roman Catholic clergy are paid by the state. In 1881, by the operation of the Falk laws, no less than two-thirds of the Prussian bishopries were vacant. Recently endeavors have been made to bring to a conciliatory conclusion the *Kulturkampf*, the controversy between church and state, which led to so abnormal a state of affairs.

Education.—Education is compulsory in P., and its management and direction are under the control of the state. In no country are better or ampler means supplied for the diffusion of knowledge among all classes of the community. P. has ten universities —viz., Königsberg, Berlin, Greifswald, Breslau, Halle, Göttingen, Münster, Bonn, Kiel, and Marburg, which, in 1882, numbered above 1000 professors and teachers, and 10,850 students. The Prussian schools are divided into eleven classes—viz., 1. *Elementary*, embracing village or town schools; 2. *Bürgerschulen*, or citizen schools; 3. *Real-schulen*, or schools in which arts, sciences, and languages are taught; 4. Seminaries, or schools for training elementary schoolmasters; 5. *Gymnasien*, or high schools for classical education; 6. Industrial schools; 7. Schools of Architecture; 8. Schools of mines; 9 Schools of agriculture; 10 Veterinary schools; and 11. Universities. Between 1870 and 1880, there were in P. 35,000 elementary schools, with 56,000 teachers, and 4,000,000 pupils. The management of the elementary national schools is in the hands of the local communities; but the state appoints the teachers, and in part pays their salaries, the remainder being supplied by the public. In addition to the libraries of the several universities there is the Royal Library at Berlin, with 700,000 volumes and about 15,000 MSS.

Among the numerous scientific, artistic, and literary schools and societies of P., the following are some of the more distinguished; the Academy of Arts, founded in 1699; the Royal Museum of Arts; the Academy of Sciences; the Natural History, Geographical and Polytechnic Societies of Berlin; the Antiquarian Society of Stettin; the Breslau Natural History and Historical Societies; &c.

Justice.—Till lately, the *Code Napoléon* was in force in the Rhenish provinces, and in Hither-Pomerania, the common German law; but in other parts of the kingdom the Prussian Code, compiled under Frederick the Great's direction, was followed. A new penal code was promulgated in 1850, by which all pre-existing seigniorial, municipal or ecclesiastical rights of decreeing punishments were unconditionally abrogated. A partial codification was brought about in 1862; and in 1869 a code of commercial law valid for the North German Confederation. Since the establishment of the empire imperial law has precedence of that peculiar to the various states in a large number of subjects. A universal criminal code is now in force for the whole empire; and a common judicature bill for the empire at large was introduced in 1879. Prussia has 16 *Oberlandesgerichte* or provincial courts, one or more in each province. Connected with that sitting at Berlin is the Privy-council of Justice, which has jurisdiction over the royal family and the princely houses of Hohenzollern. The supreme tribunal of the empire has recently been established, not at Berlin, but at Leipzig.

Army, Navy, &c.—In 1881, the strength of the Prussian army, on a peace-footing, according to official returns, numbered 344,630, of whom 53,000 were cavalry, and 40,000 artillery. On the war-footing the numbers can be raised to 900,000. The army consists of the regular troops and the Landwehr (q. v.), and in time of war an extra force can be called up under the title of the landsturm. Every able-bodied male Prussian is liable to be called upon to serve between 20 and 36 years of age (see GERMANY). Mennonites (see ANABAPTISTS), clergymen of the Roman Catholic and Evangelical churches, and indispensable supporters of families are exempt. The time of active service is three years for some branches of the service, and two for others. In peace, the army lies distributed over 309 garrison towns, and 29 fortresses, of which latter the following are fortified places of the first rank: Mainz, Coblenz (with Ehrenbreitstein), Cologne, Königsberg, Magdeburg, Spandau, and Posen. Great care is bestowed on the education and military training of officers and men; and besides numerous admirable academies, there are several good schools of operative and veterinary surgery, &c., connected with the educational department of the army. The navy of the new German empire is the navy of Prussia. See GERMANY.

Constitution, &c.—P. was an absolute monarchy till the crisis of 1848, when the decided movement in favor of liberal views compelled the late king to convoke a national assembly, and submit to the establishment of a constitutional form of government, which has been repeatedly modified. The national representative body consists of two bodies. 1. An upper chamber (*Herrenhaus*, or 'House of Lords'), which is now composed of the princes of the royal family who are of age, the chiefs of the mediatized princely houses, recognized by the Congress of Vienna, and numbering 16 in P., the heads of the territorial nobility (about 50), life-peers chosen by the king from the class of rich land-owners, manufacturers, and 'national celebrities,' a titled representative chosen by all land-owners in each of the Prussian provinces, representatives of the universities, the burgomasters of all towns having more than 50,000 inhabitants, and an indefinite number of members appointed by the king for life or for a limited period. 2. A lower chamber (*Abgeordnetenhaus*, or 'Chamber of Deputies'), composed of 432 members, 352 for the old kingdom, and 80 for the provinces annexed in 1867.

Every Prussian who has attained his 25th year, and who has a municipal vote, has also a parliamentary vote, but not a direct one. Out of every 250 *Urwähler*, or electors in the first instance, is chosen a *Wahlmann*, or direct elector. This is the man who, strictly speaking, votes for a member of parliament. Representatives are elected for three years. In addition to this general house of assembly, there are representative bodies for the provinces, communes, and circles, which debate and legislate in regard to local matters within their several departments. The council of state is composed of 8 ministers, under whose ministries are numerous departments, embracing almost every conceivable subdivision of foreign policy or internal legislation, since nothing can be done in P. independently of the state. By the modified constitution of 1850, all exclusive privileges arising from titles or station are abrogated, and perfect equality in the eye of the law fully recognized; liberty of the subject guaranteed in regard to religious persuasions, the right to hold meetings unarmed within closed doors, and become members of societies; immunity from domiciliary visits, and inviolability of letters, &c. The monarchy is hereditary in the male line. The sovereign and royal family must profess the evangelical confession of faith. The king, who is not responsible for the measures of his government, and whose decrees require the counter-signatures of his ministers, exercises the executive power, nominates and dismisses the ministry, summons and dissolves the chambers, orders the promulgation of the laws, is commander-in-chief of the forces, has the right of proclaiming peace and war, granting reprieves, &c. He bears the titles of King of Prussia, Merkgraf of Brandenburg, Sovereign-duke of Silesia, Prince of Orange, Grand-duke of Pomerania and the Lower Rhine, besides a host of lesser titles. The title 'Emperor of Germany,' by which he is now best known, is not, of course, a Prussian dignity. The arms of P. are composed of four central shields borne on the great shield of 48 fields, representing the different territories incorporated in the Prussian monarchy.

The black eagle on a field argent, surmounted by the open crown, is the special cognizance of P. Proper. The national colors are black and white; the standard is white, bearing the Prussian crowned eagle and an iron cross in the right corner. The eldest son of the king bears the title of Crown-prince. The ordinary royal residences are the palaces at Berlin, Potsdam, and Charlottenburg. The royal domains were ceded to the state by Frederick-William III. in 1820, on condition of a rental of 2½ million thalers being paid first from them for the king and his family, which, however, has been largely increased of late years,

by means of a *Krondotation* ('crown allowance'). Among the numerous military orders, the following deserve notice: the Order of the Swan, founded in 1443; and that of the Black Eagle, founded in 1701, regarded as of the highest dignity.

According to the budget estimate for 1881–82, the net receipts for that year were 501,759,207 marks (£25,087,960): the ordinary expenditure amounted, however, to 873,020,898 marks; though ordinarily receipts and expenditure are made to balance. The total debt was 1,995,312,989 marks (£99,765,649).

Population, Races.—About seven-eighths of the population of P. are Germans. Of the Slavonic tribes, the most numerous are Poles, numbering 2½ millions. In Brandenburg and Silesia, there are about 83,000 Wends; in East P., upwards of 146,000 Lithuanians; Western P. has rather more than 10,000 Walloons, using the French language; intermixed in its generally German population, Silesia has 50,000 Czechs or Bohemians; Slesvig-Holstein, 150,000 Danes—making in all about 3 millions who do not use the German language, or who employ it only as secondary to their native tongues.

Ranks, Classes.—Three distinct hereditary classes are recognized in P., viz., nobles, burghers, and peasants. To the first belong nearly 200,000 persons, including the higher officials of the state, although that number does not comprise the various mediatized houses, of which 16 are Prussian, and others belonging to different states, but connected with P. by still existing, or former territorial possessions. The burgher class includes, in its higher branches, all public office-bearers, professional men, artists, and merchants; while the peasantry—to which belong all persons engaged in agricultural pursuits—are divided into classes, depending on the number of horses employed on the land, &c.

History.—The lands bounded by the Baltic, which now form part of P., were early occupied by Slavonic tribes, nearly allied to the Letts and Lithuanians. It is conjectured that they were visited by Phœnician navigators in the 4th c. B.C.; but beyond the fact of their having come into temporary conflict with the Goths and other Teutonic hordes, prior to the great exodus of the latter from their northern homes, little is known of the people till the 10th c., when they first appear in history under the name of Borussi, or Prussians. In 997, Bishop Adalbert of Prague suffered martyrdom at their hands, while endeavoring to convert the people to Christianity. Boleslas, Duke of Poland, succeeded, however, about 1018, in compelling them to submit to baptism and subjection. After many futile attempts on the part of the people to throw off the yoke of Christianity and foreign domination, they finally made a successful stand against Boleslas IV. of Poland in 1161, and for a time maintained a rude and savage kind of independence, which the disturbed condition of Poland prevented its rulers from breaking down. The fear of losing their freedom if they adopted Christianity, made the Prussians obstinately resist every effort for their conversion; and it was not till the middle of the 13th c., when the knights of the Teutonic order entered upon their 'famous' crusade against them, that the Christian faith was formally established among them. The aggressive inroads of the pagan Prussians on the territories of their Christian neighbors, and their advance into Pomerania, were the exciting causes of this important movement.

The knights of the order, when appealed to by Conrad, Duke of Masovia, to aid in the subjection of the heathen, gladly promised their services, on condition of being permitted to retain possession of the lands which they might conquer; and having entered the Prussian territories in considerable numbers, they entrenched themselves at Vogelsang and Nessau in 1230, and at once entered upon the conquest of Prussia. For half a century the belligerent brotherhood were engaged in war with the people—winning lands and souls by hard fighting—until at length, in 1283, they found themselves undisputed masters of the country, which they had both civilized and Christianized after a fashion, namely, by almost exterminating the pagan population. During this period of struggle, the knights founded the cities of Thorn, Kulm, Marienwerder, Memel, and Königsburg, repeopled the country with German colonists, encouraged agriculture and trade, and laid the foundation of a well-ordered, prosperous state. The unhappy wars between the knights and the Poles and Lithuanians, together with the moral degeneracy of the order, led, in the 14th and 15th centuries, to the gradual decline of their supremacy. In 1454, the municipal and noble classes, with the co-operation of Poland, rose in open rebellion against the knights, who were finally compelled to seek peace at any cost, and obliged, in 1466, to accept the terms offered to them by the Treaty of Thorn, by which West P. and Ermland were ceded by them unconditionally to Poland, and the remainder of their territories declared to be fiefs of that kingdom. In 1511, the knights elected as their grand-master the Markgraf Albert of Anspach and Baireuth, a kinsman of the king of Poland, and a scion of the Frankish line of the Hohenzollern family. Although his election did not immediately result, as the knights had hoped, in securing them allies powerful enough to aid them in emancipating themselves from Polish domination, it was fraught with important consequences to Germany at large, no less than to the order itself.

In 1525, the grand-master was acknowledged Duke of P., which was converted into a secular duchy (afterwards known as East P.), and renounced the Roman Catholic religion for Lutheranism, his example being followed by many of the knights. The country made rapid advances under the rule of Albert, who improved the mode of administering the law, restored some order to the finances of the state, established schools, founded the university of Königsberg (1544), and caused the Bible to be translated into Polish, and several books of instruction to be printed in German, Polish, and Lithuanian. His son and successor, Albert Frederick, having become insane, a regency was appointed. Several of his kinsmen in turn enjoyed the dignity of regent, and finally his son-in-law, Johann Sigismund, elector of Brandenburg, after having held the administration of affairs in his hands for some years, was, on the death of the duke in 1618, recognized as his successor, both by the people and by the king of Poland, from whom he received the investiture of the duchy of P.; which, since that period, has been governed by the Hohenzollern-Brandenburg House.

Here it will be necessary to retrace our steps in order briefly to consider the political and dynastic relations of the other parts of the Prussian state. In the 12th c. the northern Mark, comprising probably the territory between the Elbe and the Oder, as far as its confluence with the Spree, was held by the immediate descendants of Albert the Bear of Luxemburg, its first hereditary markgraf, who, during the next two or three centuries, extended their dominions eastward, beyond the Oder into Further Pomerania. On the extinction of this line, known as the Acanian house, a remote kinsman, Frederick VI., count of Hohenzollern, and markgraf of Nürnberg, became possessed, partly by purchase and partly by investiture from the emperor, of the Brandenburg lands, which, in his favor, were constituted into an electorate. This prince, known as the Elector Frederick I., received his investiture in 1417. He united under his rule, in addition to his hereditary Franconian lands of Anspach and Baireuth, a territory of more than 11,000 square miles. His reign was disturbed by the insubordination of the nobles, and the constant incursions of his Prussian and Polish neighbors, but by his firmness and resolution he restored order at home and enlarged his boundaries.

Under Frederick's successors the Brandenburg territory was augmented by the addition of many new acquisitions, although the system of granting appanages to the younger members of the reigning house, common at that time, deprived the electorate of some of its original domains, as for instance the markgrafate of Anspach, which passed, on the death of the Elector Albert Achilles in 1486, as an independent state to his younger sons and their descendants. The most considerable addition to the electorate was the one to which reference has already been made, and which fell to the Elector John Sigismund through his marriage in 1609 with Anne, daughter and heiress of Albert Frederick the Insane, duke of Prussia. In consequence of this alliance, the duchy of Cleves, the countships of Ravensberg, the Mark, and Limburg, and the extensive duchy of P., now known as East P., became incorporated with the Brandenburg territories, which were thus more than doubled in area. The Reign of John Sigismund's successor, Georg-Wilhelm (1619—1640), was distracted by the miseries of the Thirty Years' War, and the country was alternately the prey of Swedish and imperial armies; and on the accession of Georg-Wilhelm's son, the great Elector Frederick-William (q. v.), in 1640, the electorate was sunk in the lowest depths of social misery and financial embarrassment. But so wise, prudent, and vigorous was the government of this prince, that at his death in 1688 he left a well-filled exchequer, and a fairly-equipped army of 38,000 men; while the electorate, which now possessed a population of one and a half million, and an area of 42,000 square miles, had been raised by his genius to the rank of a great European power. His successors, Frederick III. (q. v.), (1688—1713) and Frederick-William I. (1713—1740), each in his own way increased the power and credit of P., which had been in 1701 raised to the rank of a kingdom. The latter monarch was distinguished for his rigid economy of the public money and an extraordinary penchant for tall soldiers, and left to his son, the great Frederick II. (q. v.), a compact and prosperous state, a well-disciplined army, and a sum of nearly nine million thalers in his treasury.

Frederick II. (1740—1786) dexterously availed himself of the extraordinary advantages of his position to raise P. to the rank of one of the great political powers of Europe. In the intervals between his great wars, he devoted all his energies to the improvement of the state, by encouraging agriculture, trade, and commerce, and reorganizing the military, financial, and judicial departments of the state. By his liberal views in regard to religion, science, and government, he inaugurated a system whose results reacted on the whole of Europe; and in Germany, more especially, he gave a new stimulus to thought, and roused the dormant

patriotism of the people. Frederick was not over-scrupulous in his means of enlarging his dominions, as he proved by sharing in the first partition of Poland in 1772, when he obtained as his portion nearly all West P., and several other districts in East Prussia. His nephew and successor, Frederick-William II. (1786—1797), aggrandized his kingdom by the second and third partitions of Poland in 1793 and 1795. Frederick-William III. (q. v.), (1797—1840), who had been educated under the direction of his grand-uncle, Frederick the Great, succeeded his father in 1797, at a time of extreme difficulty, when continental rulers had no choice beyond being the opponents, the tools, or the victims of French republican ambition. By endeavoring to maintain a neutral attitude, P. lost her political importance, and gained no real friends, but many covert enemies. But the calamities which this line of policy brought upon P. roused Frederick-William from his apathy, and with energy, perseverance, and self-denial worthy of all praise, he devoted himself, with his minister Count Hardenberg, to the reorganization of the state. In the ten years which succeeded the battle of Waterloo, P. underwent a complete reorganization. Trade received a new impulse through the various commercial treaties made with the maritime nations of the world, the formation of excellent roads, the establishment of steam and sailing packets on the great rivers, and at a later period the organization of the customs-treaty, known as the Zollverein (q. v.) between P. and the other states of Northern Germany, and through the formation of an extended network of railways. The most ample and liberal provision was made for the diffusion of education over every part of the kingdom, and to every class.

In like manner, the established Protestant Church was enriched by the newly-inaugurated system of government supervention, churches were built, the emoluments of the clergy were raised, and their dwellings improved; but not content with that, the king wished to legislate for the church in accordance with a set plan; and when the various Protestant churches refused to be joined in the union prescribed for them, difficulties arose. This tendency to over-legislation has long been the predominating evil feature of Prussian administration; and the state, without regard to the incongruous elements of which it was composed, was divided and subdivided into governmental departments, which, in their turn, under some head or other, brought every individual act under governmental supervision, to the utter annihilation of political independence. The people, when they gradually began to comprehend the nature of this administrative machinery, saw that it made no provision for political and civil liberty, and demanded of the king the fulfilment of the promise he had given in 1815 of establishing a representative constitution for the whole kingdom. This demand was not acceded to by the king, and its immediate fruits were strenuous efforts on his part to check the spirit of liberalism. Every measure taken by other sovereigns to put down political movements was vigorously abetted by him. Siding with the pietists of Germany, he introduced a sort of Jesuitical despotism, which was continued by his successor, Frederick-William IV. The Landstände or provincial estates, organized in accordance with the system of the middle ages, were the sole and inadequate mode of representation granted to P. in this reign, notwithstanding the pledge made to the nation for a full and general representative government. An attempt made forcibly to unite Lutheran and Reformed Churches excited universal indignation, while the imprisonment, at a later period, of the Archbishops of Cologne and Gnesen for their conduct in regard to the vexed question of mixed marriages, involved the king in a long and fruitless dispute with the pope.

The accession of Frederick-William IV. in 1840 seemed to open a better prospect to the friends of constitutional freedom, but the reality was scarcely equal to the expectations which had been warranted by the professions of the government. Still new hopes and requirements had been excited, and a new life was infused into every department of the state. Every branch of science, art, and literature was understood to receive the attentive consideration of the sovereign, who professed to be (and, doubtless, in a sort of way, was) actuated by a love of universal progress. He made similar professions in regard to religious toleration, but the pietistic tendencies of his government exerted a forced and prejudicial influence in every department of the state; while the bureaucratic spirit of over-governing which characterized the administration was becoming daily more and more irksome to the nation, and gave rise to the formation of free churches or Protestant communities; while a contemporaneous excitement which had arisen in the Roman Catholic Church of P., as the result of the schismatic movement due to the stand taken by the chaplain Ronge (q. v.) on the exhibition of the so-called Holy Coat of Treves (q. v.), further complicated the relations between church and state. The king and his advisers, underrating the importance of the movement of 1848 in Germany, thought they had satisfied the requirements of the hour by granting a few unimportant reforms, and making equivocal promises of further concessions. When at length, however, the citizens and troops came into collision, and blood was shed, Frederick-William came forward as the professed regenerator of his country, offering to lay down his royal title and merge his kingdom in the common fatherland, for the salvation of which he recommended a cordial union of all German princes and people in one bond, and proposing himself as the guide and leader of this new Germany. His own subjects, and many Germans in other states, hailed with delight professions which seemed to give a living embodiment to the national desire for unity.

The publication of a political amnesty, the nomination of a liberal ministry, the recognition of a civic guard, the retirement of the Prince of Prussia, the heir-presumptive—with whom every arbitrary measure of government was believed to originate—and the summons of a representative chamber to discuss the proposed constitution—all tended to allay the general discontent. It might have been well if the German states and the German democracy had resolved at this time to accept the leadership of P., but the so-called national assembly at Frankfurt declined to do this, and elected the Archduke John of Austria lieutenant-general of Germany. A feeling of deep chagrin on the part of the Prussian king was the result of that extremely unwise and unpatriotic act, dictated by a fear of Prussian military strength, and oblivious of the fact that P., in spite of its despotic government, was the country most thoroughly penetrated by Germanic ideas. His ardor in the cause of the fatherland cooled, his pledges to his own subjects remained unfulfilled as long and as completely as the occasion permitted, and his policy became more strongly tinged than before with a jealousy of Austria. His powerful co-operation in putting down the insurrection in Poland, and the democratic party in Baden, gave, however, ample proof of his determined opposition to every popular demonstration against absolutism. In the first war of the Slesvig-Holstein duchies, the Prussians acted in concert with the disaffected against their sovereign, the king of Denmark, occupying the ducal provinces in the name and on behalf of the diet. The latter years of this reign were characterized by great advance in the material prosperity and internal improvement of the country. Extensive lines of railway and post-roads were opened, the river navigation greatly facilitated, treaties of commerce formed with foreign countries, and great expansion given to the Prussian and North German Zollverein (q. v.), the army put upon a footing of hitherto unprecedented efficiency of arms and artillery, and the educational system of the country still further developed.

The political freedom of P. did not, however, make equal advance. The chambers which met for the discussion and framing of a constitutional mode of government, were constantly interrupted and obstructed in the prosecution of their task, and the constitution was modified every year between 1850 and 1857, until it retained few of its original bases. Wilhelm I., who succeeded his brother in 1861, and in 1871 became German Emperor, was no more a lover of constitutional, or at least of popular, liberty than any of his predecessors; and for some years he strove hard to check the progress of the popular movement, in so far as it aimed at interference with the absoluteness of the regal power, and he repeatedly rejected measures of reform recommended by the Prussian Chamber of Deputies; but, on the other hand, it must be allowed that he has shown himself zealous for the honor and greatness of Germany above all other princes of the empire; and the exigences of the great war with France (1870–71) have compelled the Prussian government to bring itself into closer relations with popular feeling, though constitutional freedom is still far from being fully enjoyed. For the later history of P. both military and political, see GERMANY, SLESVIG-HOLSTEIN, and BISMARCK.

PRUSSIA, a province of the kingdom of Prussia, now usually divided into the two provinces of East P. and West P. The joint province of P. is bounded on the S.W. by Pomerania and the Baltic Sea, and on the E. and S. by Russia and Poland. East P. has an area of 14,100 sq. miles, and a pop. (1880) of 1,933,936; West P., of 10,016 sq. miles, and 1,405,898 inhabitants. About two-thirds of the soil consists of good land, the remainder being chiefly sandy. Agriculture is by far the most important branch of industry, manufactures being confined to such articles as supply merely local wants. Wheat is extensively cultivated, especially in the district of Gumbinnen; and, as the inhabitants live chiefly upon rye, the larger half of the wheat grown is exported. P. possesses a larger number of horses than any other province in the kingdom. For the history of the province of P., and for its principal physical features, see PRUSSIA, KINGDOM OF.

PRUSSIAN BLUE. See BLUE, CYANOGEN, FERROCYANOGEN, and FERRIDCYANOGEN.

PRUSSIC ACID. See HYDROCYANIC ACID.

PRUTH, an important affluent of the Danube, rises in the south-east of the Austrian crown-land of Galicia, on the north-east side of the Carpathian mountains, and near the base of

Mount Rusky in that range. It flows in a deep valley eastward past Kolomea and Czernowitz, and from the point at which it leaves Austrian territory to its embouchure in the Danube at Reni, 12 miles below Galatz, it forms again, as it used to do before 1856, the boundary between the Russian province of Bessarabia and Roumania. Length about 500 miles. Swift in its upper course, the P. becomes navigable near Jassy. Its affluents are numerous, but inconsiderable.

PRYNNE, WILLIAM, noted as a pamphleteer and active politician during the reign of Charles I., and the subsequent period of the Commonwealth, was born near Bath in the year 1600. He received his early education there, and was afterwards transferred to Oriel College, Oxford, where, in 1620, he took his bachelor's degree. Selecting the law as his profession, he entered himself at Lincoln's Inn, where he became a bencher and reader; but it does not appear that he ever very seriously endeavored to obtain practice at the bar. He was early drawn into the vortex of ecclesiastical controversy, and speedily made himself heard of as a champion of the Puritan party. In 1632, appeared his *Histriomastix, or a Scourge for Stage Players*, a tasteless and scurrilous attack on the popular amusements of the period, which procured him the attention of the authorities. For this performance he underwent prosecution in the Star Chamber, with results sufficiently unpleasant. His sentence involved him in a fine of £3000, degradation from the bar, expulsion from Oxford and Lincoln's Inn, the loss of both his ears in the pillory, and the shock to his vanity as an author, of seeing his book burned in public by the hangman. He was, moreover, condemned to perpetual imprisonment, and immured in the Tower accordingly. If the severity of the punishment seems, at first sight, astounding in its disproportion to the nature and amount of the offence, it is perhaps sufficiently explained by the fact, that P., by his previous issue of a series of anti-prelatical tracts, as by other indications of hostility, had made himself most obnoxious to Archbishop Laud and the clergy.

Three years after, the pertinacious offender found means to publish from his prison another pamphlet in which he fiercely attacked the hierarchy, and was unsparing in his personal abuse of Laud and certain other bishops. For this he was again prosecuted; a fine of £5000 was imposed upon him; he was once more pilloried, losing such stumps of ears as the executioner had before spared; and was branded on both cheeks with the letters S. L. (Seditious Libeller). He was then removed to Caernarvon Castle, and afterwards to that of Mont Orgueil, Jersey, where he remained a close prisoner, till, in 1641—the Long Parliament then sitting—he was released by a warrant of the House of Commons, and a tumultuous expression of popular sympathy celebrated his restoration to liberty. Shortly afterwards, he was sent to parliament as member for Newport, in Cornwall, and for some years was actively, and, at times, even prominently engaged on the popular side in the proceedings of the House of Commons. In the extreme measures, however, leading to the deposition and death of the king, he declined all share; and being one of those of whom Cromwell shortly after 'purged' the House of Commons, he proceeded to assail him in print with an asperity not inferior to that with which he had before made war upon the bishops, as a consequence of which imprudence he was once more subjected to several years' imprisonment. On Cromwell's death he returned to his place in parliament, zealously interesting himself in the royal cause; and after the Restoration, the office was bestowed on him of Keeper of the Records in the Tower. Subsequently his inveterate habit of envenomed pamphleteering involved him in difficulties with the House of Commons, from which, on a charge of seditious libel, he narrowly escaped expulsion. He died at Lincoln's Inn in October 1669. The continuous stream of writings on the perilous topics of the day, which brought him so constantly into trouble, represents but a fraction of P.'s literary activity. He busied himself as a compiler of matter illustrative of constitutional and parliamentary history. His most valuable works in this field are the *Calendar of Parliamentary Writs*, and his *Records*, both of which contain much that is useful and important.

PRZE'MYSL, a town of the Austrian Empire, in the province of Easter Galicia, on the right bank of the San, an affluent of the Vistula, 53 miles west from Lemberg. It is connected by railway with Cracow, and so with the west and north of Germany on the one hand, and with Lemberg on the other. P. is a flourishing town, carries on a considerable trade, and has manufactures of linens and leather. Pop. (1880) 22,373.

PRZI'BRAM, a town of the Austrian Empire, in Bohemia, 33 miles south-south-west from Prague, on the Litawka, a feeder of the Moldau. It derives its importance chiefly from extensive lead and silver mines in the neighborhood, and is the seat of a superior court of mines. Pop. (1880) 11,020.

PSALMANAZAR, GEORGE, a somewhat remarkable impostor, was born about the year 1680. His real name and the place of his birth are unknown, but he is presumed to have been a native of Switzerland or the South of France. He received a good education, and gave early indication of talent, more especially for the acquisition of languages. Impelled by a restless and impatient temper, which indisposed him to any regular pursuit, for some years he roamed over Europe as a mere vagabond adventurer, assuming at first the disguise of an Irish pilgrim, exiled on account of his religion; and afterwards as soldier, menial, preceptor, beggar, or vagrant nondescript, living on his wits as he could, according to the whim or necessity of the hour. In the course of his wanderings, he was thrown into contact with a Colonel Lauder, commanding a Scotch regiment at Sluys, on whom he first passed the imposture to which he subsequently owed his notoriety, assuming the name by which he is since known, and representing himself as a Japanese convert to Christianity and native of the island Formosa. The good colonel seems to have been completely deceived by him; not so, however, the chaplain of the regiment, one Innes, a man equally acute and unprincipled, who speedily detected the deception, but was not the less willing to use it for the furtherance of his own ends.

By Innes, P. was brought to England, and instantly became the religious lion of the day, his patron skilfully availing himself of the connection to secure for himself preferment in the church. Dignitaries of the church contended for the honor of being serviceable to him; and through the influence of the Bishop of Oxford apartments were assigned him at the university, in order that he might prosecute his studies there. The talent, ingenuity, and resource which he displayed in keeping up the deception, go far to account for what may seem to us the strange credulity with which his story was received. He published, in Latin, a fabulous account of the island Formosa, the consistency and veri-similitude of which imposed upon the learned world. He also invented a language, compact and somewhat complex in structure; and was able, in virtue of a memory not less than astonishing, to defy the ordinary methods of detection. In the midst of his success, however, at the age of about 32, he became the subject of religious impressions, and his conscience awoke to the ignominy of the deceit which he was practising. Urged by what seems to have been a genuine feeling of penitence, he withdrew himself from public notice, and for the rest of his long life honorably earned his livelihood by literature, in which he had a moderate success. Besides much assiduous compilation for the booksellers, of history, geography, and the like, he published several works anonymously, one of which, *An Essay on Miracles, by a Layman*, was for some time exceedingly popular. On his death in London in 1762, it was found that he had also busied himself in preparing for posthumous publication an account of his curious career, which, under the title *Memoirs of ——, commonly known as George Psalmanazar, a reputed native of Formosa, written by himself*, was some years after given to the world.

PSA'LMODY, in its widest sense, is the singing of the Psalms of David and other sacred songs; but from the beginning of the Reformation period, the term has been restricted to the singing of metrical versions of the Psalms to short simple airs. Psalm-singing was of ancient date among the Jews, and was practised from the first ages of Christianity; the charge of Pliny the Younger against the Christians was, that they sung psalms to Christ '*quasi Deo*.' No authentic record, however, exists of the kind of melodies sung to the psalms by the primitive Christians. The practice of singing psalms in antiphony, or by two choirs, as still practised (see ANTIPHONY), was introduced at an early period; it is said to have been begun in the Eastern Church by Ignatius, Bishop of Antioch, in the 2d c.; and in the Western Church by Ambrose, Bishop of Milan, in the 4th century. At first, the whole congregation, clergy and laity, joined in the psalms; but difficulties and abuses arose from the growing neglect of musical cultivation; and with a view of restoring public decency and order, the Council of Laodicea, in the year 363, considered it necessary to forbid the laity to sing in church at all, except in certain simple chants of a popular description. Down to the Reformation, the music of the church was surrendered to the clergy and trained musicians.

Psalmody, in the more modern sense, began in the 16th c., when Clement Marot, the court-poet of Francis I. of France, translated 52 of the Psalms into French verse, dedicating them both to his royal master—whom he likened to the Hebrew psalmist—and to the ladies of France. The sacred song-book, on its first appearance, not being accompanied by music, it became the practice to sing the psalms to favorite tunes—often those of popular ballads, and for a considerable time, psalm-singing became a favorite fashion among the gay courtiers of Francis.

Marot's collection was continued and concluded by Theodore Beza, whose psalms had the advantage of being set to music, Beza having in this the assistance of Calvin, who engaged the best composers of the day to unite his sacred songs with beautiful and simple airs of a devotional character. Psalm-singing was taken up by the Reformers, first for private devotion, and soon as part of the service of the church, Luther and Calvin restoring to

the people their share in the musical part of public worship, and furnishing them with the means of performing it. From the time that psalm-singing was adopted by the Reformers it was discountenanced by the Roman Catholics, and soon came to be regarded as a badge of Protestantism. Luther and Calvin differed, however, in their ideal of psalmody; the former was favorable to harmony in parts, while the latter confined himself to the bare unaccompanied melody. Once taken up by the Calvinists and Lutherans, psalmody spread over France, Germany, and the Low Countries, and reached England at the moment of her embracing the Reformation. The first English metrical version of the Psalms was made in the reign of Henry VIII. by Thomas Sternhold, a native of Hampshire, groom of the robes to King Henry, aided by John Hopkins and William Whyttinghame. Vocal psalmody was soon after introduced into the church-service, the choral mode of singing being still retained in cathedrals and collegiate churches, and the liturgic hymns being retained in the prayer-book. Of the psalm-tunes which came into use, some have been attributed to Claude Goudimel, Claude Le Jeune, and Guillaume Franc, and a few owe their origin to Luther. The well-known 100th Psalm is an adaptation of Gregorian phrases by Guillaume Franc.

The first important collection of psalm-tunes for four voices published in England was made by Thomas Ravenscroft, Mus. Bac., and appeared in 1621; it was entitled '*The whole Booke of Psalms*, &c., composed into four parts by sundry authors, to such several tunes as have been and are usually sung in England, Scotland, Wales, Germany, Italy, France, and the Netherlands.' In this collection were included contributions by Tallis, Morley, Dowland, and all the great masters of the day, as well as by Ravenscroft himself, who contributed the tunes St. David's, Bangor, and Canterbury. The name of John Milton, father of the poet, appears as composer of the tunes, York and Norwich. According to the then prevalent usage, the subject or air was given to the tenor voice. This custom was first departed from in the *Whole Book of Psalms, in Three Parts*, published in 1671, compiled and arranged by John Playford—whom Sir J. Hawkins calls the 'father of modern psalmody'—where we have the more proper practice, which has since obtained, of making the melody the soprano part. Croft, Courteville, Cary, the Bachs, and Handel have, since that time, contributed to the psalmody in use in Britain.

Among other metrical versions of the Psalms produced was one of doubtful origin which was attributed to James I.; and which, notwithstanding a strong recommendation by his son, was never much used in churches. The version of the Psalms by Sternhold and Hopkins came to be supplanted in England, toward the beginning of the last century, by that of Nahum Tate, poet laureate under William III. and Anne, and Dr. Nicholas Brady, less literal in its renderings than its predecessor, and somewhat commonplace as regards poetical character. This *New Version of the Psalms* first appeared in 1698, with the royal authority allowing its use in churches. Of late years, modern hymns, selected according to the taste and at the will of the incumbent, have to a large extent taken the place of metrical psalms in the Church of England.

In Scotland, the early Reformers paid great attention to singing. In John Knox's Psalter, arranged for use in churches, the metrical psalms are set to music in harmony of four parts. Several early translations of the Psalms were produced in North Britain, but that of Sternhold and Hopkins was used in worship from 1564 down to the middle of the 17th century. In 1632, an attempt made by Charles I. to supersede it by King James's version, was more resolutely and decidedly opposed than in England. The version now in use in Scotland was introduced during the Commonwealth by the General Assembly, and founded on the metrical translation of Francis Rous, a member of Cromwell's council. This new version was in 1649 appointed by the General Assembly to be the only paraphrase of the Psalms sung in the Kirk of Scotland. About the beginning of the 18th century, an agitation began for the enlarging of the psalmody of the Kirk, by adding to it paraphrases of other portions of Scripture. A collection of such paraphrases was published in 1745, and was widely used. In 1775, a committee was appointed to revise it; and in 1781 the collection which has been so long in use was sanctioned by a *permissive* act of Assembly. In addition to these, separate hymn-books are now sanctioned in the Established and Free Churches of Scotland, and have long aided in the worship of the U. P. Church.

PSALMS (Heb. *Tehillim*, Songs of Praise, or *Tefilloth*, Prayers; Jerome, *Liber Hymnorum*), the well-known canonical book generally ascribed to David. The single hymns contained in the book are variously designated either as 'Prayer' (Tefilla), as 'Praise' (Tehillah), or from some special characteristic 'Song' (Shir), or a song of deeper meaning, (Michtam), 'Instruction' (Maskil), or a dithyrambic poem (Shigayon). Respecting the general contents of the book, it may be said that it comprises, in the form of pious lyrics, written for and on behalf of the congregation, the quintessence of the dogmatical, ethical, historical, and theocratical portions of the Old Testament. The divine essence and qualities, providence and its guidance—especially of Israel—the rule of the universe, the nature of the human heart and its relations to God and His revelation, the blessings of the theocratic community: these and similar reflections form the themes of its ever-varying modes. A certain more spiritual conception of the ordinances of the Pentateuch is visible throughout, and although the strictest adherence to these is enjoined, yet their deeper meaning is impressed more strongly still.

Used as a liturgical hymn book in the Temple, it has been bodily received for the same purpose in the Christian church; and certain additional hymns which occur in the Greek and Syriac Psalter have not been sanctioned by the authority of the general church. There are, in all, 150 canonical hymns or psalms, which, after the model of the Pentateuch, have been divided into five books—thus: i.—xli; xlii.—lxxii.; lxxiii.—lxxxix.; xc.—cvi.; and cvii.—cl. The Syriac, the LXX., and the Vulgate Versions differ in some respects in their counting. The Authorized Version, however, follows strictly the Masoretic Jewish text, except with regard to the numbering of the verses; for while the latter includes the superscriptions among the verses, the former does not reckon those. This division into five books is, as it is traditional, also the most natural; and the doxologies at the ends of psalms xli., lxxii., lxxxix., and cvi., further mark authoritatively the respective ends of the special divisions. A further division, or rather classification, has been attempted according to the contents; but, considering the constantly changing variety of moods and sentiments of manner and contents which these songs exhibit, it is a most precarious one.

The Psalms have generally—thirty-four only excepted—superscriptions more or less expressive of the contents of the special hymn, and sometimes with, sometimes without, the name of an author. In some, certain notes, referring to the musical and liturgical part, are added, which are far from being quite clear now, e. g., 'On the octave,' 'For the chief musician,' 'On Machalath' (illness?), 'In the time of death to the son,' 'The hind of Aurora,' 'Lilies,' 'Dumb dove of the far ones,' &c. One of the greatest puzzles is the word Selah, which occurs several times at the end, or in the middle of some psalms, and which the LXX. render Diapsalma, 'Interlude,' but about the real signification of which, numerous yet very unsatisfactory suggestions have been made at various times. Thus, it has been identified with amen, hallelujah, piano, &c. So much seems certain, that it was a kind of catchword or sign for the performers. These headings belong very probably to the individual poets themselves, and not to the collectors, as has been surmised.

The authorship of the Psalms is described by the headings of the various chapters as follows: Psalm xc.—one of the most ancient in form and contents—is attributed to 'Moses, the man of God.' Seventy-three psalms are inscribed with David's name; two with Solomon's; twelve with that of Asaph, the Levite and singer, of which five, however, belong to the times of Jehoshaphat, Hezekiah, and the beginning of the Babylonian exile respectively. Eleven psalms go under the name of the Sons of Korah, or the Korahites—a family of singers descended from the Levite Korah, known from the Pentateuch. Their head at the time of David was Heman. Part of these psalms belongs to the time of David; others, to that of Solomon, and others are of an uncertain later period. Respecting the psalm inscribed 'Prayer of Moses,' there seems, indeed, to be no valid reason against its authenticity; it is quite worthy of the great legislator, and to a certain extent similar to other compositions of which he is reasonably regarded as the author. The numerous body of psalms attributed to David, manifest (those at least which can fairly be believed to be his work) a vivid and profound feeling and rare poetical gifts. The singer abandons himself entirely to whatever feeling of joy or grief, repentance or revenge, piety or despair, sweeps over his soul. This also accounts to a certain extent for the violent manner in which he calls down at times the vengeance of God upon the heads of his adversaries; while at others, he humbles himself to the dust on account of his own iniquities. On his style and manner, we cannot enlarge here; suffice it to add, that his lyrics have deservedly been counted among the gems of all human literature for well-nigh 3000 years—quite apart from their sacred liturgical character. Asaph's psalms show their author to have been a didactic poet of high order; but, as we said before, many of those ascribed to him belong to poets later than the schism, and even posterior to the Exile. The Korahite hymns, although all more or less fraught with the same depth of feeling, the same conciseness, the same grandeur and lyrical exaltation, exhibit signs of being written partly during the time of Solomon, or even during the Exile.

Of the anonymous psalms, some may fairly be added to the number of those that issued from the hand of the royal singer

himself; others, however, belong to the post-exilian times. Some of these (the hallelujahs, for instance, or the 'Songs of Degrees') were, in all probability, pilgrim-gongs, chanted during the ascent to the sanctuary. Whether other psalms belonging to the Maccabean period or not—a question hotly disputed—we cannot discuss here.

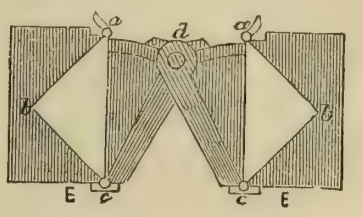
There is a great deal in favor of the opinion that the collection and redaction of the book, such as we have it now, is owing to one man, who arranged the single hymns according to their contents and tendency. Thus, following all the while the law of analogy, the redactor gave the first place to David's and his contemporaries' (Asaph, Ethan, Heman) compositions. These were further classified according to the prevalent use of the peculiar divine name (Jehovistic and Elohistic), and were divided into three books—the first of which contains the Davidic Jehovistic psalms; the second, the Elohistic ones of the Korahites, of Asaph, David, Solomon, and some unknown poets; the third, the rest of Asaph's and the Korahite psalms of a mixed (Jehovah-Elohistic, or purely Jehovistic) nature. The arrangement within these larger classes was made, again, according to the inner nature and relation of these hymns to each other, and by a certain likeness in phraseology, similes, &c. Psalms i. and ii. were then prefixed, on account of their general introductory matter and manner. The same laws have also been followed in the remaining portions of the collection.

It is difficult to fix the period of the redaction. Assuming, however, the collecting and editing to be the work of one man, he could not possibly have lived before the time of Nehemiah, even according to those who affirm the non-existence of Maccabean psalms in our canon. If, on the other hand, various single collections are assumed, out of which our present book has grown, there is no reason why some of those should not be placed at a much earlier date. We forbear to add a list of writers on the subject of psalms. Nearly all the principal authorities in biblical literature, in the Jewish, Roman, and Protestant churches, have contributed their share towards the elucidation of the Psalms; and to the individual works of the chief biblical commentators, the reader is referred for special information. Le Long, in his *Bibliotheca Sacra*, enumerates more than 500 commentators on the Psalms, and Calmet carries the number up to a thousand. Of these, some are very voluminous, that of Le Blanc filling no fewer than six folio volumes.

PSAMME'TICHUS, the name of three kings of Egypt, of the 26th dynasty, distinguished on the monuments by different prænomens, and of two other persons of ancient history. The first and most notable P. was the son of Necho I. After the defeat and death of his father, he fled into Syria, and thence, by means of foreign aid, appears to have established himself as one of the twelve monarchs who then reigned over Egypt, with the rest of whom he was connected in a kind of federation. An oracle having declared that the monarchy of the whole country should go to that one who made a libation out of brass, P. fulfilled the condition by pouring it out of a brazen helmet. By the answer of another oracle, he was told that he should succeed by means of brazen men who would appear from the sea. Some Carian and Ionian pirates who appeared soon after in panoplies of brass on the shores of Egypt, answered the response of the oracle.

P. engaged them in his service, and by their means finally subdued his rivals at Momemphis, after a struggle of fifteen years' duration. He strengthened his power by employing Greek mercenaries, whom he settled at Daphnon and Pelusium, to protect the eastern borders of Egypt, and whose headquarters were subsequently transferred to Memphis. To them he assigned the right wing, or post of honor, in the army—their arms and discipline being far superior to that of the native troops. This proceeding gave great disgust to the Egyptian army, and on his refusing to send the Greeks home, after their term of service, the Elephantine garrison, of 240,000 men, deserted the country, and marched into Ethiopia beyond Meroë. Although exhorted, they refused to return. To protect Egypt from the Syrians, he besieged Azotus, which he finally took, after 29 years' siege. P. fostered in every way the Greek influence in Egypt, divided amongst them lands, encouraged the study of the language, and contracted alliances with the Athenians. He also facilitated the commerce, and opened the ports which had been hitherto closed. Under P., the arts revived, the sculpture and architecture imitated the older prototypes, and the government was remodelled on the plan of the ancient dynasties. In literature, a new handwriting, the demotic, was introduced. Egypt, however, had fallen into a national decadence, and its own polity and institutions, subverted by the foreign influence prevalent in the country, could not be restored. P. reigned, according to Manetho, 54 years; his reign closed about 609—610 B.C. The other personages of this name are of little importance.—Herodotus, ii. 154; Pliny, *Nat. Hist.* vi. 35; Diodorus, i. 67; Champollion-Figeac, *L'Egypte*, pp. 367—370; Sharpe, *Hist. Egypt*, p. 58.

PSEU'DOSCOPE (*pseudos*, false, and *skopein*, to see), an optical instrument invented by Professor Wheatstone, and so called from the fact of its exhibiting objects viewed through it, under aspects the exact converse of their natural appearance. Its construction is shown by the annexed figure: *abc*, two rectangular prisms of flint-glass, the hypothenuses of which measure 1⅝ inch in length, and 1¼ inch in depth. The prisms are hinged at *c*, so that they may be inclined towards each other in any desired degree, and are fixed each in a wooden framework, fastened together by the hinge or pivot *d*. By means of the pivot *d*, the distance between *e* and *e* may be made to accommodate itself to the different interval between the eyes in various observers. In using the instrument, the eyes are placed at E and E respectively. The thumb-pieces attached to the prisms at *a* and *a*, are used in



adjusting the instrument for distinct vision of any particular object. The optical effect of each prism is twofold: it displaces the object, and it procures the lateral inversion of the image. From the latter circumstance, it follows that the right-hand side of a cube, for example, is seen on the left, and *vice versâ;* this inversion being occasioned by the *reflection* of the rays upon the side of the hypothenuse within each prism. By the two refractions undergone by the rays as they enter and leave the prisms, the axis of the emergent pencil is no longer directed towards the real place of the object, but is diverted in such sort that the convergence of the optic axes *diminishes* as the distance of the object *diminishes;* and *increases* as its distance *increases*—a complete reversal of the ordinary conditions of sight, and one which, in conjunction with the lateral inversion before mentioned, gives rise to very curious visional phenomena. See VISION. It is essential to the efficient use of this instrument that the object be seen by both eyes; and therefore the observer, having placed the object at the usual distance for distinct vision, should, by closing the eyes alternately, ascertain that it is within the field of each prism. He should then adjust the prisms until the two images coincide in point of space, when they will coalesce, and, at first, the object will probably retain its natural aspect; but on a sudden, it undergoes a change, and the converse appearance stands out to view with the utmost distinctness and reality.

A hat will appear to be turned completely inside out; the interior of a basin will appear convex and protruding; and 'a bust regarded in front becomes a deep hollow mask.' To facilitate the illusion, the object should be equally illuminated on either side, so as to prevent shadows.—For a full account see, the original paper by Wheatstone, *Phil. Trans.*, 1852, p. 11, *et seq.*

PSI'DIUM. See GUAVA.

PSITTA'CIDÆ. See PARROT.

PSKOV (Ger. *Pleskau*), a government in the north-west of European Russia, lies south of the governments of St. Petersburg and Novgorod. Area, 17,045 sq. m.; pop. (1870) 775,701, almost all Russians, except in the western districts, where there is a small number of Finns. The climate is temperate, the surface is hilly in the west, and the soil is of average fertility. Lake Pskov and Lake Ilmen receive almost all the drainage of the government, the river Velikaia falling into the former, and the Shelon, the Polista, and the Lovat into the latter. The rivers are navigable for rafts, and, nearer their mouths, for barges and ships. Lakes abound in the eastern and south-eastern districts. Agriculture is the staple employment; flax-growing being the most remunerative branch. The manufactures carried on in the government are inconsiderable. The St. Petersburg and Warsaw Railway, by which ready access is afforded to the metropolitan market for the agricultural productions of P., has exercised a most beneficial influence in developing the industry and resources of the government.

PSKOV, a town in the north-west of European Russia, capital of the government of the same name, stands on the banks of the Velikaia, 180 miles south-south-west of St. Petersburg by railway. During the 14th and 15th centuries, it made one in the confederation of the Hanse Towns, and had then a population greater than at present. In 1510, it was annexed to the kingdom of Moscow. During the wars with Lithuania, P. was a stronghold of great importance. It contains a cathedral, 42 churches, and 4 monasteries. Fish, obtained from Lake Peipus, and flax, are the principal articles of a foreign commerce which is not extensive. Pop. (1867) 12,981.

PSORA'LEA, a genus of plants of the natural order *Leguminosæ*, sub-order *Papilionaceæ*, having the calyx permanent after flowering, and its tube sprinkled with callous points; the legume one-seeded, sometimes ending in a beak. The flowers are blue, purple, or white. The leaves are of various forms, but in general abruptly pinnate. Some of the species are natives of India; others of other warm countries.—*P. esculenta*, the BREAD-ROOT of North America, and *Prairie Apple* of the Canadian boatmen, is an herbaceous perennial, about a foot high, with a carrot-like root, swollen above the middle, and abounding in farinaceous matter. It is used as an article of food, both boiled and raw. In Britain, it requires the protection of a frame, in order to produce an abundant crop or large roots.

PSORI'ASIS (from the Greek word *psora*, which signifies a cutaneous eruption, supposed by some to be the itch) is now employed to signify a disease characterized by slight elevations of the surface of the skin covered with whitish scales. There are various forms of this disorder, such as *P. guttata* (which is the simplest kind, and derives its specific name from the scales not coalescing, but remaining distinct, like isolated drops of water on the skin); *P. diffusa*, when the disease spreads over large portions of the skin, and often renders the patient hideous to look at, the scaly incrustations being often interspersed with bleeding cracks and fissures in all directions; *P. inveterata*, which is merely the severest phase of the preceding form, and occurs chiefly in aged persons of broken-down constitution; and *P. gyrata*, a rare form, in which the disease occurs in narrow stripes or rings. The causes of psoriasis are very obscure. It is certainly not contagious, but there appears to be in some families an hereditary tendency to it. It is occasionally associated with gout and rheumatism. Persons of both sexes, of all ages, and of all conditions of life, are liable to it, although it is more common in middle and advanced life than in childhood. The *treatment* varies with the condition of the patient.

A middle-aged, vigorous patient should be purged two or three times a week with sulphate of magnesia, should be restricted in his diet to vegetables and milk, should be debarred from all stimulants, and should take a warm bath daily. The internal remedies of most repute for this disease are—1. Decoction of dulcamara, from half a pint at first to a pint being taken in divided doses through the day; 2. Liquor potassæ, in doses of from half a drachm to a drachm, three times a day, in a glass of milk or beer; 3. Liquor arsenicalis, in doses of from three to four minims, three times a day, to be taken after meals; 4. Iodide of potassium, in five-grain doses, three times a day; and 5. Pitch pills. In very inveterate cases, tar ointment, first diluted with lard, or a weak ointment of iodide of sulphur, should be applied locally; but these should not be tried unless internal treatment fails.

PSY'CHÉ (Gr. breath, or soul), a creation of the later mythology of Greece, or perhaps we should rather say, a personification of the human soul, devised by the later poets. Appuleius (q. v.) relates the following story about her, which is obviously allegorical. P. was the youngest of three daughters of a king. She was so exquisitely beautiful that mortals mistook her for Venus, and did not dare to love, but only to worship her. This excited the jealousy of the goddess, who sent Eros (Cupid) to inspire P. with a passion for the most contemptible of all men; but Eros was himself wounded as deeply by her glances as ever he had wounded others with his darts. Meanwhile, P.'s father wished to see his daughter married, and inquired about her at the oracle of Apollo, by whom he was told to bear the maiden in funeral robes to the summit of a hill, and to leave her there alone, as she was destined to be the bride of a huge all-destroying snaky monster, that terrified both gods and men. Amid loud wailing and lament, P. was borne to the fatal spot, and left trembling in horrible solitude, when suddenly a light-winged zephyr flew round her, and bore her off to a beautiful palace of pleasure belonging to Eros, who visited her, unseen and unknown, every night, and left her before morning broke. Here P. would have enjoyed perpetual delight, had she remembered the advice of her unknown lover, who warned her not to seek to know who he was. But her jealous sisters, whom against Eros's injunction, she had allowed to visit her, working upon her curiosity, persuaded her that she was embracing a monster in the darkness of night; and having lighted a lamp when Eros was asleep, she saw with rapture that she was the mistress of the most handsome of gods. In her excitement, she let a drop of hot oil fall on the sleeper's shoulder, who awoke, upbraided her for her mistrust, and vanished.

P. gave way to the most passionate grief; she even thought of drowning herself. After wandering about for some time, she came to the palace of Venus, where she was seized by the goddess, and kept as a slave. Eros, however, who still loved her, invisibly helped and comforted the hapless maiden, reconciled her to his mother, and was finally united to her in immortal wedlock. All critics have agreed to consider the story an allegory of the progress of the human soul through earthly passion and misfortune to pure celestial felicity.

PSYCHO'LOGY. See MIND.

PTA'RMIGAN (*Lagopus*), a genus of *Tetraonidæ*, differing from the true grouse (q. v.) chiefly in having the toes thickly clothed with short feathers as well as the legs (*tarsi*). Hence the name *Lagopus*, a name used by Pliny from the resemblance of the foot to that of the hare. The bill is very short, and clothed at the base with feathers. The species are natives of the northern parts of the world, and either of elevated or of strictly arctic regions



Common Ptarmigan (*Lagopus mutus*).

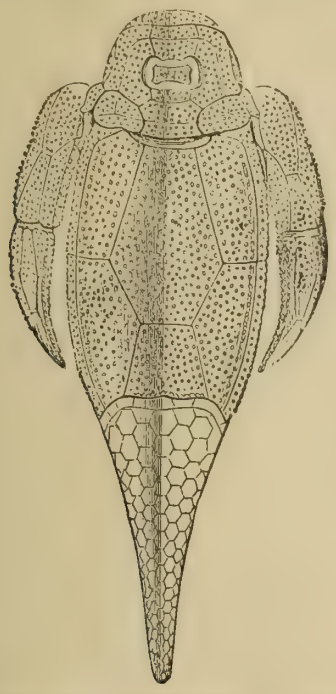
They are not polygamous, like the true grouse, nor do the males strut with erected and expanded tail. Most of the species change color very much on the approach of winter, assuming a white, or nearly white plumage; and the diversities of color have caused some confusion and difficulty concerning them. They are all much esteemed for the table. The COMMON P., or GRAY P. (*L vulgaris* or *L. mutus*), is a native of the most northern parts both of the Old and New Worlds. In Britain, it is now seldom seen much further south than the Grampians, and occurs only on high mountains. It was formerly an inhabitant of those of Cumberland and Wales. It is not found in Ireland. It is abundant in Norway, from which great numbers are annually brought to the London market.

In arctic countries, the haunts of the P. are not mountain-tops, but low valleys and plains even to the sea-shore. In form and habits, it much resembles the Moorfowl (q. v.), but is rather smaller. The winter plumage is pure white, except a black band above the eye of the male, and some parts of the quill and tail feathers. The summer plumage is as beautifully adapted to the concealment of the bird from enemies, by its harmony with the general aspect of the ground, as that of winter; the male being mostly brownish-gray, with undulating lines of black; the wings, middle-tail feathers, and under parts of the body, white; the female similar, but with a prevalent yellow tinge. The plumage, however, varies very much, according to age, sex, and the season of the year. Ptarmigans seem to trust very much for safety to the facility with which they are able to elude observation, whether among the snows of winter or the lichen-covered rocks in summer, and an unaccustomed sportsman is often startled by a covey springing up close beside him, of which he had not previously observed one. The P. is capable of being tamed, and has even been found to breed in confinement. The voice of the P. is a low croaking cry. The name P. is a modification of the Gaelic name. The *Rock P.*, said to occur in the north of Sotland, and to be common in Norway, seems to be merely the common species in a particular state of plumage.—The Moorfowl (q. v.) is a species of Ptarmigan.—Another is the WILLOW P., or WILLOW GROUSE (*L. saliceti*), of the northern parts of the world, abundant in the arctic parts of America, and in Norway, from which great numbers are brought to the London market. Its summer plumage much resembles that of the moorfowl; but its winter plumage is white. It does not inhabit regions so cold and lofty as the common P., but loves thickets of willow and dwarf-birch. It is found in Europe as far south as the valleys of the Alps. In North America, it is partially migratory.—There are other species in Siberia, Iceland, the Rocky Mountains, the mountains of Mexico, &c.

PTERI'CHTHYS (Gr. wing-fish), a genus of ganoid fishes, peculiar to the beds of the Old Red Sandstone measures. Fragments of the bony case had been found in Russia as early as 1813; in 1840, they were described as belonging to a fish to which the generic name Asterolepis was given. In the same year, the late Hugh Miller exhibited to the members of the British Association

the first specimen which gave an idea of the form of the fish, and to this Agassiz applied the generally-received name of P., from the wing-like appearance of the pectoral spines.

The head and anterior part of the body were covered with hard ganoid plates, fitting closely to each other and forming a strong protecting case. The remainder of the trunk was flexible, and covered with small scales. The fish was furnished with a small dorsal fin, and the body terminated in a heterocercal tail; but



Pterichthys Milleri (Dorsal Surface).—From Owen.

neither of these, from their soft texture, is common in the fossil specimens. The creature was not fitted for rapid motion. The pectoral spines, which were at first erroneously supposed to be fins, were more probably used as weapons of defence, and perhaps they were also of service in assisting the P. to move along the sandy bottoms on which it lived. The spines were composed of two segments, and were covered with tubercles like the trunk. Twelve species of the genus have been described.

PTE'ROCLES. See GANGA.

PTERODA'CTYL (Gr. wing-finger), a remarkable genus of fossil lizards, peculiar to the Secondary strata. Its anomalous structure was long a puzzle to comparative anatomists. Blumenbach considered it a palmipede, or web-footed bird; while its original describer, Collini, and other more eminent naturalists, referred it to the mammalia, finding its nearest ally in the bat. The careful investigations of Cuvier, however, showed that the P. was a true lizard, but possessed of the power of flight, which it performed, not by a membrane stretched over its ribs, like the living dragons, but more as in the bats, except that the wing was attached, not to several, but only to a single finger—the fifth—the others being free and short. The bones of the fifth finger were very greatly elongated, and the last joint terminated in a long, slender, unguarded apex; the terminal joints in the other fingers were furnished with strong claws. Mantell thus graphically describes the genus: 'With a long-snouted head and long neck much resembling that of a bird, bat-like wings, and a small trunk and tail, with lacertian affinities in its skull, teeth, and skeleton, and with a bird-like structure of sternum and scapular arch, these creatures present an anomaly of structure as unlike their fossil contemporaries as the duck-billed ornithorhynchus of Australia to living mammals. The cranium is small; the jaws are long, and either armed with numerous, sharp-pointed teeth, or toothless, like those of a bird. The eye-orbit is very large; the sclerotica consists of a ring of bony plates, and the nostrils are placed near the orbits. The cervical vertebræ are large and strong, and capable of great flexibility backwards and forwards, probably to allow the head to fall back to the center of gravity during flight. The dorsal vertebræ are from 17 to 20 in number. The sacrum is formed by the coalescence of two vertebræ only, as in existing reptiles, and not of many, as in birds and certain extinct saurians. The tail is generally short, an unusual character with saurians; but a species with a long tail occurs at Solenhofen. There are five toes or digits on each foot; the outer finger of the forearm is immensely elongated for the support of a membranous expansion (the impression of which is preserved in some instances); and the other digits of fore and hind feet terminated in long curved claws. The size and form of the extremities show that the Pterodactyl was capable of perching on trees, of hanging against perpendicular surfaces, and of standing firmly on the ground, when, with its wings folded, it might crawl on all-fours, or hop like a bird.' The famous quarry of lithographic stone at Solenhofen, of Upper Oolite age, has supplied a great variety of these flying lizards; but the largest species have been found in the Secondary beds of this country. In the Upper Greensand, at Cambridge, the remains of a species that must have had a spread of wing of 25 feet across, have been found; and in the Kentish Chalk, another has been met with very little short of this in its dimensions. The various species vary as much in structure as in form, so that the original genus has been lately raised to the position of an order, under the name of PTEROSAURIA, and the species have been arranged under the following genera, characterized principally by the structure of the jaw and teeth: *Pterodactylus*, in which the jaws are furnished with long slender teeth along their whole length; *Ramphorhynchus*, with the extremities of the jaws smooth; probably furnished when living with a horny bill, and towards the bases of the jaws having four or five strong teeth; and *Dimorphodon*, with large strong teeth in front, and small shorter ones behind. Nearly 30 species have altogether been described.

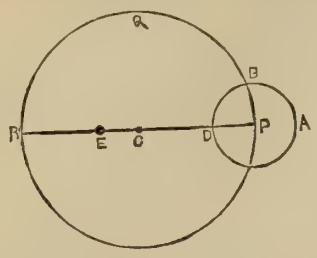
PTE'ROMYS. See FLYING SQUIRREL.

PTERO'PODA (Gr. wing-footed), a class of molluscs, having for their only organs of locomotion wing-like fins attached to the sides of the head or neck, one to each side, by which they make their way through the water, flapping them as a bird or an insect does its wings in the air. They are allied to *Gasteropoda*, but are inferior to them in organization; and their wings are not at all homologous to the *foot* of that class. They are hermaphrodite. The head is perfectly distinct in some, but obscurely distinguished from the body in others. Those which have the head most distinct, as *Clio* (q. v.), have no shell, and form the order *Gymnosomata;* those with the head indistinct, the order *Thecosomata*, have a thin external shell, which in some is globular, with slits for the wings to pass through, in some triangular and pyramidal, in some conical, in some slipper-shaped, &c. All the species are marine; they are small and delicate creatures, very lively and active, always in quest of food, and affording food to fishes and cetaceans. They are found in all parts of the world, some of them in immense numbers in tropical, and some in arctic seas. None of them are common on the British coasts. The genera and species are few.

PTOLEMA'IC SYSTEM of Astronomy, so called from Ptolemy (q. v.), its chief expounder, was originated, however, long before his time, and was, in fact, merely an attempt to reduce to a scientific form the common and primitive notions concerning the motions of the heavenly bodies. It was implicitly adopted by Plato, Aristotle, Hipparchus, and (with the exception of the Pythagoreans, and probably of Pythagoras himself) all the eminent physicists and philosophers of ancient times; passing from them to the Byzantines and Arabs, who, especially the latter, were the means of disseminating it through Western Europe, where it continued to be the universally established doctrine till the 16th century. The primary and fundamental doctrines of this system are that the earth is the center of the universe, and that the heavenly bodies revolve round it in circles, and at a uniform rate. These notions, which are naturally suggested by the first general aspect of things, having, previous to any accurate observation, established themselves as unquestionable axioms, phenomena which were found, on closer examination, to be inconsistent with them, were explained by the introduction of additional hypotheses.

The belief that the earth is the center of the universe, was supported by its being in accordance with the relation of the primary elements of which the material world was supposed to be composed. Thus, earth, the most stable of the elements, held the lowest place, and supported water, the second in order; above water was placed air, and then fire, ether being supposed to extend indefinitely above the others. In or beyond the ether element were certain zones or heavens, each heaven containing an immense crystalline spherical shell, the smallest enclosing the earth and its superincumbent elements, and the larger spheres enclosing the smaller. To each of these spheres was attached a heavenly body, which, by the revolution of the crystalline, was made to move round the earth. The first or innermost sphere was that of the moon, and after it in order came those of Mercury, Venus, the Sun, Mars, Jupiter, Saturn, and the fixed stars, *eight* in all. To this system, later astronomers added a *ninth* sphere, the motion of which should produce the precession of the Equinoxes (q. v.), and a *tenth*, to cause the alternation of day and night. The tenth sphere, or *primum mobile*, was supposed to revolve from east to west in 24 hours, and to carry the others along with it in its mo-

tion; but the Ptolemaic astronomers do not venture to explain how this was done, although since the axis of motion of the *primum mobile* was that of the equator, its extremities being the poles of the heavens, while that of the ninth sphere was the axis of the ecliptic, some explanation was certainly necessary. As observations of the heavens became increased in accuracy, it was



found that the heavenly motions were apparently not uniform, and this was explained as follows: The acceleration of the sun on one side, and retardation on the other side of his orbit, is only apparent, and results from the earth not being in the center of his sphere, C (see fig.), but at E, and consequently his motion appears to be slowest at P, and quickest at R.

The alternate progression and regression of the planets was accounted for by supposing them to move, not directly with their crystallines, but in a small circle, whose center was a fixed point in the crystalline, and which revolved on its axis as it was carried round with the latter; thus (fig.) the planet was carried round the small circle ABD, as that circle was carried round PQR (now supposed to represent the planetary crystalline). The planet, while in the outer portion of its small circle, would thus have a forward, and in the inner portion a backward motion. The larger circle was called an *eccentric*, and the smaller an *epicycle*. This theory of eccentrics and epicycles satisfied the early astronomers; but further investigations showed its incompleteness, and in later times it was found necessary to explain newly-discovered discrepancies by heaping epicycle upon epicycle, till such a complication of the system had been produced, as drew from Alfonso X. of Castile, to whom the P. S. was being explained, the humorous though somewhat blasphemous remark, that 'if the Deity were now to reconstruct the world, he (Alfonso) could give him a few useful hints.' As soon as astronomers came to understand and test the *Copernican Theory* (q. v.), the venerable and disorderly pile of hypotheses, the then representative of the P. S., which had received the papal seal of infallibility, and had in various forms held supreme sway over the minds of men for twenty centuries, at once crumbled to atoms, and sunk into oblivion.

PTOLEMAI'S. See ACRE.

PTO'LEMY I., son of Lagus, is also known by his surname SOTER, or the Preserver. He was believed by some to be the son of Philip of Macedon, because his mother, Arsinoë, had been a concubine of that king, his father being a Macedonian of humble station. P. acted as one of Alexander's generals in his eastern campaigns; and when the possessions of the great conqueror was divided, after his death at Babylon, 323 B.C., Egypt fell to the lot of the son of Lagus. Troubles soon followed such an acquisition; but P. was a man of energy and valor, and not only warded off danger from his own realm, but also extended his dominions by the addition of Phœnicia and Cœle-Syria, capturing Jerusalem, too (most probably in this expedition), by assaulting it on the Sabbath-day. In 316 B.C., war again broke out between P., Lysimachus, and Cassander on the one hand, and Antigonus on the other. (See these names.) It lasted till 301 B.C.; and at its conclusion P. was left in possession of almost the same territory as he ruled at its commencement, with the exception of Cyprus, which, by the naval battle off Salamis in that island (306 B.C.), was gained by Antigonus. P., however, recovered Cyprus in 295 B.C., and in was thereafter attached to the Egyptian kingdom. After said battle of Salamis, 306 B.C., Antigonus assumed the title of king, which example P. and the other successors of Alexander followed. In 305 B.C., P. compelled Demetrius, the valiant son of Antigonus, to raise the siege of Rhodes, for which deliverance the Rhodians were so grateful that they worshipped him as a deity, and conferred on him the title of *Soter*, or Preserver. The latter part of his reign was peace. He governed his kingdom with an enlightened and vigorous policy, and so laid the foundation of that prosperity which Egypt enjoyed for many succeeding generations. He encouraged commerce, and soon made Alexandria the great mart of the Mediterranean. He fostered literature, science, and art; and not only founded the famous Museum and Library of Alexandria, but also entertained at his court the votaries of the Muses; Euclid, the geometrician; Stilpo, the philosopher; Philetas, the elegiac poet; Zenodotus, the grammarian; Antiphilus and Apelles, the painters; with many others. The history of Alexander's wars, by P., is the basis of Arrian's work on the same subject. Two years before his death, which occurred in 283 B.C., he abdicated in favor of his son, Ptolemy Philadelphus. His reign extended from 323 to 285 B.C.

PTOLEMY II., surnamed PHILADELPHUS, was the son of Ptolemy I. and Berenice. He was born 309 B.C., in the island of Cos. His reign is remarkable rather for the successful cultivation of the arts of peace than of the practice of war. Excepting a contest with his half-brother, Magas, for the province of Cyrene, his wars against Syria are almost the only military exploits which interfered with the prosecution of those designs for the improvement of his kingdom, which have rendered his name famous among wise and enlightened sovereigns. He carried on, with even increased zeal, the good work which his father had begun. He enriched the library of Alexandria with all the literary treasures of his own and of earlier times, and the museum was crowded with the learned from all countries—with such men as Theocritus and Philetas, the poets; Euclid, the geometrician; Aristarchus and Aratus, the astronomers; Theodorus and Hegesias; the philosophers; and many more. Tradition alleges that it was by his orders the Hebrew Scriptures were translated into Greek, and the version called the 'Septuagint' (q. v.) thus formed. He induced Manetho to write in Greek, a political history of Egypt, and an account of the religious tenets of the Egyptians. He encouraged the study of natural history; and to facilitate the pursuits of those who devoted themselves to it, he formed a collection of rare and curious animals in the preserves, which we may call the 'Royal Zoological Gardens' of Egypt. He founded many colonies in those parts of the empire which seemed specially suited to become centers of trade and of enlightenment, and thus spread more widely the seeds of civilization and Greek culture; among these was Ptolemais (Acre), in Palestine. He ruled over Egypt, Phœnicia, and Cœle-Syria, Lycia, Caria, Cyprus, and the Cyclades, with parts of Arabia, Libya, and Ethiopia. His son Ptolemy married Berenice, the daughter of Magas, and the province of Cyrene was thus peacefully brought back to his empire. Under P. Philadelphus, Egypt rose to a high rank among the nations in power and in wealth. The surname of Philadelphus was assumed by P. to indicate his great affection for his sister Arsinoë, whom he married after the death of her husband, Lysimachus. His former wife, Arsinoë, daughter of Lysimachus, was banished by him; and two of his brothers were put to death.

It is with reference to this last circumstance that some have explained the name Philadelphus, as in irony. By his first wife, he had two sons, Ptolemy, his successor, and Lysimachus; and one daughter, Berenice, married to Antiochus II., king of Syria. He reigned from 285 to 247 B.C.

PTOLEMY III., surnamed EUERGETES, succeeded his father Philadelphus, and reigned from 247 to 222 B.C. He made war on the kingdom of Syria, to avenge the death of his sister Berenice, who had been murdered at the instigation of Laodice, former wife of Antiochus. He overran all the provinces as far south as Babylon and Susa; those on the north and east as far as Bactria and India, offered him homage; and he might have extended the bounds of his empire much farther, had not domestic troubles compelled him to hasten back to Egypt. The treasures he brought with him were immense; and among the things most highly prized were the statues of the Egyptian gods which Cambyses had carried off to Babylon in 525 B.C. It was the restoration of these to their proper temples which gained for P. the title of Euergetes (the Benefactor). His fleets gained many possessions on the coast of the Mediterranean, such as Pamphylia, Cilicia, and Ionia, which remained for a long time subject to Egypt, though the eastern provinces recently conquered soon returned to their former sovereign. He pushed the limits of the home-empire further south, by conquering part of Ethiopia where he formed a colony and center of trade at Adule. P., like his predecessors, patronized learned men, and encouraged the study of the arts and sciences. He added so largely to the library of Alexandria that he has by some been called its founder. Among the celebrated men who adorned his court, and kept up the fame of the 'Museum,' were Apollonius, Rhodius, Eratosthenes, and Aristophanes, the grammarian. In his reign, the Egyptian kingdom reached the highest point of military glory, prosperity, and wealth.

PTOLEMY IV., surnamed PHILOPATOR, reigned from 222 to 205 B.C. He was the unworthy son of the preceding king. His reign began in blood by the murder of his mother Berenice, his brother Magas, and his uncle Lysimachus; and it ended in blood by the violent death of his wife Arsinoë. He abandoned himself to debauchery, and intrusted the management of his kingdom to favorites. Antiochus, king of Syria, profiting by his indolence, wrested from him in war some of the provinces which his father had gained; but P., at length roused from his lethargy, took the field in person, and defeated Antiochus at the battle of Raphia.

When peace was concluded, P. returned to his capital, and plunged with increased zest into every vice and indulgence. He died in 205 B.C.; his death being hastened by his excesses. He followed the example of his father and grandfather in patronizing arts and letters, and cultivated friendship with the Romans, to whom he sent large supplies of grain during the second Punic War, but persecuted the Jews, against whom he had conceived a hatred in consequence of being refused admittance to the sanctuary at Jerusalem by the high priest.

PTOLEMY V., EPIPHANES, succeeded to the throne of his father Philopator, when only five years of age, and reigned from 205 to 181 B.C. His dominions were invaded by Antiochus, king of Syria, and Philip, king of Macedonia, while he was still an infant, and several provinces were severed from the Egyptian kingdom; but the Romans at length interfered, and peace was concluded, it being arranged that P. should marry Cleopatra, daughter of Antiochus, and receive as her dowry those parts of his empire in Syria which had been taken from him. He was declared of age in 196 B.C., and his coronation was performed with unusual splendor. The decree published on this occasion is that which forms the inscription on the far-famed Rosetta Stone (q. v.). P. married Cleopatra in 193 B.C. The affairs of the kingdom were managed by the wise and virtuous Aristomenes, and so long as P. followed his counsels, all went well. But the king's ear was gradually opened to insinuations against his great minister, whom he ultimately compelled to drink poison. While P. was preparing for an expedition against Syria, he was poisoned by some of his followers, whom he had alarmed for their own safety. Under him, Egypt rapidly sank in prosperity, power, and reputation.

PTOLEMY VI., PHILOMETOR, reigned from 181 to 146 B.C. He was very young at his father's death, and the affairs of the kingdom were therefore directed by his mother Cleopatra, who acted with remarkable prudence and energy. When she died in 173 B.C., the administration fell into the hands of two worthless ministers, Eulæus and Lenæus, who, engaging in war with Antiochus, brought the kingdom to the brink of ruin. The young king was taken prisoner by Antiochus (170 B.C.), who hoped to obtain possession of the whole of Egypt; but his younger brother, also called Ptolemy, immediately declared himself sovereign under the title of Euergetes II., and took vigorous measures to defend the kingdom. By the intervention of the Romans, Antiochus was compelled to return to his kingdom. The brothers reigned jointly for some time, but at length quarrelled, and a civil war ensued in which Euergetes II. was ultimately worsted. The deputies of the Roman Senate, who now did as they pleased in Egypt, arranged that P. Philometor should retain Egypt proper, while Euergetes II. should obtain Cyrene as a separate sovereignty. This settlement substantially held during the lifetime of the former. P. reigned 35 years, and died in 146 B.C., from injuries received by a fall from his horse in a battle against the Syrian usurper Alexander Balas. He is celebrated for his mild and humane disposition, which was strikingly evinced in his magnanimous treatment of his unworthy brother.

PTOLEMY VII., or EUERGETES II., best known by the nickname PHYSCON, or *Big-belly*, ascended the throne after the death of his brother. He married his brother's sister and widow, Cleopatra (who was also his own sister), and on the same day murdered her infant son P. Eupator, whom she had at first declared king. The history of his reign is one unbroken record of murder and blood, whence his subjects nicknamed him *Kakergetes* ('the malefactor'). Not only relatives who stood in his way to the throne, but those who opposed his accession, and even innocent persons, were butchered with savage cruelty. His private vices and debaucheries were equally infamous. He divorced his wife and sister Cleopatra to marry her daughter by her first husband —his own brother; and when temporarily driven from his throne, 130—127 B.C. by the indignation of his subjects, who chose the divorced Cleopatra in his room, the monster took a diabolical revenge by murdering his own and Cleopatra's son, and sending the head and hands as a present to the latter on her birthday. One is almost ashamed to add that he retained the hereditary taste for learning, and patronized learned men. He himself wrote a work of 24 books, called *Memoirs* (*Hypomnemata*). He reigned from 146 to 117 B.C.

Besides these, there are several Ptolemies of less note—as, for example, PTOLEMY VIII., or SOTER II., otherwise called LATHYRUS or LATHURUS, who reigned first from 117 to 107 B.C., and again from 89 to 81 B.C.; also PTOLEMY IX., or ALEXANDER I., youngest son of Ptolemy VII., who reigned from 107 to 90 B.C.; PTOLEMY X., or ALEXANDER II., son of Alexander I., 81—80 B.C.; PTOLEMY XI., or DIONYSUS, or AULETES, an illegitimate son of Ptolemy Lathyrus, who reigned from 80 to 51 B.C.; PTOLEMY XII., who reigned for some time in conjunction with his sister Cleopatra, and who was ultimately drowned in the Nile, after being defeated by Cæsar; and lastly, PTOLEMY XIII., younger brother of the preceding. Cæsar appointed him joint ruler with Cleopatra, his sister and intended wife. He died by violence in 43 B.C., at the instigation of Cleopatra.

PTOLEMY, a celebrated astronomer and geographer, whose proper name is CLAUDIUS PTOLEMÆUS, was a native of Egypt, though it is uncertain whether he was born at Pelusium or Ptolemais in the Thebaid. Nothing is known of his personal history, except that he flourished in Alexandria in 139 A.D., and there is probable evidence of his having been alive in 161 A.D. The chief of his writings are *Megale Syntaxis tes Astronomias*, which, to distinguish it from the next-mentioned, was probably denominated by the Arabs *megiste*, the greatest, whence was derived the name *Almagest* (Arab. article *al*, the), by which it is generally known; *Tetrabiblos Syntaxis*, with which is combined another work, called *Karpos* or *Centiloquium*, from its containing a hundred aphorisms, both works treating of astrological subjects, and held by some on this account to be of doubtful genuineness; *Phaseis aplanon asteron kai synagoge episemaseion*, a treatise on the phenomena of the fixed stars, or a species of almanac; the *Geographike Hyphegesis*, his great geographical work, in eight books. The rest of his works are of inferior importance, and consist of descriptions of various kinds of Projections (q. v.), the theory of the musical scale, chronological and metaphysical treatises, and a summary of the hypotheses employed in his great work, the *Almagest*. Others of P.'s works have been lost, and it is still a moot-point whether or not they contained a treatise on Optics, as a Latin version of what is said to have been an Arabic translation of P.'s original treatise on that subject is still in existence.

P., both as an astronomer and geographer, held supreme sway over the minds of almost all the scientific men from his own time down till about the 15th c.; but, and in astronomy specially, he seems to have been not so much an independent investigator as a corrector and improver of the work of his predecessors. In astronomy, he had the labors of Hipparchus to guide him; and, indeed, scrupulously distinguishes between Hipparchus's labors and his own. To P. belongs the invention of a planetary theory, the discovery of the moon's Evection (q. v.), and the singular distinction of being the sole existing authority on the subject of ancient astronomy. From this last mentioned fact, the system of astronomy which he sets forth in the *Almagest* received his name; and, as the *Ptolemaic System* (q. v.) obtained the homage of succeeding generations till the time of Copernicus. His great work, the *Almagest*, is divided into 13 books. P. seems to have been little of an independent observer, trusting implicitly to his predecessor, Hipparchus; but his geometrical powers were of a very high order, unless, as Delambre suggests, but with little probability, the elegant demonstrations here and there occurring in the *Almagest* were borrowed from other sources.

As a geographer, P. occupies a similar position to what he holds in astronomy; he appears before his readers as the corrector and improver of the works of a predecessor, Marinus of Tyre, about whom, except from P.s' writings, little is known. P. here appears to more advantage as an independent investigator, and his improvements and suggestions are at once more valuable and correct; but it is sometimes difficult to separate his data from those of Marinus. His geography is divided into eight books, all of which, with the exception of the first, eighth, and a portion of the seventh, are nothing more than a catalogue of places, with their latitude and longitude (to 12ths of a degree), with a brief general description prefixed to each continent and country or tribe, and interspersed here and there with remarks of a miscellaneous character on any point of interest. The rest of the work contains details regarding his mode of noting the positions of places—by latitude (*mekos*) and longitude (*platos*)—with the calculation of the size of the sphere of the earth, and of the extent of surface then known. He also describes the mode adopted by him of projecting the surface of a hemisphere on a flat surface, and shows its superiority over the projections of Eratosthenes, Hipparchus, and Marinus. He also constructed a series of twenty-six maps, together with a general map of the world, in illustration of his work.

The *Almagest* and the *Geography* were the standard text-books to succeeding ages, the first till the time of Copernicus, the second till the great maritime discoveries of the 15th c. showed its deficiences. They have passed through numerous editions, the best of which are, for the *Almagest* and the most of P.'s minor works, that by Halma (Paris, 1813—16—19—20, quarto); and for the *Geography*, the Latin versions of 1482 and 1490, published at Rome, the *editio princeps* of the Greek text by Erasmus (Basel, 1533, 4to), and the Elzevir edition (Lugd. Bat. 1619, fol.). The catalogue of stars has been frequently reprinted separately, the last and best edition being that of Francis Baily, in vol. xiii. of the *Memoirs of the Royal Astronomical Society* (London, 1843.)

PTO'SIS (from the Gr. *pipto*, I fall) signifies a drooping or falling of the upper eyelid, and arises from palsy of the third or *motor oculi* nerve. It may arise either from debility, in which

case it may be removed by tonics; or from congestion of the brain, when it is usually accompanied with giddiness, headache, &c., and should be treated by bleeding, purgatives, and low diet; or from organic disease of the brain, in which case remedies are of little use. If it occurs without any apparent cause, and resists medical treatment, it may be removed by a surgical operation, by which the eyelid is brought under the action of the occipito-frontal muscle, which receives its nervous power from another source.

PTY'CHODUS, a genus of cretaceous fish, founded on large square crushing teeth, which occur in considerable quantity in the Chalk beds. The crown of the teeth are raised in the center into a number of parallel transverse ridges, and the flat margin is finely granulated. They were set, as in the Port Jackson shark, like a pavement on the borders of the mouth, and were admirably adapted to crush the shells of the crustacea and mollusca on which they fed. Large dorsal spines have been found associated with the teeth; but as no materials exist for the restoration of the external form of the fish, the analogy of their modern representative, the Port Jackson shark, alone suggests that they belonged to the Ptychodus.

PUBLI'CANI (from Lat. *publicum*, that which is public or belongs to the state), the name given by the Romans to those persons who farmed the public revenues (*vectigalia*). These revenues were put up to auction by the censors, and were 'sold' for a period of five years. They were derived chiefly from tolls, tithes harbor-duties, *scriptura* (the tax paid for the use of public pasture-lands), mining and salt duties. As the state required the publicani to give security for the sum at which they had purchased the collecting of the taxes, and as this sum was usually much greater than the wealth of any single individual, companies (*societates*) were formed, the members of which took each so many shares and were thus enabled to carry on conjointly undertakings far beyond the capabilities of the separate shareholders, Their contract with the Roman government was made in the name of a single person, who was called *manceps*, and who was held responsible for his *socii* to the state. Every *societas* had also a head-manager (*magister*), who resided at Rome, and transacted all foreign correspondence with the inferior officers who directly superintended the collection of taxes. In general, a societas farmed only one branch of the revenue, but exceptions occur. Only Roman citizens were eligible as publicani, and, as a matter of course, only the wealthiest among these could become such. After the middle of the 2d c. B.C., the farming of the public revenues fell into the hands chiefly of the Equites (q. v.). By a wise regulation, no governor of a Roman province was allowed, during the period of his governorship, to have anything to do with these tax-gathering companies. The design of this was to place the governor in such a position that he could afford to act justly towards the people, who were often cruelly oppressed by the exactions of the provincial underlings—the 'publicans' of the New Testament.

PUBLIC BURDENS is a phrase in Scotch law to denote the usual taxes or charges on land, in respect both of its ownership and possession. Such are the land-tax, minister's stipend, manse assessments, schoolmaster's salary, poor-rates, rogue-money, road and bridge assessments. Public burdens, where no stipulation is made to the contrary, fall upon the landlord, and not on the tenant, except in the case of schoolmaster's salary, which is equally divided between landlord and tenant.

PUBLIC HEALTH ACT is an important act in England regulating sanitary matters (11 and 12 Vict. c. 63). It enabled local boards of health to be created all over England. The initiative was given to one-tenth of the rated inhabitants of cities, boroughs, parishes, and places having a defined boundary, to take proceedings to have the act applied to their district, whereupon and so to deal systematically with sewerage, drainage, water-supply, paving, lighting, watching. The General Board of Health first send an inspector to report, and afterwards direct the act to apply. The act has been further supplemented by a family of kindred acts called the Local Government Acts, the Nuisances Removal Acts, the Prevention of Diseases Acts, &c. The state of the law produced by these combined statutes is very complicated, but the result is greatly to extend sanitary improvement.

PUBLIC-HOUSES in England are known under two classes, viz., Ale-houses, also called Inns (q. v.), and Beer-houses. The former give board and lodging to travelers, while the latter are mere shops for the sale of beer to be consumed on or off the premises.—1. An alehouse must be first licensed by the justices, before the keeper of it can sell excisable liquors to be consumed on the premises. The granting of the license may be opposed by any inhabitant.

The justices' license, if new, must be confirmed by the confirming authority of other justices; and an excise license must follow, and not precede the justices' license. The license is in force for one year; and if any offence or misconduct is committed, the renewal of the license may be opposed, and refused on the next meeting. The statute compels the keeper to keep unadulterated liquor, to use only legal measures, not to permit drunkenness or unlawful games, or bad characters, to keep good order, and lastly, not to open his house, except to travelers, on Sundays, during the morning and afternoon divine service. The law as to the opening of public-houses during Sunday may be varied by the country justices within certain narrow limits, and is as follows: No public-house can be opened for the sale of fermented or distilled liquors before half-past 12 at noon on Sunday, or in London before one, or elsewhere before one if so ordered. It must be again shut between 3 and 6 P.M., and shut altogether at 11 P.M., in London, but at 10 P.M. elsewhere. Christmas-day and Good Friday, but not public fast or thanksgiving days, are treated as Sundays. On week-days, such houses cannot be opened before 5 A.M., or after 12½ P.M., in London, and elsewhere before 6 A.M. and after 10 or 11 P.M. Travelers are expressly excepted from the above rule, and the decisions and statutes have settled the point that a traveler is a person who walks or drives three miles' distance, whether for pleasure or on business. As regards public-houses, constables have the power of entering them to keep order, and it is an offence in the publican to refuse them admission.—2. Beer-houses are subject to the same rules as ale-houses on Sundays. They also now require to have certificates or licenses from justices, and so do all wine-house keepers and grocers who sell beer, wine, spirits, sweets, and any intoxicating liquor. All houses licensed for the first time after 1872, for consumption on the premises, must be of higher values than formerly—namely, £12 to £50.

In 1872, many of the previous statutes were modified by the Intoxicating Liquor Licensing Act, 35 and 36 Vict. c. 94, and in 1874 by 37 and 38 Vict. c. 49. The chief new features were to define the opening and closing of the houses on Sundays and week-days, and to allow country justices to vary these hours a little. Though travelers are still entitled at all hours to enter inns, persons are subjected to penalties for falsely pretending that they are travelers, and also for being found within licensed premises without sufficient reasons, during the hours when such houses ought by law to be closed. Any constable may enter one of these houses for cause, and demand the name and address of persons found therein during prohibited hours, and it is an offence to give a false name and address. While the hours of opening and closing are now clearly defined, a power is given to the local justices or the metropolitan police commissioners to relax them for houses near any night-work or market. A power was also given to record convictions on the licenses, and after three convictions the keeper of the house was to forfeit his license and remain disqualified for five years, and even the premises themselves were to be disqualified from receiving a license for two years. The other chief feature was that justices were divided into two bodies for granting new licenses, one of them being a select committee to review the other, while there was no appeal allowed from the refusal to grant a license for a new inn. The justices thus had larger powers of refusal than before. The English Act of 1872 applied in most respects to Ireland; and many of its provisions were made applicable to Scotland by an Act passed in 1876.

In Scotland, the law affecting public-houses has been considerably altered of late years, and the governing statute is now 25 and 26 Vict., c. 35. Certificates for the sale of excisable liquors must be applied for to the justices of the peace, who meet for the purpose in April and October. The justices have a discretion in particular localities as to fixing the hours of closing within certain limits. Certificates to sell wines and spirits include power to sell beer and cider also; but they may be granted for the sale of wine, porter, ale, beer, cider, and perry only; or for beer, porter, ale, cider, and perry only; so that there are three kinds of certificates, corresponding to what exists in England. The justices' certificate also must be obtained for the spirit and wine license, before application for the excise license. The justices have power, in special circumstances, to regulate the hours of closing; but the general hours of closing in all cases are as follows: the houses shall not be open for sale or drinking before 8 A.M., nor after 11 P.M., with the exception of refreshment to travelers, or to persons lodging in the premises; and the house shall not be opened for the sale of any excisable liquors, or drinking thereof, on Sunday, except for the accommodation of lodgers and travelers. Though however, on Sundays, travelers and lodgers only are to be supplied with drink, this is only so in the case of inns and hotels; for with regard to public-houses proper, and spirit or beer-shops, these are not allowed to be open on Sundays even to travelers or lodgers. The certificate of justices is granted on the same conditions as to good order as in England. The owner of any property in the neighborhood may object to the granting or renewing of the certificate. Constables may enter at any time eating-houses, if they suspect excisable liquors are unlawfully sold there. The chief officer of police is to report to the procura-

tor-fiscal the places where intoxicated persons are seen frequently to issue. Persons keeping shebeens, or uncertificated places where spirits or excisible liquors are sold or drunk, are punished heavily, and also the persons found drunk there may be fined 10*s*.

The main difference between English and Scotch inns and public-houses is the shutting up these for the whole Sunday in Scotland. In both countries, travelers are excepted; and the same definition will and ought to be given to that word in both countries, and there is a penalty imposed in Scotland of £5 on any person who falsely represents himself to be a traveller, so as to procure entertainment and drink in an inn; as there now is also in England, where the burden of proof that the person served is a traveler is thrown on the publican: yet, if the latter take all precautions to ask and satisfy himself on the point, English statutes have now decided that he incurs no penalty. The policy of these restrictions on the opening of inns and public-houses on Sunday has been much discussed of late years.

PUBLIC PROSECUTOR. See PROSECUTOR.

PUBLIC SCHOOLS. See SCHOOLS.

PUCCI'NIA, a genus of fungi, of the division *Coniomycetes*, all very small and parasitic, on the leaves or stems of plants within the tissue of which the mycelium creeps. One of the most common species, and the most important, is the CORN MILDEW (*P. graminis*), which is almost always present in corn-fields, and in some years is very injurious to wheat and other cereal crops. It is pitchy brown or black, and grows in irregular lines, somewhat following the venation of the leaf, the lines sometimes confluent. The spores are supposed to find their way from the root upwards, with the juices of the plant on which they vegetate, but this has not yet been proved by observation.

PUD, or POOD, a Russian weight which contains 40 Russian pounds—almost equivalent to 36 English pounds avoirdupois.

PUDDING, although a word in such common use, and so generally understood, is very difficult to define, for there are few preparations of cookery so varied. It may be considered one of the national dishes of Great Britain; in no other country is it used so extensively by all classes of the people. The plum-pudding is the glory of an English table, and is regarded as an essential on all festive occasions. Puddings are either made of dough simply boiled in a cloth or basin, and with or without other materials; or they may be made of a batter of flour, or other farinaceous material, and water, and poured into the pudding-cloth and boiled; or into a dish and baked. It is common also to make fruit and meat puddings, by rolling out dough or paste into large flat sheets, and enclosing the fruit or meat entirely in them, and then tying them up in the pudding-cloth and boiling them. These are the general characters of this dish, but the recipes for varying the details are innumerable.

PUDDING-STONE, a rock composed of water-worn pebbles, cemented together by a firm paste. It is now more generally known as Conglomerate (q. v.).

PU'DDLING, a process by which wells, ponds, canals, &c., are lined with clay or loam impervious to water. See EMBANKMENT.

PUE'BLA, or PUEBLA DE LOS ANGELES, a city of Mexico, capital of a state of the same name, stands on a fruitful plain, 7381 feet above sea-level, and 76 miles east-south-east of the city of Mexico. In the vicinity are Orizaba, Popocatepetl, and other lofty mountains. It was founded in 1531, and is one of the most populous, as well as one of the most industrious cities in the empire. Its streets are regular, broad, and well paved. The houses, which are frequently three stories in height, are flat-roofed, covered with variously-colored tiles, and profusely ornamented, both inside and out, with fantastic paintings resembling frescoes. There are 44 fountains, and the water is supplied by means of an aqueduct. It contains 72 churches, 9 monasteries, 11 convents, and 23 theological colleges. On the great square stands the cathedral, an imposing building, the interior of which is decorated in the most sumptuous manner with ornaments of gold and silver, paintings, statues, &c. Among the numerous educational institutions, there are several of the highest class. There are also hospitals, the government and the bishop's palaces, charity schools, and other benevolent institutions. The more wealthy inhabitants are accomplished, refined, and benevolent; but the lower classes are esteemed the most demoralized in the empire. Glass, earthenware, soap, woollen fabrics, and sword-blades are manufactured. Pop. 70,000. After a siege of three months, P. surrendered temporarily to the French in May 1863. See MEXICO.

PUE'RPERAL FEVER, is the most fatal disease to which women in childbed are liable. It has been described under various other names than that which is now assigned to it—as *Childbed Fever*, *Peritoneal Fever*, &c. A careful investigation of the records of more than two centuries shows that the disease prevails epidemically, and that it is more virulent in lying-in hospitals than in private practice. The essential nature of the disease is a subject that has led to the expression of many different opinions. The views that it is (1) *inflammation of the uterus*, (2) *inflammation of the omentum and intestines*, (3) *peritonitis, either alone or connected with erysipelas*, (4) *fever of a special nature*, (5) *disease of a putrid character*, or (6) *a disease of a complicated nature*, have all been advocated by physicians of high reputation; and Professor Scanzoni, one of the highest German authorities in the department of midwifery, maintains that the disease originates in an altered condition of the blood, and consists mainly in the presence of pus in that fluid. This variety of views is doubtless, in a great measure, due to the varied characteristics of different epidemics. When a disease is epidemic, it is always difficult to ascertain whether it is contagious; but in the case of puerperal fever, there is an overwhelming amount of evidence, not only that the virus can be carried by the practitioner from one parturient woman to another, but from various other morbid sources; the peculiar condition of childbirth, and possibly certain atmospheric conditions, rendering the mother peculiarly susceptible of such contagion. Numerous series of fatal cases have been traced back to the medical man or nurse having immediately before been in attendance on a case of erysipelas, of sloughing sores, of gangrene, or of typhus fever. It is the opinion of Rokitansky and others that the morbid matter acquired by the dissection of subjects not dying from this disease, may excite the disease in a patient shortly afterwards delivered by the dissector; and there is no doubt that any one who assists at the *post-mortem* examination of a puerperal patient, becomes, as it were, a focus of intense contagion.

Considering the extreme severity and undoubted contagious nature of this disease, the practitioners and nurses who come in contact with it should bathe their persons, washing their hands either with a weak solution of chlorine in a solution of chloride of lime, or other disinfectant, as well as with soap and water; should use carbolic acid or salicylic acid gargles; and change the clothing. Moreover, persons much engaged in midwifery would do well not to take any part in *post-mortem* examinations, especially when the death resulted from this disease; and when of necessity they are present, they should wear a special dress for the occasion, and take every precaution to ablution.

Puerperal fever occurs in such varied forms that numerous divisions or species of it have been suggested. The late Dr. Gooch, one of the highest authorities on this subject, divided puerperal fever into (1) the *inflammatory* and (2) the *typhoid;* while Dr. Robert Lee and Dr. Ferguson (two of the chief authorities) make four divisions.

Inflammatory puerperal fever is most commonly due to peritonitis, but may depend upon inflammation of the uterus, the ovaries and uterine appendages, the uterine veins, &c. The ordinary symptoms, in the most common form (namely, when there is peritonitis), are rigors, followed by heat of skin, thirst, flushed face, quickened pulse, and hurried respiration. The abnormal heat of the skin soon subsides, and is followed by nausea, vomiting, pain in the region of the womb, commencing at one spot, and extending over the abdomen. This pain increases as the inflammation extends, till the patient presents the symptoms described in the article PERITONITIS. The pulse is uniformly high; the tongue coated; the urinary secretion diminished, and often passed with difficulty; while the intellectual faculties are rarely affected. Five or six days are the average duration of this disease, which may prove fatal on the first day, or may extend to ten or eleven days.

In some epidemics (as, for example, in Paris, in 1746; in Edinburgh, in 1773; and in Vienna, in 1795), none recovered. Dr. Ferguson states, that 'to save two out of three may be termed good practice in an epidemic season.' The treatment so closely resembles that which is required in ordinary acute Peritonitis (q. v.), that it is unnecessary to enter into any details regarding it.

Typhoid or *malignant puerperal fever* may commence in various ways, but is always accompanied with fever of a low typhoid character, and with the symptoms which usually are associated with such fever. Treatment is of little or no avail, and the patient usually sinks at the end of a few days, or even hours.

PUERPERAL MANIA comprehends many forms and degrees of mental derangement. In the experience of Esquirol, these forms presented the following proportions: of 92 cases, 49 exhibited symptoms of mania; 35, those of monomania; and 8, those of dementia. The points of agreement between these widely-differing moral phenomena are, that they occur during some stage of child-bearing, and that they can be traced to physical, but not necessarily common physical causes. Insanity is developed either during pregnancy, shortly after parturition, or during nursing. Under whatever circumstances the malady may arise, it is one of exhaustion, debility, and prostration; and this is nearly equally true, whether it be characterized by depression, languor,

and passiveness, or by extreme excitement and violence. The latter are the features by which it is generally recognized, and which have justified the name by which it is generally known. The similarity to ordinary frenzy is great: there is the same watchfulness, fury, incoherence, the same vitiation of the secretions, and emaciation; and the chief differences between these affections consist in puerperal insanity being invariably traceable to disturbance of the circulation, or to animal poisoning, and in the short duration of the great majority of cases.

The prognosis is, in fact, so favorable, recourse to seclusion in an asylum so painful, that it has been proposed to treat all such cases at home, or that a distinct hospital or sanatorium should be established exclusively for them. When it is stated that a physical cause may be detected in the puerperal condition, this must not be construed as excluding the psychical elements which enter into the production of all such affections. Thus, it was found by Macdonald, that of 66 cases, only 6 could be attributed to a purely physical origin; and that in the majority, fright, or anxiety, or anger had formed the last or principal of that series of conditions which culminated in alienation. It not merely affects feeble and hysterical females more than others, but in a marked manner those belonging to tainted families. Of 66 patients in the Bloomingdale Asylum, 17 labored under a hereditary tendency to mental disease. As connected with this point, it may be mentioned that unmarried are more liable to the disease than married women, in the proportion of 11 to 2. This great disparity may partly be explained by the fact, that the fallen and unfortunate are, more than any other class of females, compelled to seek shelter in those institutions from which such statistics are obtained.—Reed on *Treatment of Puerperal Insanity;* Marcé, *Folie des Femmes Enceintes;* Simpson, *The Diseases of Women;* Barker, *The Puerperal Diseases.*

PUE'RTO BE'LLO, a small decayed seaport town of the United States of Colombia, on the northern shore of the Isthmus of Panama, and 40 miles north of the town of that name. It is surrounded by mountains, has an excellent harbor, is very unhealthy, and has fallen into decay since 1739, when it was stormed by Admiral Vernon, during the war between England and Spain. Pop. 3500.

PUE'RTO-CABE'LLO, or PORTO-CABELLO, a town of Venezuela, in the province of Caracas, 78 miles west from Caracas. It stands on an island in the Golfo Triste, separated from the mainland by a channel so narrow as to be crossed by a bridge. The situation is very unhealthy, but the harbor is safe and commodious; its imports in 1877 amounted to £1,171,522; exports, £1,535,747. P. is the port of Valencia, which is about 20 miles inland. Pop. (1881) 10,145.

PUE'RTO DE SA'NTA MARI'A (usually called EL PUERTO, the Port), a seaport of Spain, in the modern province of Cadiz, stands at the mouth of the Guadalete, in a most fertile district, on the Bay of Cadiz, 6 miles north-east of the city of that name, and 9 miles by railway south-west of Xeres. Suspension-bridges cross the Guadalete and the Rio de S. Pedro. The mouth of the Guadalete forms the harbor; but the bar is dangerous and much neglected. P., a pleasant and well-built town, resembling Cadiz in its houses, and containing only one long and handsome street, while the others are narrow and ill paved, is the port for the shipment of Xeres wines. The wines are lodged in numerous *bodegas*, or wine-stores, lofty buildings built with thick walls and narrow windows, in order to secure an even temperature inside. This town vies with Cadiz and San Lucar as a wine exporting place; the principal exporting houses are English or French. The bull-fights which take place here in May are among the most famous in the country. Steamers ply frequently between this town and Cadiz, and P. supplies that city with drinking-water at a cost of several thousand pounds a year. Pop. 21,278.

PUE'RTO PRI'NCIPÉ, SANTA MARIA DE, an important inland town, in the east of the island of Cuba, about 325 miles east-south-east of Havana, and 45 miles south-west of its port, Las Nuevitas, with which it is connected by railway. Pop. 30,000.

PUERTO RI'CO, an island in the West Indies, belonging to Spain, is one of the Greater Antilles, and lies east of Hayti or St. Domingo, lat. 17° 55′—18° 30′ N., long. 65° 39′—67° 11′ W. It is in size somewhat less than Jamaica, being fully 100 miles from east to west, 40 miles from north to south, and closely resembling a rectangle in shape. The island is traversed from east to west by a range of mountains, 1500 feet in average height, though rising in one peak to 3678 feet above the sea. From the base of the mountains, rich alluvial tracts extend to the sea, and there are numerous well-wooded and abundantly watered valleys. The soil is remarkably fertile. The principal crops are sugar, coffee, and tobacco of the finest quality, and cotton remarkable for its length of fibre, tenacity, and whiteness. Cattle and sheep are extensively reared, of a quality superior to any others in the West Indies. The imports consist of cotton, woollen, linen, silk, and embroidered goods, metals, hardware, and provisions, as ale, porter, fruits, wines, &c. The exports are sugar, tobacco, coffee, cotton, molasses, rum, hides, and cattle. The chief ports are San Juan, commonly called Puerto Rico, in the north-east, Ponce in the south-west, and Mayaguez in the west. P. R. is one of the coolest and healthiest places in the West Indies. Area, 3600 sq. m.; pop. (1880) 754,300, of whom about 350,000 are whites. Of the colored race, 20,000 were still slaves in 1871. The value of the annual exports is over £2,000,000; of the imports, £2,500,000. In 1878, 1,500,000 cwts. of sugar and 150,000 cwts. of coffee were exported. The trade is mainly with Britain, but owing to duties and port charges, it is carried on in Spanish bottoms.

The frequent changes in the executive government of P. R. do not appear to affect its commercial stability. The commerce of the island is almost wholly in the hands of foreigners and Spaniards from the Peninsula. The Preliminary Act of Emancipation, which came into operation at the beginning of 1871, decreased the number of slaves by 100,000. The slave-trade was already extinct; and in 1873 slavery was entirely swept away. There is a unanimous feeling against any immigration of laborers, whether Chinese, coolies, or others. A deep-sea cable now unites P. R. with Europe, America, and the other Antilles; railways, irrigation, drainage, &c., are still things in embryo. It is remarkable that, notwithstanding the fertility and healthiness of P. R., the poverty of the island flora and fauna is very great; there are hardly any flowers, birds, or wild animals.

PUFF-ADDER (*Clotho arietans*), a serpent of the family *Viperidæ*, having a short and broad flat head, with scales so sharply keeled as to end in a kind of spine. It is one of the most venomous and dangerous serpents of South Africa. It attains a length of four or almost five feet, and is thick in proportion to its length, often as thick as a man's arm. Its head is very broad; its tail suddenly tapered; its color brown, chequered with dark brown and white; a reddish band between the eyes; the under parts paler than the upper. Its movements are generally slow, but it turns very quickly if approached from behind. It usually creeps partially immersed in the sand of the South African deserts, its head alone being completely raised above ground. When irritated, it puffs out the upper part of its body, whence its name. The P. is easily killed by the oil, or even by the juice of tobacco. Its poison is used by the Bosjesmans for their arrows.—South Africa produces several other species of *Clotho*, similar in their habits to the P., and almost equally dangerous.

PUFFBALL (*Lycoperdon*), a Linnæan genus of *Fungi*, now divided into many genera, belonging to the section *Gasteromycetes*, and to the tribe *Trichospermi*. They mostly grow on the ground, and are roundish, generally without a stem, at first firm and fleshy, but afterwards powdery within; the powder consisting of the spores, among which are many fine filaments, loosely filling the interior of the *peridium*, or external membrane. The peridium finally bursts at the top, to allow the escape of the spores, which issue from it as very fine dust. Some of the species are common everywhere. Most of them affect rather dry soils, and some are found only in heaths and sandy soils. The most common British species is *L. gemmatum*, generally from one to two and a half inches in diameter, with a warty and mealy surface. The largest British species, the GIANT P. (*L. giganteum*), is often many feet in circumference, and filled with a loathsome pulpy mass, when young; but in its mature state, its contents are so dry and spongy that they have often been used for stanching wounds. Their fumes, when burned, have not only the power of stupifying bees, for which they are sometimes used, in order to the removal of the honey, but have been used as an anæsthetic instead of chloroform. The same properties belong also to other species. Some of them, in a young state, are used in some countries as food, and none of them is known to be poisonous.

PUFF-BIRD. See BARBET.

PUFFENDORF, SAMUEL, son of a Lutheran clergyman, was born in 1632 at Chemnitz, in Saxony. He received the early part of his education at Grimma; whence he removed to the university of Leipzig. There he studied theology for several years. In 1656 he went to the university of Jena, where he seems to have devoted himself at first chiefly to mathematics, and subsequently to the study of the *Law of Nature*, as he, and others who have treated on the same subject, have termed the law which regulates the duties of men to one another, independent of the mutual obligation which is enforced by political government, or by revelation of divine will. After quitting Jena, he was appointed tutor to the son of the Swedish ambassador at Copenhagen. Soon after he had received this appointment, a rupture having taken place between Denmark and Sweden, P. was detained as a prisoner in the Danish capital. The power of his mind here showed itself in a remarkable manner. Deprived of books and of society, he threw himself vigorously into meditating on what he had formerly read in the treatise of Grotius, *De Jure Belli et Pacis*, and in the writings of Hobbes on the principles of general law. The result

was the production of the *Elementa Jurisprudentiæ Universalis*—a work which was the foundation of its author's fortune. It was dedicated to the Elector Palatine; and by this prince, P. was appointed to the professorship of the Law of Nature and Nations at the university of Heidelberg. He now gave his attention to the tissue of absurdities which existed in the constitution of the Germanic Empire. As was to have been expected, the work (*De Statu Reipublicae Germanicae*, 1667), in which he exposed the defects of the system, raised a storm of controversy.

Austria was especially furious. P. had taken care to publish it under a pseudonym—that of Severinus a Mozambano, but still to avoid the possible consequences, he accepted an invitation from Charles XI. of Sweden, in 1670, to become professor of the Law of Nations at Lund. During his residence there, he published the work on which his fame now principally rests, *De Jure Naturæ et Gentium*. He then removed to Stockholm, where the king of Sweden made him his historiographer, with the dignity of a counsellor of state. In his official character, he published a very uninteresting history of Sweden, from the expedition of Gustavus Adolphus into Germany to the death of Queen Christine. In 1688, the Elector of Brandenburg invited him to Berlin to write the history of his life and reign. P. accepted the invitation, and executed the required work in 19 dreary volumes His intention was to have returned to Stockholm, but death overtook him at Berlin in 1694. P. lacked the genius to render the subjects on which he wrote generally interesting, but his intellectual power was nevertheless very considerable, and it appears to have throughout been honestly exercised and with unflagging industry.—See Jenisch's *Vita Pufendorfi* in the *Memoirs of the Academy of Stockholm*, 1802.

PU'FFIN (*Fratercula*), a genus of birds of the Auk (q. v.) family, *Alcadæ*, having the bill shorter than the head, very much compressed, its height at the base equal to its length, the ridge of the upper mandible as high as the top of the head, both mandibles arched, and transversely grooved. The bill gives to the birds of this genus a very extraordinary appearance. They have short legs, very short tail, and short wings; their legs are placed far back, and they sit very erect, like auks and penguins, resting not merely on the foot, but on the tarsus. Notwithstanding their shortness of wing, they fly rapidly, although they seem incapable of long-sustained flights. They swim and dive admirably. The best known and most widely distributed species is the COMMON P. (*F. arctica*), a native of the arctic and northern temperate regions, breeding not only in high northern latitudes, but as far south as the coasts of England, and migrating from the colder regions in winter, when it is to be found even on the coasts of Spain and of Georgia. The P. is a little larger than a pigeon; the forehead crown, back of the head, a collar round the neck, the back, wings, and tail are black, the other parts of the plumage white. The P. lays only a single egg, sometimes in a rabbit burrow, but more frequently in a burrow of its own, which often extends three feet, and is not unfrequently curved; sometimes in deep fissures or crevices of cliffs. Great numbers congregate together, and their chosen breeding-places are crowded with them. These are mostly on unfrequented islands and headlands, where there is some depth of soil. In some of them, the ground is covered by puffins, old and young, in thousands. The eggs are sought after by fowlers, and also the young birds, the flesh of which is used for food. The Scilly Isles were held in the 14th c., under the king as Earl of Cornwall, by Ranulph de Blancminster, for an annual payment of 6*s*. 8*d*., or 300 puffins at Michaelmas. The P. is also known by the name *Coulterneb*, and on the east coast of Scotland it is familiarly called *Tammienorie*. Their food consists of small crustaceans and fishes.—Other species are found in different parts of the world; one in Kamtchatka, the Kurile Islands, &c., with two silky tufts of long feathers on its head.—The name P. is given in France to the *Shearwaters* (q. v.), or *Puffin Petrels*, the genus *Puffinus* of some ornithologists.

PUG, or PUG-DOG, a kind of dog much like the bull-dog in form, and in particular, in its much abbreviated muzzle. The nose is often a little turned up. The disposition is, however, extremely unlike that of the bull-dog, being characterized by great timidity and gentleness. Pug-dogs are only kept as pets. They are often very affectionate and good-natured, bearing without resentment the roughest handling to which children can subject them. They are all of small size. The common English Pug is usually yellowish with a black snout, the tail firmly curled over the back. New breeds have of late been introduced from China and Japan, interesting from their peculiar appearance, gentleness, and docility, with extremely short *puggish* muzzle; the Chinese breed very small, with smooth hair; the Japanese rather larger, with an exuberance of long soft hair and a very bushy tail.

PU'GET SOUND, the southern continuation of the Admiralty Inlet, in the N.W. of Washington Territory, U.S. In a wide sense, P. S. includes the Admiralty Inlet, and thus would comprise the whole body of water to the south-east of Vancouver Island, connecting with the Pacific by Fuca Strait, and is a land-locked sea 125 miles long, by from 5 to 25 miles broad. Even in this sense P. S. is all navigable; and the smaller inlets especially afford safe, deep, and spacious harborage. The coast-line of P. S., in the stricter sense, is 280 miles; in the wider sense, 806. Admiralty Inlet extends from the strait of Fuca, about 70 miles; the sound itself extends S.E. from the 'Narrows,' and has numerous islands and inlets. The shores are fertile and richly timbered. The sound has received a new importance from the completion in 1883 of the Northern Pacific Railway, which has a main terminus at Tacoma, a rapidly-increasing place on P. S., and an extension to Seattle, on the east shore of the sound. Other towns on the sound are Olympia, capital of the territory; Steilacoom; and Port Townsend. The difficult navigation of the lower Columbia River causes much of the traffic of its basin to be sent to Tacoma to be shipped; Tacoma has accordingly a great and increasing grain trade, and around the shores of the sound there is an enormous timber trade. The forest mainly consists of redwood, the timber of the *Sequoia sempervirens*. The wood is light and close grained, but not very strong; splits very easily; is eminently durable, and is well suited both for building purposes and for cabinet work. The only other species of the sequoia genus is the *S. gigantea*, the so-called Wellingtonia (q. v.). Coal is found near Seattle, and exported.

PU'GILISM, or BOXING, is the art of defending one's self or attacking others with the weapons which nature has bestowed—fists and arms. The origin of boxing is likely as old as man himself. Pollux, the twin-brother of Castor in the heathen mythology, was reckoned the first who obtained distinction by the use of his fists. The ancients increased the power of their fists by the addition of the Cestus (q. v.). With the ancients pugilism was considered an essential part in the education of youth, and formed part of the course of training practised in their gymnasia; it was valued as a means of strengthening the body and banishing fear; but it was practised in public rather with a view to the exhibition of the power of endurance than for mere skilful self-defence. The earliest account we have of systematic British boxing is in 1740, when public exhibitions of professors of the art attracted general attention. Up to this period, the science of self-defence had made but little progress, and strength and endurance constituted the only recommendations of the practitioners at Smithfield, Moorfield, and Southwark fair, which had long had booths and rings for the display of boxing. Broughton, who occupied the position of 'champion of England,' built a theater in Hanway Street, Oxford Street, in 1740, for the display of boxing; advertisements were issued announcing a succession of battles between first-rate pugilists who never quitted the stage till one or other was defeated, the reward of each man being dependent upon, and proportioned to, the receipts. Broughton was for 18 years champion of England, and with him commences the first scientific era of pugilism. He propounded some rules for the regulation of the ring, and these remained in authority till 1838, when they were materially altered. Rule 1 is, That a square of a yard be chalked in the middle of a stage, and that in every fresh set-to after a fall, the seconds are to bring their men to the side of the square, and to place them opposite each other, and until this is done, it is not lawful for one to strike the other. Rule 2, That if either of the combatants is unable to be brought up to the square within 30 seconds after a fall and the close of a round, he shall be deemed a beaten man. No man is permitted to hit his adversary when he is down, or to seize him by the breeches, or below the waist, and a man on his knees is to be reckoned down.

These rules laid the foundation of fair play, and robbed boxing of half its horrors. To Broughton also is due the introduction of gloves for 'sparring-matches,' where lessons could be taken without injury. The greatest professor of the art was Jackson, who was champion in 1795. He was not only the most scientific boxer of his day, but he gave his art such a prestige and popularity that half the men of rank and fashion of the period were proud to call themselves his pupils. He opened rooms for the practice of boxing in Bond Street, and for years these were crowded by men of note. His 'principles of pugilism' were, that contempt of danger and confidence in one's self were the first and best qualities of a pugilist; that in hitting, you must judge well your distances, for a blow delivered at all out of range, was like a spent shot, and valueless; that men should fight with their legs, using all possible agility, as well as with their hands; and that all stiffness of style and position was wrong. Jackson is still regarded as the best theorist on the 'noble art,' and since his time, it has received no essential improvement. Shaw, the Life Guardsman, who immortalized himself at Waterloo, was a pupil of his, and the prowess which he so brilliantly displayed on that occasion, was owing as much to his scientific training as to his great strength. At this period, pugilism was actively supported by many persons of high rank—the Dukes of York and Clarence, the Earls of Albemarle, Sefton, &c., Lords Byron, Craven, Pomfret. In 1814, when the allied sovereigns were in England, among other entertainments,

a 'sparring' display was provided under Jackson's management; and the distinguished foreigners expressed the great gratification they had experienced from the exhibition of so much science and fine physical development. Besides Jackson, Belcher, Gulley, and Cribb were noted champions at this period. George IV. was a staunch patron of boxing in his youth, and although he discontinued by his presence to give countenance to the sport, frequent indications were observable of his desire for its promotion. At the time of the coronation, when the popular feelings were much enlisted on behalf of Queen Caroline, who was excluded from the throne, a body of pugilists were employed to preserve order; and so well did these men perform their duties, that the king presented each man with a gold medal, to commemorate the event, and to show his satisfaction. This period may be termed the 'palmy days of the ring;' and from various causes, its decline has since then been uninterrupted.

Among other causes, several cases occurred of prize-fighters who were tempted to lose fights on which large sums had been staked, and to deceive their most influential backers. The most distinguished patrons of the ring gradually seceded; the 'Pugilistic Club,' which had been established in 1814, and which included all the aristocratic patrons of the ring, was broken up. The magistracy of the country set their faces against the lawless assemblies of 'roughs' and pickpockets who latterly formed the greater part of the spectators at prize-fights. The electric telegraph, and the establishment of an efficient rural police, have given the finishing touches to an already-expiring profession. Matches can now only be got up by stealth, and the place of meeting is kept a profound secret to the last moment, for fear of interruption. A few years ago, however, the international combat between Tom Sayers the Englishman, and John Heenan the American, revived for a moment public interest in the art; but apart from exceptional matches, the popular feeling is that prize-fighting should not be countenanced, and we may look for its gradual extinction. The art of boxing, as an active and healthy exercise, is likely to be maintained; and the display of science between two accomplished boxers is very interesting, while it is deprived of all the horrors of the prize-ring; the rapidity of the blows, the facility with which they are mostly guarded or avoided by moving the head and arms; the trial of skill and manœuver to gain a trifling advantage in position, all give a wonderful interest to the spectator, who can watch the perfection of the art devoid of the brutalities of the ring. The pugilists of the present day are mostly publicans; their friends and the patrons of the 'fancy' meet at their houses for convivial evenings, sparring-matches, ratting, and the like. It has constantly been urged in defence of pugilism, that were it abolished, the use of the knife would increase, and Englishmen would lose their present manly system of self-defence. This may be true, if the use of the fist in self-defence depended on the mercenary exhibition of pugilistic encounters, which, however, is mere assumption.—On this subject, see *Fistiana* (office of *Bell's Life*, 1868); *Pugilistica*, by H. D. Miles (1880).

PULCI, LUIGI, an Italian Poet of distinguished family, was born at Florence, 3d December 1431, and devoted his life to study and to literary composition. He was one of the most intimate friends of Lorenzo de' Medici and of Poliziano, from the latter of whom he derived no little assistance in the composition of his poem *Il Morgante Maggiore* (Morgante the Giant). This celebrated work, a burlesque epic (in 28 cantos), of which Roland is the hero, is a vivacious parody of the romances of Carlovingian chivalry, which had become (as P. thought) undeservedly popular in Italy. His mocking imagination took a pleasure in turning into ridicule the combats with giants, the feats of magicians, and all the incredible adventures that form the materia basis of the medieval epic; and he manages to do it with a wonderfully pleasant and original naïveté. But although the poem is essentially heroic-comic, it occasionally contains passages of the finest pathos, in which P. fortunately seems to forget his design of travestying the inventions of the *trouvères*, and comes out undisguisedly as a real poet. Moreover, in the midst of the most extravagant buffooneries, we come upon the truest and most natural pictures of manners—the vanity and inconstancy of women, the avarice and ambition of men. P. died in 1487. The *Morgante Maggiore* is one of the most valuable sources for acquiring a knowledge of the early Tuscan dialect, the niceties and idioms of which have been employed by P. with great skill. The first edition appeared at Florence in 1488, and has since been frequently reprinted. Other works of P. are a series of sonnets (often grossly indecent), *La Beca du Dicomano* (a parody of a pastoral poem by Lorenzo de' Medici); *Confessione a la San Vergine*, a novel, and some letters.—BERNARDO PULCI, elder brother of Luigi, wrote an elegy on the death of Simonetta, mistress of Julian de' Medici; and a poem on the passion of Christ and also executed the first translation of the *Eclogues* of Virgil.—LUCA PULCI, another brother, achieved some literary reputation too by his *Giostra di Lorenzo de' Medici*, a poem in honor of the success won by Lorenzo in a tournament; *Il Ciriffo Calvaneo*, a metrical romance of Chivalry; *Driadeo d'Ancore*, a pastoral poem; and *Epistole Eroide*.

PU'LEX. See FLEA.

PULICA'T, PALIKAT, or PALVELAKA'TU, a town of British India, in the presidency of Madras, and district of Chingleput, 20 miles north from Madras. It stands on an island in a large inlet of the sea or salt-water lake called the Lake of Pulicat. The lake is about 37 miles in length from north to south, and 11 miles in breadth at the widest. It contains a number of islands. The communication between the lake and the sea is by very narrow openings. The lake is much used as affording facilities of traffic by boats between Madras and more northern places. P. was occupied by the Dutch in 1609, and became afterwards the capital of their settlements on the Coromandel coast, but fell into the hands of the British in 1795.

PULKO'VA, a village of Russia, in the government of St. Petersburg, about 9 miles south of the capital, contains a population of 600. It stands on a ridge called Pulkova Hills, which command a splendid view of St. Petersburg, and is noted for its magnificent observatory, built by the Czar Nicholas, and placed under the direction of Friedrich Struve. Struve's son succeeded to the charge in 1864. In 1882, a remarkable telescope, said to be the largest in the world, was erected here.

PU'LLEY, one of the Mechanical Powers (q. v.), consists of a wheel, with a groove cut all round its circumference, and movable on an axis; the wheel, which is commonly called a *sheave*, is often placed inside a hollow oblong mass of wood called a *block*, and to the sides of this block the extremities of the sheave's axle are fixed for support; the cord which passes over the circumference of the sheave is called the *tackle*. Pulleys may be used either singly or in combination; in the former case they are either *fixed* or *movable*. The *fixed pulley* (fig. 1) gives no mechanical advantage; it merely changes the direction in which a force would naturally be applied to one more convenient—thus, W can be raised without lifting it directly by merely pulling P down. The *single movable pulley*, with parallel cords, gives a mechanical advantage = 2 (fig. 2), for a little consideration will show that as

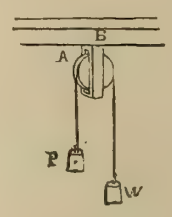


Fig. 1.

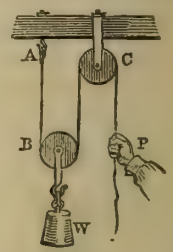


Fig. 2.

the weight W, is supported by two strings, the strain on each string is ½ W, and the strain on the one being supported by the hook A, the power, P, requires merely to support the strain on the other string, which passes round C. The fixed pulley, C, is only of service in changing the naturally upward direction of the power into a downward one. If the strings in the single movable pulley are not parallel, there is a diminution of mechanical advantage—i. e., P must be more than half of W to produce an exact counterpoise; if the angle made by the strings is 120°, P must be equal to W; and if the angle be greater than this, there is a mechanical disadvantage, or P must be greater than W. The following are examples of different combinations of pulleys, generally known as the first, second, and third systems of pulleys. In the first system, one end of each cord is fastened to a fixed support above; each cord descends, passes round a pulley (to the lowest of which the weight, W, is fastened), and is fastened to the block of the next pulley, with the exception of the last cord, which passes round a fixed pulley above, and is attached to the counterpoise P.

The tension of a string being the same in all parts, the tension of every part of the string marked (1) in fig. 3 is that which is produced by the weight of P, consequently, as the last movable pulley is supported on both sides by a string having a tension P, the tension applied in its support is 2P. The tension of the string marked (2) is therefore 2P, and the second movable pulley is supported by a force equal to 4P. It may similarly be shown that the force applied by the strings marked (4) in support of the last pulley (which is attached to W), is 8P. Hence, we see, that according to this arrangement, 1 lb. can support 4 lbs., if two movable pulleys are used; 8 lbs., if there are 3 movable pulleys; 16 lbs., if there are 4 movable pulleys; and if there are n movable pulleys, 1 lb. can support 2^n lbs. It must be noticed, however, that in practice, the weight of the cords, and of the pulleys, and

the friction of the cord on the pulleys, must be allowed for; and the fact, that in this system all of these resist the action of the power P, and that to a large extent, has rendered it of little use in practice.—The second system is much inferior in producing a mechanical advantage, but it is found to be much more convenient in practice, and is modified according to the purpose for which it is to be used; two prevalent forms are given in figs. 4 and 5. In this system, one string passes round all the pulleys, and as the tension in every part of it is that produced by the

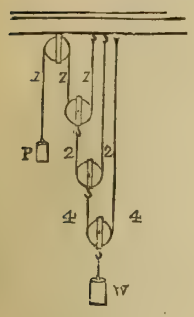


Fig. 3.

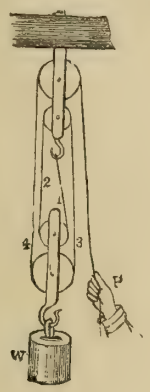


Fig. 4.

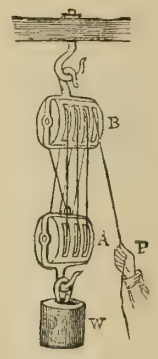


Fig. 5.

weight of P, the whole force applied to elevate the lower block with its attached weight, W, is the weight P multiplied by the number of strings attached to the lower block; in fig. 4, W = 4P, and in fig. 5, W = 6P, the pulleys in the upper block being only of use in changing the direction of the pulling force. This system is the one in common use in architecture, in dock-yards, and on board ship, and various modifications of it—such as White's pulley, Smeaton's pulley, &c., have been introduced; but the simpler forms shown above have been found to answer best.—The third system (fig. 6) is merely the first system inverted, and it is a little more powerful, besides having the weight of the pulleys to support the power, instead of acting in opposition to it, as in the former case.

By this time, it will have been evident to the reader that the mechanical advantage is not produced by the pulleys, but by the strings, and that the pulleys are merely useful in keeping the strings in a certain position, changing with as little friction as possible the direction of the pull, and affording a convenient means of attaching the weight. Theoretically, the larger the number of movable pulleys in one combination, the greater is the mechanical advantage afforded; but the enormous friction produced, and the want of perfect flexibility in the ropes, prevent any great increase in the number of pulleys.

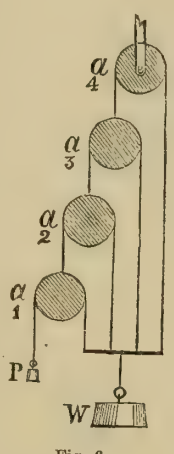


Fig. 6.

PULMONA'TA, an order of gasteropodous molluscs, having, for the purpose of respiration, a vascular air-sac or lung, which opens by a hole under the margin of the mantle, capable of being contracted or dilated at pleasure. Some are terrestrial, some aquatic. Slugs and snails are familiar examples of the former; water-snails, or pond-snails (*Limnæa, Planorbis*, &c.), of the latter. Most of the P. are protected by a shell; in some, as slugs, the shell is internal and rudimental.

PULNEY or PALNAI HILLS, a range of Southern India, linking the southern extremities of the Eastern and Western Ghauts. The average height of this range is about 7500 feet above the level of the sea. It possesses peculiar advantages for the establishment of a sanitarium. The climate is one of the most equable anywhere to be found, the variation of the thermometer during twelve months in a closed room without a fire being observed to be no greater than between 58° and 62°. At present, there are only a few European residences built on these hills.

PU'LO-PENA'NG. See PRINCE OF WALES ISLAND.

PULP, a term employed to describe those very soft and succulent parts of plants, almost exclusively of fruits, which consist of cellular tissue with much juice. The pulp of a fruit is sometimes found in one part of it, sometimes in another; thus, in the peach, plum, and other drupes, it is the *mesocarp;* in the grape and gooseberry, it is developed from the placentas, and the seeds are embedded in it.

PU'LPIT (Lat. *pulpitum*), an elevated tribune or desk, from which sermons, lectures, and other solemn religious addresses are delivered. In great churches, the pulpit is commonly placed against the wall, or in juxtaposition with a pillar or buttress. Originally it would appear to have been used chiefly for the singing, chanting, or recitation which form part of the public service, and was a kind of stage sufficiently large to accommodate two or even more chanters. For the convenience of the hearers, this stage began to be used by the bishop, priest, or deacon, for the delivery of the homily; and thus by degrees a tribune expressly suited to the latter use alone came to be introduced. In some of the older churches, the *ambo* or *pulpitum* is still used for the chanting of the Gospel and Epistles. In Catholic churches, the pulpit is generally distinguished by some religious emblems, especially by the crucifix; and the pulpits of the Low Countries and of Germany are often masterpieces of wood-carving, the preaching-place in some of them forming a part of a great artistic group, as of the Conversion of St. Paul, the Vocation of Peter and Andrew, the temptation of Adam and Eve, and other similar subjects. The pulpit (in Arabic, *mimber*) forms one of the scanty appliances of Mohammedan worship.

PULQUE, a favorite beverage of the Mexicans and of the inhabitants of Central America, and some parts of South America; made from the juice of different species of *Agave* (q. v.), which is collected by cutting out the flowering-stem from the midst of the leaves in the beginning of its growth, and scooping a hole for the juice. From this cavity, large quantities of juice are removed daily for months. The juice is an agreeable drink when fresh, but is more generally used after fermentation, when it has a very pleasant taste, but a putrid smell, disgusting to those unaccustomed to it. Pulque is retailed in Mexico in open sheds called *Pulquerias*, which also serve for dancing-rooms. When mixed with water and sugar, and allowed to ferment for a few hours, it forms a beverage called *Tepache*. A kind of spirit is also prepared from it.

PULSE (Lat. *puls*), a name for the edible seeds of leguminous plants, as *corn* is the name for the edible seeds of grasses. Peas and beans are the most common and important of all kinds of pulse; next to them may be ranked kidney-beans, lentils, chick-peas, pigeon-peas, &c. *Legumine* (q. v.), a very nitrogenous principle, abounds in all kinds of pulse. Legumine forms a thick coagulum with salts of lime, wherefore all kinds of pulse remain hard if boiled in spring-water containing lime. The best kinds of pulse are very nutritious, but not easy of digestion, and very apt to produce flatulence.

PULSE (Lat. *pulsus*, a pushing or beating). The phenomenon known as the arterial pulse or arterial pulsation is due to the distention of the arteries consequent upon the intermittent injection of blood into their trunks, and the subsequent contraction which results from the elasticity of their walls. It is perceptible to the touch in all excepting very minute arteries, and in exposed positions, is visible to the eye.

'This pulsation,' says Dr. Carpenter, 'involves an augmentation of the capacity of that portion of the artery in which it is observed; and it would seem to the touch as if this were chiefly effected by an increase of diameter. It seems fully proved, however, that the increased capacity is chiefly given by the elongation of the artery, which is lifted from its bed at each pulsation, and when previously straight, becomes curved; the impression made upon the finger by such displacement not being distinguishable from that which would result from the dilatation of the tube in diameter. A very obvious example of this upheaval is seen in the prominent temporal artery of an old person.'—*Principles of Human Physiology*, 4th ed., p. 492. The number of pulsations is usually counted at the radial artery at the wrist, the advantages of that position being that the artery is very superficial at that spot, and that it is easily compressed against the bone. In some cases, it is preferable to count the number of contractions of the heart itself.

The qualities which are chiefly attended to in the pulse are its frequency, its regularity, its fulness, its tension, and its force.

The *frequency* of the pulse varies greatly with the age. In the fœtus *in utero*, the pulsations vary from 140 to 150 in the minute; in the newly-born infant, from 130 to 140; in the 2d year, from 100 to 115; from the 7th to the 14th year, from 80 to 90; from the 14th to the 21st year, from 75 to 85; and from the 21st to the 60th year, 70 to 75. After this period, the pulse is generally supposed to fall in frequency, but the most opposite assertions have been made on this subject. There are many exceptions to the preceding statement; young persons being often met with having a pulse below 60, and cases not unfrequently occurring in which the pulse habitually reached 100, or did not exceed 40 in the minute, without apparent disease. The numbers which have been given are taken from an equal number ofmales and females, and the pulsations taken in the sitting position. The influence of sex is very considerable, especially in adult age, the pulse of the adult female exceeding in frequency that of the male of the same age by from 10 to 14 beats in the minute. The effect of muscular exertion in raising the pulse is well known; and it has been found

by Dr. Guy that posture materially influences the number of pulsations.

Thus, in healthy males of the mean age of 27 years, the average frequency of the pulse was, when standing, 81, when sitting, 71, and when lying, 66, per minute; while in healthy females of the same age the averages were—standing, 91; sitting, 84; and lying, 79. During sleep, the pulse is usually considerably slower than in the waking state. In disease (acute hydrocephalus, for example), the pulse may reach 150 or even 200 beats; or, on the other hand (as in apoplexy and in certain organic affections of the heart), it may be as slow as between 30 and 20.

Irregularity of the pulse is another condition requiring notice. There are two varieties of irregular pulse: in one, the motions of the artery are unequal in number and force, a few beats being from time to time more rapid and feeble than the rest; in the other variety, a pulsation is from time to time entirely left out, constituting intermission of the pulse. These varieties often concur in the same person, but they may exist independently of each other. Irregularity of the pulse is natural to some persons; in others, it is the mere result of debility; but it may be caused by the most serious disorders, as by disease of the brain, or by organic disease of the heart; and hence the practical importance of ascertaining the various meanings of this symptom.

The pulse is said to be *full* when the volume of the pulsation is greater than usual, and it is called *small* or *contracted* under the opposite condition. A full pulse may depend upon general plethora, on a prolonged and forcible contraction of the left ventricle of the heart, and possibly, to a certain extent, on relaxation of the arterial coats; while a small pulse results from general deficiency of blood, from feeble action of the heart, from congestion of the venous system, or from exposure to the action of cold. When very small, it is termed *thread-like*.

The *tension* of the pulse is the property by which it resists compression, and may be regarded as synonymous with *hardness*. A hard pulse can scarcely be stopped by any degree of pressure of the finger. It occurs in many forms of inflammation, and its presence is commonly regarded as one of the best indications of the necessity of venesection. A *soft* or compressible pulse is indicative of general weakness.

The *strength* of the pulse depends chiefly on the force with which the blood is driven from the heart, but partly also upon the tonicity of the artery itself and the volume of the blood. A strong pulse is correctly regarded as a sign of a vigorous state of the system; it may, however, arise from hypertrophy of the left ventricle of the heart, and remain as a persistent symptom even when the general powers are failing. As strength of the pulse usually indicates vigor, so *weakness* of the pulse indicates debility. There may, however, be cases in which weakness of the pulse may occur in association with undiminished energy of the system at large. For example, active congestion of the lungs may so far impede the passage of the blood through these organs that it cannot reach the heart in due quantity; the necessary result is a weak and feeble pulse, which will rapidly increase in strength if the congestion is relieved by free blood-lettings. Various expressive adjectives have been attached to special conditions of the pulse, into the consideration of which our space will not permit us to enter. Thus, we read of the jerking pulse, the hobbling pulse, the corded pulse, the wiry pulse, the thrilling pulse, the rebounding pulse, &c.

PULTOWA. See POLTAVA.

PU'LTUSK, a town of Poland, in the government of Lomza, is situated in a thickly-wooded district on the Narew, 35 miles north-north-east of Warsaw. It contains numerous churches and a very large bishop's palace. Pop. (1880) 7689. Here, on December 26, 1806, was fought one of the battles of the campaign of Eylau, between the Russians and the French. The field was most obstinately contested, but the victory, which, however, was claimed by both armies, inclined in favor of the French.

PU'LU, a beautiful substance, resembling fine silk of a rich brown color and satin lustre, used largely as a styptic by the medical practitioners of Holland, and introduced into this country for the same purpose. It consists of the fine hairs from the stipes of one or more species of tree-fern, referrible, without doubt, to the genus *Cibotium*. It was first imported into this country in 1844 from Owhyhee under the name of Pulu, or vegetable silk, and was proposed as a substitute for silk in the manufacture of hats, but could not be applied. In 1856, it was again imported from Singapore under the Malay names of Penghawar Djambi and Pakoe Kidang, and was said to have been used in Dutch pharmacy for a long period as a styptic. Several importations have since taken place, and it has been successfully used. It acts mechanically by its great absorbent powers.

PULWU'L, a town of British India, in the district of Gurgaon, in the Punjab, 36 miles south-by-east from Delhi, on the route to Muttra. Pop. (1868) 12,629.

PU'MA, or COUGAR (*Felis concolor*, *Leopardus concolor*, or *Puma concolor*), one of the largest of the American *Felidæ*, rivalled only by the jaguar. It is sometimes called the American Lion, although it is more allied to the leopard, notwithstanding its wants of spots and stripes. It is from 4 to 4½ feet in length from the nose to the root of the tail, and the tail about 2 feet or 2½. The fur is thick and close, reddish-brown above, lighter on the sides, and reddish-white on the belly; the muzzle, chin, throat, and insides of the legs grayish-white, the breast almost pure white. Young pumas have dark-brown spots in three rows on the back, and scattered markings elsewhere, exhibiting the relation to the leopards. The long tail of the P. is covered with thick fur, and is generally coiled up, as if it were prehensile, which it does not seem to be, although the P. climbs trees very well, and often descends on its prey from among their branches. The P. was formerly found in all except the coldest parts of America, but is now rare in most parts of North America, having been expelled by man. It rarely attacks man, but is very ready to prey on domestic animals, and seems to have a thirst for blood beyond that of other *Felidæ*, one P. having been known to kill 50 sheep in a night, drinking a little of the blood of each; a very sufficent reason for the anxiety which all American farmers show for its destruction. Yet it is easily tamed, and when tamed, a very gentle creature, purring like a cat, and showing equal love of attentions. The geographical range of the P. extends far southwards in Patagonia, and northwards even to the state of New York, although it is now very rare in all long-settled parts of North America. It is the *Painter* (Panther) of North American farmers. It sometimes issues from the forests, and roams over prairies and pampas, and is not unfrequently caught by the lasso of South American hunters.—A BLACK P. (*Felis nigra* of some naturalists), a doubtful species, and probably only a variety of the common P., is found in some parts of South America.

PU'MICE, a mineral found in volcanic countries, generally with obsidian and porphyries. In chemical composition, it agrees with obsidian, of which it may be regarded as a peculiar form, rapidly cooled from a melted and boiling state. It is of a white or gray color, more rarely yellow, brown, or black; and so vesicular, that in mass, it is lighter than water, and swims in it. The vesicles, or cells, are often of a much elongated shape. P. often exhibits more or less of a filamentous structure; and it is said to be most filamentous when silica is most abundant in its composition. It is very hard and very brittle. It is much used for polishing wood, ivory, metals, glass, slates, marble, lithographic stones, &c., and in the preparation of vellum, parchment, and some kinds of leather. Among other purposes to which it is applied is the rubbing away of corns and callosities. Great quantities are exported from the Lipari Isles to Britain and all parts of Europe. The Lipari Isles are in great part composed of P., which there, as in some other places, occurs as a rock. P. is the chief product of some volcanic eruptions; but in some eruptions none is produced. It is found also in regions where there are now no active volacnoes, as at Andernach on the Rhine.

PU'MPKIN. See GOURD.

PUMPS are machines for raising water and other fluids to a higher level. They are divided into several classes according to their mode of action. Of these, as the most important, we shall describe in detail the following: 1. The Lift or Suction Pump; 2. The Lift and Force Pump; 3. The Chain-pump; 4. The Centrifugal Pump; 5. The Jet-pump.

1. *The Lift or Suction Pump.*—The diagrams figs. 1 and 2 represent the ordinary suction pump. A is a cylinder, which is called the barrel; with it is connected at the bottom a pipe, B, which communicates with the water to be raised; and at its top is another pipe, C, which receives the water raised. In the barrel are placed two valves, D and E. D is fixed in position at the bottom of the barrel; E is attached to, and forms part of the piston F, which moves up and down the barrel when motive-power is applied to the rod G. The piston, or bucket, consists of a cylindrical piece of wood or metal, which fits exactly the barrel in which it moves, so that no water or air can pass between its circumference and the sides of the cylinder. This tight fitting is attained in wooden pistons by surrounding them with a leather ring; and in those of metal, by hemp or other packing, which is wrapped round a groove made in their outer surface. The hollow interior of the piston is closed at the top by the valve E, which is a kind of door opening on a hinge, at one side of it, in an upward direction, on the application of pressure, and shutting on to its seat on the piston when the pressure is removed. When opened, water or air can pass through it to the upper side of the piston; but when shut, none can pass from one side of the piston to the other. The other valve, D, is similar to it in all respects, except that, as before stated, it is fixed in the bottom of the barrel; it also can only open upwards.

To describe the action of the pump, we shall suppose the piston to be at the bottom of the barrel, and the pump to contain nothing

but air. On moving the piston up the barrel—the valve in it being shut, and kept so by the atmospheric pressure above it—no air can pass from above it into the part of the barrel from which it is moving; the air contained in which becoming rarefied, by having to occupy a greater space, exerts less pressure on the valve D at

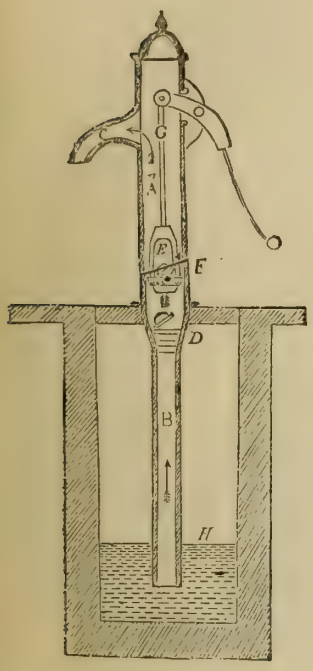


Fig. 1.

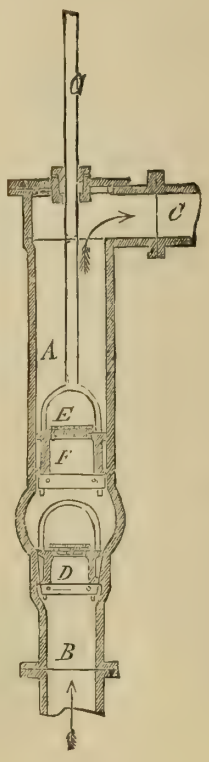


Fig. 2.

the bottom of the barrel than the air in suction-pipe B below it. This valve is thus opened, and the air from the suction pipe enters the barrel; so that when the piston has arrived at the top, a volume of air equal to the contents of the barrel has passed from the suction-pipe into the barrel. When the piston descends, it compresses the air in the barrel, which shuts the valve D; and when the density of the compressed air becomes greater than that of the atmosphere, the valve E in the piston is forced open, and the air in the barrel passes to the upper side of the piston. The next upward stroke of the piston again draws a like quantity of air from the suction-pipe into the barrel; and, as none of this air again enters the pipe, but is passed to the upper side of the piston by its downward stroke, the suction-pipe is by degrees emptied of the air it contained. During this process, however, motion has taken place in the water at the foot of the suction-pipe. The surface of the water at H is pressed upon by the weight of the atmosphere with a pressure of about 15 lbs. on every square inch; and by the laws of fluid-pressure, if an equal pressure is not exerted on the surface of the water in the suction-pipe, the water will rise in it, until the pressure on its surface, plus the weight of its fluid column, balances the pressure of the atmosphere on the surface H outside; so that, as the air in the suction pipe is rarefied, the water rises in it, until, when all the air is extracted from it, the water stands at the level of the valve D. By the next upward stroke of the piston, the barrel being emptied of air, the water follows the piston, and fills the barrel as it filled the suction-pipe. The pressure produced by the downward stroke shuts the valve D, and forces the water in the barrel through the valve E. The succeeding upward stroke carries this water into the pipe above, and again fills the barrel from the suction-pipe. In like manner, every successive upward stroke discharges a body of water equal to the content of the barrel into the pipe above it, and the pump will draw water as long as the action of the piston is continued.

The action of this pump may be more shortly described by saying that the piston withdraws the air from the barrel, and produces a vacuum, into which the water rushes through the suction-pipe impelled by the pressure of the atmosphere on its surface. This atmospheric pressure balances a column of water of about 33 feet in height; so that if the barrel be placed at a greater height than this from the surface of the water in the well, the water will not rise into it, and the pump will not draw.

With regard to its efficiency—that is to say, the relation between the power expended and the work produced, as measured by the water raised—we may remark, that the power is expended— 1st, in raising the water through the required height; 2d, in overcoming the friction of the moving parts of the pump; 3d, in the friction and fluid resistance of the water in passing through the valves and pipes; 4th, in the losses arising from the want of proper proportion between the various parts of the pump. The losses arising from these last sources are very great, and vary so much according to the construction of each particular pump, that no useful estimate can be formed of this efficiency. We may say, however, that a pump of this description, to yield 50 per cent. of the applied power must be well proportioned and carefully constructed.

2. *The Lift and Force Pump.*—Figs. 3 and 4 represent two varieties of this pump. That shown in fig. 3 is very similar to the suction-pump before described, with the exception, that the valve E, instead of being fixed on the piston, is placed in the discharge-pipe, the piston itself being solid.

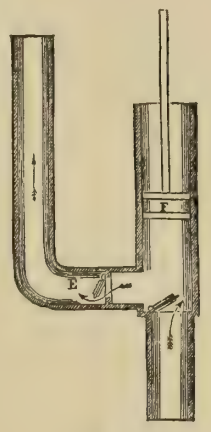


Fig. 3.

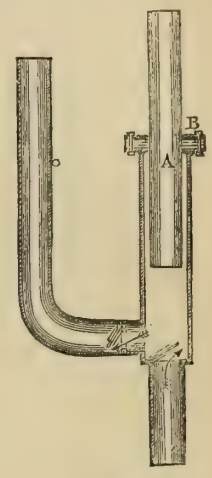


Fig. 4.

The water is drawn up into the barrel by suction in the manner just described in the suction-pipe, and then the pressure of the piston in its downward-stroke forces it through the valve E to any height that may be required. That shown in fig. 4 is provided with a different description of piston, called the plunger-pole. Its action is precisely the same as that of the other, with this exception, that the plunger-pole, instead of emptying the barrel at every stroke, merely drives out that quantity which it displaces by its volume. It is simply a solid rod of metal, A, moving through a water-tight stuffing-box, B. This stuffing-box is made by placing, on a circular flange of metal, rings of india-rubber or other packing, the inner diameter of which is slightly

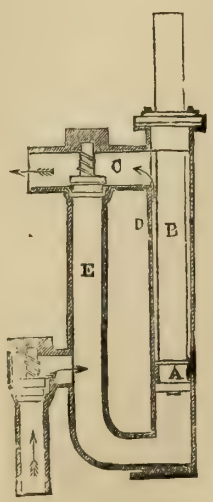


Fig. 5.

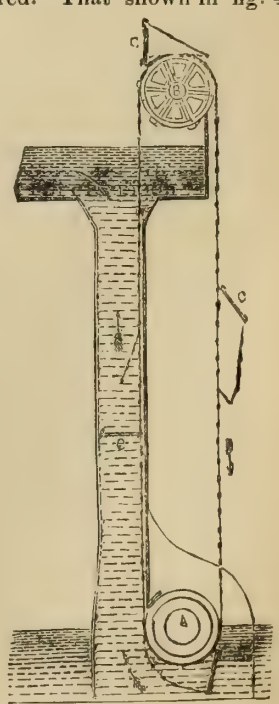


Fig. 6.—Murray's Chain-pump.

less than that of the plunger-hole. On these is placed a ring of metal, and through the whole are passed bolts, which, on being screwed tight, force the packing tightly against the plunger-pole. It possesses many advantages, for the packing can be tightened and repaired without removal of the piston or stoppage of the pump; also, the cylinder is not worn by its action, nor does it require to be accurately bored out, as in the other form of pump.

In these pumps, it will be observed that the water is forced into the ascending pipe or column only on the downward stroke; it will thus be discharged in a series of rushes or jerks. As it is a great object to procure a continuous discharge, both for its convenience, and for the saving of the power wasted by the continual acceleratlon and retardation of the ascending column, various methods have been used for that purpose. The most common is the reservoir of air, which is an air-tight receptacle fixed vertically on the discharge-pipe; the water forced into the pipe by the down-stroke compresses this air, which, acting as a spring returns this force to the ascending column during the period of the up-stroke, and so, by taking the blow of the entering water, and returning it gradually, equalizes the pressure, and renders the discharge uniform. Another method is the double-action force-pump, by which equal volumes of water are forced into the ascending column by both up and down strokes. An example of this is shown in fig. 5. The solid piston A is worked by a rod B of half the section of the piston itself. During the up-stroke, the upper surface forces a volume of water into the ascending column and the lower surface draws in twice that volume. In the down-stroke, these two volumes are sent through the pipe E into the receptacle C, communicating with the upper face of the piston. One of the volumes fills the space D, which would otherwise be left empty by the descent of the piston; the other volume is sent into the ascending column; so that a volume of water equal to half the content of the barrel is sent into the ascending column by both the up and the down strokes.

A pump exhibited in the International Exhibition of 1862, by Messrs. Farcot and Sons, attains this object in a much more simple manner. In its 'two equal pistons, with valves affording very large water-ways, work parallel to each other in two pump cylinders. During the successive strokes, the first piston draws in water by its upper surface, and delivers it to the ascending column by causing it to traverse the second piston. In its ascending course, the second piston raises in its turn the column of water by its upper face, while the lower face sucks the water, causing it to traverse the first piston.' It will be seen from this description that a valve is placed in each piston, that the cylinders communicate at their base, and that the pistons make their strokes simultaneously. This pump has yielded all the good results promised by its ingenious construction, and it is adopted in the water-supply of Paris.

In spite of the great antiquity of the lift and force pump, it is only of late years that improvements have been introduced into its construction capable of rendering it an efficient machine—that is, one which returns in the shape of water raised, a good proportion of the power applied to it. In 1849, M. Morin found by experiments that the power lost was 55 to 82 per cent.—that is to say, that of the motive-power, 45 per cent. was yielded in the best and 18 in the worst, giving an average of about 30 per cent. In 1851, the jury, reporting on those exhibited in the Great Exhibition, say that it is one of our worst machines, considered in a mechanical sense, as a means of producing a given result with the least possible expense of power. In those exhibited in the International Exhibition of 1862, we find a marked improvement. The jury report that 'a large number of constructers have sought to give the waterways and valves dimensions which render as small as possible the loss of power by friction. They have also sought to give a continuous movement to the ascending column of water, independently of the action of the reservoir of air.'

3. *The Chain-pump.*—This pump is formed in general of plates of wood fastened to an endless iron chain, and moving upwards in a rectangular case or box. Fig. 6 shows an example of this pump, which was exhibited in the International Exhibition of 1862, called 'Murray's Chain-pump;' a pump which is very much used on public works, on account of the ease of its construction and erection, and its admirable efficiency even at considerable heights. In this pump, the friction is reduced by having only 3 or 4 lifts instead of 20 or 30, as was previously the case. The chains pass under a roller, A, at the foot, and are driven by a small pitch-wheel, B, at the top, over which they are conducted, and which is driven by appropriate gearing. The lifts feather in passing over the wheel to the descending side, and only unfold when brought around to the ascending side; thus the pump is enabled to take off the water with the same dip as other pumps. The pump is not liable to be choked, as a back turn of the chain immediately releases any substance getting between the lift and the barrel. The speed is variable, in proportion to the duty required. The speed at which the chain is ordinarily worked is from 200 to 300 feet per minute. The greatest lift yet made by Murray's chain-pump is 60 feet high; but it is considered that 100 tons of water per minute could be raised 100 feet high. From 10 to 12 feet apart has been found to be the best pitch for the lifts; putting them nearer needlessly increases the friction. Experiments made by Mr. Lovick for the Metropolitan Board of Works, showed that the slip of the lifts which work in the barrel, and are one-eighth of an inch shorter each way than the barrel, averaged 20 per cent. of their motion, and that the useful work done averaged 63 per cent. of the indicator horse-power of the engine working it.

4. *The Centrifugal Pump.*—These pumps, with reference to those previously described, may be called new, as, though they have been in use in one form or another for at least a century, their merits were not brought prominently forward till the year 1851, when the great efficiency of the models exhibited by Messrs. Appold, Gwynne, and Bessemer drew general attention to the subject.

The essential parts of this pump are—1. The wheel to which the water is admitted at the axis, and from which it is expelled at the circumference, by the centrifugal force due to the rotatory motion imparted to it in passing through the rapidly revolving wheel; and 2. The casing or box in which the wheel works, and by which the entering water is separated from that discharged.

Figs. 7 and 8 are a section and plan of a centrifugal pump. The water enters the pump by the supply-pipes A, A, which lead

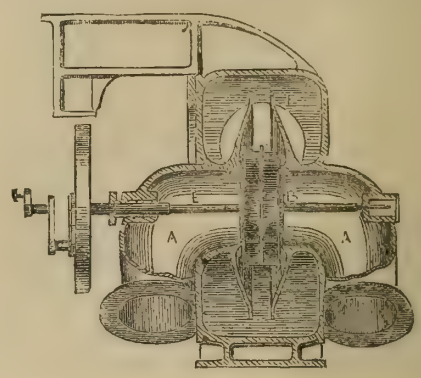


Fig. 7.

to the central orifices of the wheel B, B; it then passes through the passages C, C, formed by the vanes and the side covering-plates, D, of the wheel. In passing through these passages of the wheel, which is made to revolve by power applied to the shaft E, it acquires a rotatory motion, which still continues when it leaves the circumference of the wheel, and enters the circular whirlpool chamber F; so that the interior of the pump may be looked on as a whirlpool, extending from the axle of the wheel to the circumference of the whirlpool chamber. Into this whirlpool the water is drawn at the central orifice of the wheel, and dis-

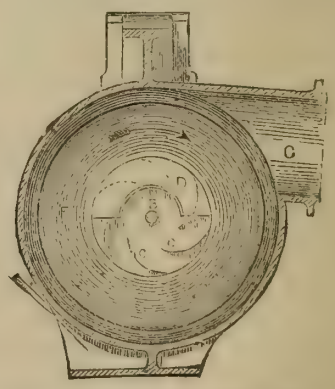


Fig. 8.—Thomson's Centrifugal Pump.

charged by the pipe G at the circumference of the whirlpool chamber; and the force with which it is discharged, or the height to which it will rise in the pipe G, is measured by the centrifugal force of the water revolving in the whirlpool.

With reference to the efficiency of these pumps, it is impossible to give any accurate estimate, since as high as 70 per cent. of the applied power is claimed to be returned by forms of the pump shown in figs. 7 and 8, while some other descriptions experimented on in 1851 gave only 18 per cent. of useful effect.

It will be evident, from the above description of the pump, that the height to which the water will be raised depends entirely upon

the speed of revolution of the wheel; and it is by this that the application of centrifugal pumps is limited to comparatively low lifts of say less than 20 feet, as the speed for high lifts requires to be greater than can be conveniently and usefully attained in practice. They are best applied when raising large quantities of water through low lifts. It will also be observed, that on account of the simplicity of their parts, and the absence of valves, they are much less liable than other pumps to be choked by the entrance of solid materials. In some descriptions of this pump, the exterior whirlpool chamber is dispensed with; and to the vanes of the wheel is given such a curvature backwards from the direction of motion, that the water leaving the circumference of the wheel is spouted backwards from the vane-passages with a speed equal to that of the wheel in the opposite direction, so that it has only a radial motion with reference to a fixed object; in other words, that the force is acquired from the radial component of the pressure of the vanes, instead of the centrifugal force of the revolving water. Those pumps, however, give the best results which, as the one above described, combine both actions. In all cases, curved vanes are much superior to straight ones.

5. *The Jet-pump.*—This pump is worked by water-power, and is worthy of notice on account of the extreme simplicity of its parts, and of not requiring the care of an attendant while in operation.

Fig. 9 is a representation of this pump, C is the water which it is required to raise to the level of the water D, and B is the water in the stream available for working the pump. The water B passes down the pipe A, and is discharged from the jet or nozzle, E, into the conical pipe F. Round the nozzle is the vacuum-chamber G, at the bottom of which is attached the conical pipe F, and into the side of which the suction-pipe H enters from the water to be pumped. The water, in passing from the nozzle into the conical pipe, carries air with it, and so gradually forms a vacuum in the chamber G, when the water rises into it from the level C, through the pipe H; and it is in turn carried with the jet down the conical pipe into the discharge-level D. The velocity of the water coming from the jet is gradually retarded by the action of the conical pipe, the speed decreasing as the area of section in-

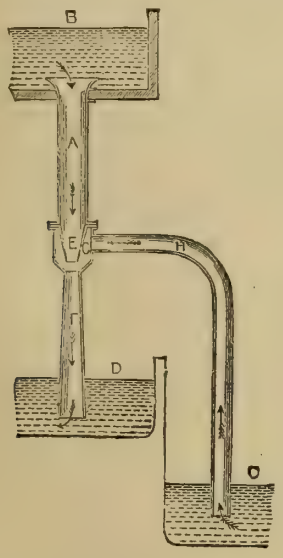


Fig. 9.

creases; and the *vis viva* of its motion is by this retardation converted into a sucking force, drawing the water from the suction-pipe through the vacuum chamber into the conical pipe. The water issuing from the jet will have a speed equal to that produced by a column of the height BC, or the sum of the fall and lift. This pump may be viewed, for purposes of explanation, as a syphon, into the shorter leg of which a jet of water is injected, which overcomes the pressure due to the difference of levels, and reverses the ordinary motion of the water in a syphon. An efficiency of 18 per cent. has been obtained from this pump, which is low, as compared with that obtained from other descriptions of pump; yet in cases where waste of water-power is not so much to be avoided as expense in erecting, working, and maintenance, these pumps possess decided advantages. The case to which they are peculiarly applicable is the drainage of marshes, which have streams of water adjacent to them descending from a higher level.

PUN is the name given to a play upon words. The wit lies in the equivocal sense of some particular expression, by means of which an incongruous, and therefore ludicrous idea is unexpectedly shot into the sentence. One or two examples will make the matter clearer than any definition. Two persons looking at a beggar-boy with an extraordinary big head—'What a tower!' cried the first. 'Say, rather,' replied the second, 'what a *fort o' lice*' (fortalice).—A noted punster was once asked, with reference to Mr. Carlyle's writings, if he did not like 'to expatiate in such a field.' 'No,' was the felicitous rejoinder; 'I can't get over the *style*' (stile).—A Massachusetts lady complaining to a friend that her husband (whose business had taken him to the far West) constantly sent her letters filled with expressions of endearment, but no money, was told, by way of comfort, that he was giving her a proof of his *unremitting* affection.

PUNCH, the chief character in a popular comic exhibition performed by means of *Puppets* (q. v.). Various accounts are given of the origin of the name. The exhibition is of Italian origin, and the Italian name is *Pulcinella*, or *Policinella*. According to one story, a peasant, a well-known character in the market-place of Naples, got the name Pulcinella from dealing in fowls (*pulcinelli*), and after his death was personated in the puppet-shows of the San-Carlino theater. Another account makes the word a corruption of Puccio d'Aniello, the name of a witty buffoon of Acerra who joined a company of players and became the favorite of the Neapolitan populace. Others give his original name as Paolo Cinella. The variety and inconsistency of the legends show them to be myths—histories invented to account for the name. The modern P. is only a modification of an ancient Mask (q. v.) to be seen represented on ancient vases, and taken perhaps from the Oscan Atellanæ; and the Italian name is pretty evidently a diminutive of *pollice*, the thumb—Tom Thumb (the dwarfs of northern mythology are sometimes styled *däumling*, thumkins). The English name *Punch* is apparently identical with Eng. *paunch*; Bavarian *punzen*, a cask; Ital. *punzone*, a puncheon; and denotes anything thick and short (e. g., a Suffolk *punch*). The name *Punchinello* seems to have arisen from blending the English and Italian names.

The drama or play in which the modern P. figures, is ascribed to an Italian comedian, Silvio Fiorillo, about 1600. The exhibition soon found its way into other countries, and was very popular in England in the 17th century. Its popularity seems to have reached its height in the time of Queen Anne, and Addison has given in the *Spectator* a regular criticism of one of the performances. The scenes as now given by the itinerant exhibitors of the piece are much shortened from what were originally performed, in which allusions to public events of the time were occasionally interpolated. The following is an outline of the plot as performed in 1813. Mr. P., a gentleman of great personal attraction, is married to Mrs. Judy, by whom he has a lovely daughter, but to whom no name is given in this piece, the infant being too young to be christened. In a fit of horrid and demoniac jealousy, P., like a second Zeluco, strangles his beauteous offspring. Just as he has completed his dreadful purpose, Mrs. Judy enters, witnesses the brutal havoc, and *exit* screaming; she soon returns, however, armed with a bludgeon, and applies it to her husband's head, 'which to the wood returns a wooden sound.' P. at length exasperated seizes another bludgeon, soon vanquishes his already weakened foe, and lays her prostrate at his feet; then seizing the murdered infant and the expiring mother, he flings them both out of the window into the street. The dead bodies having been found, police-officers enter the dwelling of P., who flies for his life, mounts his steed; and the author neglecting, like other great poets, the confining unities of time and place, conveys his hero into Spain, where, however, he is arrested by an officer of the terrible Inquisition. After enduring the most cruel tortures with incredible fortitude, P., by means of a golden key, opens his prison-door, and escapes. The conclusion of the story is satirical, allegorical, and poetical. The hero is first overtaken by Weariness and Laziness in the shape of a black dog, which he fights and conquers; Disease, in the disguise of a physician, next arrests him; but P. 'sees through the thin pretence,' and dismisses the doctor with a few derogatory kicks. Death at length visits the fugutive; but P. lays about his skeleton carcass so lustily, and makes the bones of his antagonist rattle so musically with a bastinado, that 'Death his death's blow then received.'

Last of all comes the Devil; first under the appearance of a lovely female, but afterwards in his own natural shape, to drag the offender to the infernal regions, to expiate his dreadful crimes. Even this attempt fails, and P. is left triumphant over Doctors, Death, and the Devil. The curtain falls amid the shouts of the conqueror, who, on his victorious staff, lifts on high his vanquished foe.

The well-marked peculiarities in the original personification of P., which were a high back, distorted breast, and long nose, were intended to give an increased zest to his witticisms; but these features have been much exaggerated in the now so well-known illustrations of the popular periodical which bears his name.

The performance of P., as generally represented, requires the

assistance of only two persons—one to carry the theater and work the figures, the other to bear the box of puppets, blow the trumpet, and sometimes keep up the dialogue with the hero of the piece. The movements of the puppets are managed simply by putting the hands under the dress, making the second finger and thumb serve for the arms, while the forefinger works the head.

PUNCH, or the LONDON CHARIVARI, the English comic journal par excellence, is a weekly magazine of wit, humor, and satire in prose and verse, copiously illustrated by sketches, caricatures, and emblematical devices. It draws its material as freely from the most exalted spheres of foreign politics as from the provincial nursery; and, dealing with every side of life is not less observant of the follies of Belgravia than of the peculiarities of Whitechapel. P. gives due place to Irish bulls and dry Scotch humor, and does its best to present them in the raciest vernacular.

Stern in the exposure of sham and vice, P. is yet kindly when it makes merry over innocent foibles. Usually a *censor morum* in the guise ot Joe Miller, a genial English Democritus who laughs and provokes to laughter, P. at times weeps with those that weep, and *jocis remotis*, pays a poetical tribute to the memory of the departed great. This wittiest of serial prints was founded in 1841, and, under the joint editorship of Mark Lemon and Shirley Brooks soon became a household word, while erelong its satirical cuts and witty rhymes were admittedly a power in the land. P. is recognized as an English institution, and in corners of Europe where an Englishman rarely comes, the frequenters of the café may be seen puzzling over the esoteric wit and wisdom of Cockaigne. Their contributions to P. helped to make Douglas Jerrold (q. v.), Tom Hood (q. v.), Albert Smith, and Thackeray (q. v.) famous; as their illustrations have done for Doyle, Leech, Tenniel, Du Maurier, and Keene. It should be noted that our comic paper has done memorable service in purifying the moral standard of current wit in England. For the alternative name, see CHARIVARI.

PUNCH, a beverage introduced into England from India, and so called from being usually made of five (Hindu, *pantsh*) ingredients—arrack, tea, sugar, water, and lemon-juice. As now prepared, punch may be described as a drink, the basis of which is alcohol, of one or more kinds, diluted with water, flavored with lemon or lime-juice and spices, and sweetened with sugar; sometimes other ingredients are added according to taste, especially wine, ale, and tea. The mixture is usually compounded in a large china bowl made for the purpose, and is served out in glasses by means of a ladle. It is much more rarely seen now than formerly, which is not to be regretted, for a more unwholesome or intoxicating beverage could hardly be compounded. The ordinary mixed punch consists of the following ingredients: the juice of three lemons squeezed out into a large jug, and one lemon cut in slices, with the rind on for flavor, twelve ounces of loaf-sugar, and two quarts of boiling water; after being infused half an hour, and strained off, the liquid is poured into the punch-bowl, and half a pint of rum and of brandy are added. A favorite mode of drinking this composition at present is as a liqueur after fish at dinner, for which purpose it is bottled, and when wanted, is iced, either by placing the bottles in rough ice, or by pounding and mixing in fine ice. The principal varieties of punch, in addition to this, are rum, gin, and brandy punches, in which only one of the spirits mentioned is used, and champagne, milk, orange, raspberry, tea, wine punches.

PUNCH, a tool for cutting circular or other shaped pieces out of metal, wood, or other materials. The simplest form of this instrument is shown in fig. 1, which consists of a piece of steel



Fig. 1.

formed at one end into a hollow cylinder, *a*, the end of which at *b* is ground to a very sharp cutting edge. The other end of the punch at *c* is made strong and thick, to receive blows from a hammer, and to serve as a handle. When the instrument is in use, the cutting-edge, *a*, is applied to the surface which is to be perforated, and a blow sufficiently hard is struck on the end of the

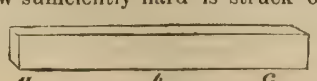


Fig. 2.

handle, *c*, when a circular piece of the material is cut out and left in the hollow part, *a*, which can be removed at the upper end of the opening at *d*. The mode of manufacturing such tools is very simple. A piece of square steel-bar is taken, the thickness of which must correspond with the thickness of the handle at *c*, fig. 1, for which fig. 2 may be taken as the commencement. This is brought up to a sufficient heat in the furnace, and is then beaten or rolled laterally so as to have the shape in fig. 3. In the next stage, the



Fig. 3.

edges, *a*, *a*, fig. 4, are brought up; and finally, a mandril is put into the groove thus made, and the edges are brought together, and welded; the mandril is then withdrawn, and the tool goes to be ground and finished. It will be obvious that, by skill, punches may be made which will make holes of almost any shape.



Fig. 4.

The enormous development of our iron manufactures has necessitated the use of machine-tools in the place of those made for the hand, and none of the very ingenious inventions for this purpose have played a much more important part than the *punching-machines*, for without them the labor of drilling holes in iron plates for such objects as steam-boilers, iron ships, bridges, and other great works, would have been so great as to have effectually prevented them from being undertaken. The punching-machine invented by Messrs. Roberts and Nasmyth, with recent modifications and improvements, is in very general use in all our great engineering works; its essential parts are the punch, lever, and the spring. The punch is simply a piece of tough, hard steel of a cylindrical form, and of the size of the intended holes; it fits into a socket, which is suspended over a fixed iron plate or bench, which has a hole exactly under the punch, and exactly fitting it. In the socket which holds the punch is a coiled iron spring, which holds up the punch, and allows it to descend when the power is applied, and returns it when the pressure is relieved. The lever, when in action, presses on the top of the punch, and the plate of metal which is to be perforated being placed on an iron bench, receives the pressure of the punch with sufficient force to press out a disc of metal exactly the diameter of the punch, which falls through the hole in the iron bench. The lever is moved by a cam on a powerful wheel, which presses upon it until it can pass; then the lever being relieved, the punch is drawn up by the spring in its socket, ready to receive the action of the cam when the revolution of the wheel again brings it to bear on the lever. The punch itself is always solid, differing entirely in this respect from the hand-tools. This useful machine will perforate thick plates of iron, such as are used for shipbuilding, almost as quickly as a workman, with an ordinary hand-punch could perforate thin plates of tin; the holes made are quite true, and are ready to receive the rivets.

PUNCTUA'TION, the division of a writing into sentences, and the subdivision of these into parts by means of certain marks called *points*, a great help to the clear exhibition of the meaning and to the pleasant reading of what is written. The ancients were not acquainted with the use of points, or used them very little, and only for oratorical purposes. Punctuation, according to the grammar and sense, is said to have been an invention of the Alexandrian grammarian, Aristophanes; but was so much neglected and forgotten, that Charlemagne found it necessary to ask Warnefried and Alcuin to restore it. It consisted at first of a point called the *stigma*, and sometimes a line, variously formed and introduced. The system of punctuation now in use was introduced by the Venetian printer, Manutius, in the latter part of the 15th c.; the example was soon and generally followed, and little change has since been found requisite.

PUNDERPU'R, or PANDHARPUR, a town of British India, in the district of Sholapur, and presidency of Bombay, 90 miles east from Satara, on the right bank of the Bima, a large branch of the Kistna. It is highly revered by the Hindus, on account of a celebrated temple dedicated to an incarnation of Vishnu. Pop (1872) 16,275.

PU'NDLER, the name which in Scotland used to be given to a person employed on an estate as hedger, ditcher, forester, and general guardian, in absence of the proprietor. The office of a pundler was probably analogous to that of poynder. In a few cases, the term pundler is still employed.

PU'NIC WARS, the name commonly given to the three great wars waged for supremacy between Rome and Carthage. The Latin word *punicus* or *pœnicus*, was the name given by the Romans to the Carthaginians, in allusion to their Phœnician descent. For

an outline of the struggle between the two rival powers, see CARTHAGE, ROME, HAMILCAR, HANNIBAL, and the SCIPIOS. —The Romans, who believed, not without reason that the Carthaginians never sincerely meant to keep any treaty of peace, employed the phrase *punica fides*, 'Punic faith,' to denote a false and faithless spirit.

PU'NICA. See POMEGRANATE.

PU'NISHMENT, in this country, usually means the deprivation of property or liberty, or the infliction of pain on the body of one who commits a criminal offence. It is not applicable, generally, to civil actions, though these are also followed with the compulsory payment of money, and failing which, with the deprivation of property and liberty. As the legal consequence of crimes, punishment consists chiefly of the infliction of pain on the body, and this ranges from capital punishment or death, down to imprisonment for a term of years, and, in some cases, whipping is added; and in military and naval offences, flogging. Capital punishment is inflicted only in case of treason and murder (but there are other instances under naval or army discipline), and in the form of Hanging (q. v.). In crimes of less degree, imprisonment, or Penal Servitude (q. v.) for a term of years, is the punishment. As a general rule, the judge has a discretion to fix the punishment within two defined limits. In the great mass of the smallest crimes, which are cognizable by justices of the peace, and are frequently termed offences punishable summarily, the usual punishment is a fine or penalty, i. e., a sum of money is ordered to be paid by the offender, and if he do not pay it, his goods are sold to make up the sum; failing which, he is committed to the house of correction for a short period of 3, 6, or 12 months; but, in some of the cases, imprisonment and hard labor are imposed in lieu of a fine. The crown can put an end to a sentence of punishment by a free pardon, or may commute a sentence of death to imprisonment for life.

PUNISHMENT, FUTURE. See HELL.

PUNISHMENTS, MILITARY AND NAVAL. These, in the British service, include death, by shooting, if for an offence against discipline—or by hanging, if for a disgraceful offence; for serious crimes in the field against discipline, field imprisonment No. I. and No. II. instead of Flogging (q. v.), abolished in 1881; for minor offences, degradation of rank, imprisonment, extra drill, stoppage of grog, loss of good-conduct pay, stoppage of leave, &c. Death, penal servitude, imprisonment, degradation, and loss of leave are the punishments which may be inflicted on an officer. An officer can only be punished by sentence of a court-martial; he may be cashiered, dismissed the service, deprived of his regiment or ship; or, in the navy, reduced in rank by being placed at the bottom of the list of officers of his grade. —In certain of the German armies, punishment is inflicted on the men in the form of strokes with a cane or with the flat of a sabre.

PU'NJAB, or PANJAB (from two Persian words signifying 'five rivers:' the *Pentapotamia* of the Greeks), is an extensive territory in the north-west of Hindustan, watered by the Indus, and its five great affluents—the Jhelum, Chenab, Ravi, Beas, and Sutlej, and forms a British possession since February 1849. It is bounded on the W. by the Suliman Mountains, on the N. by Cashmere, and on the E. and S.E. by the Sutlej, which, in its lower course, is called the Ghara. The extreme length is about 800 miles, and width about 650 miles. The total area is over 200,000 sq. miles, more than half of which is the territory of feudatories. The British possessions are 106,632 square miles, of which less than a third is cultivated. At the census of 1868, the pop. was 17,611,498. At that of 1881, it was 18,850,347; giving an average of 176 to the square mile. The length of roads is 20,798 miles; railways open, 412 miles. The physical character of the northern contrasts strikingly with that of the southern districts. In the north, the whole surface is traversed by spurs from the Himalayas, which enclose deep valleys. In the south, the surface is unbroken by any important eminence, except the Salt Range, varying from 2000 to 5000 feet high, between the Indus and the Jhelum.

The country, divided into five doabs, or interfluvial tracts, and frequently spoken of as the plains of the Indus, has a general slope towards the south-west. The climate in the plains is most oppressively hot and dry in summer, reaching in May 115° to 121° in the shade at several stations; but cool, and sometimes frosty, in winter. Little rain falls except in the districts along the base of the Himalayas. The soil varies from stiff clay and loam to sand; but, in general, is sandy and barren, intermixed with fertile spots. The rivers afford abundant means of irrigation. The indigenous vegetation of the P. is meagre. Trees are few in number and small, and fuel is so scarce, that cow-dung is much used in its stead. With an efficient system of agriculture, however, the territories of this part of India might be rendered very productive. Of the ordinary crops, wheat of excellent quality is produced in considerable quantities, and indigo, sugar, cotton, tobacco, opium, buckwheat, rice, barley, millet, maize, and numerous vegetables and fruits are grown. The manufacturing industry of this region is very considerable, and is carried on for the most part in the great towns, as Amritsir (q. v.), Lahore (q. v.), Multan (q. v.), &c. Spices and other groceries, dye-stuffs, cloths, metals, and hardware, are imported from the more eastern provinces of British India; and grain, ghee, hides, wool, carpets, shawls, silk, cotton, indigo, tobacco, salt, and horses are exported. The inhabitants are of various races, chiefly Sikhs, Jats, Gujurs, Rajputs and Patans. Of the whole population, nearly two-thirds are Mohammedans; the remaining third is pretty fairly divided between those of the Hindu faith and the Sikhs. There are upwards of 17,000 Europeans in the P. The Jats are the most prominent of the races of the P., and are said to have formed the 'core and nucleus' of the Sikh nation and military force. Of the hisory of the P., all that is important is given under the heading SIKHS.

PU'NKAH, a gigantic fan for ventilating apartments, used in India and tropical climates. It consists of a light frame of wood, covered with calico, from which a short curtain depends, and is suspended by ropes from the ceiling; another rope from it passes over a pulley in the wall to a servant stationed without; the servant pulls the punkah backwards and forwards, maintaining a constant current of air in the chamber.

PUNT, a heavy, oblong, flat-bottomed boat, useful where stability and not speed is needed. Punts are much used for fishing. Some are fitted for oars; but the more usual mode of propulsion is by poles operating on the bottom. Punting is a very laborious exercise.

PU'PA (Lat. a girl, or a doll), the second stage of insect life after the hatching of the egg. The first stage after the egg is that of *Larva* (q. v.). In those insects of which the metamorphosis is *complete* (see INSECTS), the pupa is generally quite inactive, and takes no food. This is the case in the *Lepidoptera*, the pupa of which is called a *Chrysalis* or *Aurelia*, and in the *Coleoptera*, *Hymenoptera*, and *Diptera*. Manifestations of life may indeed be produced by touching, or in any way irritating, the pupa, but it is incapable of locomotion and of eating. It is quite otherwise with the pupæ of other orders, which are often very voracious, and resemble the perfect insect in almost everything but that the wings are wanting. The peculiarities of the pupa are noticed in the articles on the different orders and genera of insects.

PUPIL. See EYE.

PUPIL, in the Law of Scotland, means, in the case of a male, one who is under 14 years of age; in the case of a female, one under the age of 12 years.

PUPPET, a name (derived from the Lat. *pupus*, a child or boy, Fr. *poupée*, a doll) signifying a childlike image. The Italian *fantoccini* (from *fantino*, a child), and the French *Marionettes* (q. v.) are other names for puppets. Puppet-plays, or exhibitions in which the parts of the different characters are taken by miniature figures worked by wires, while the dialogues is given by persons behind the scenes, are of very ancient date. Figures with movable limbs have been found in the tombs of ancient Egypt and Etruria. Originally intended to gratify children, they ended in being a diversion for adults. In China and India they are still made to act dramas either as movable figures or as shadows behind a curtain 'Ombres Chinoises'). In Italy and France puppet-plays were at one time carried to a considerable degree of artistic perfection, and even Lessing and Göethe in Germany thought the subject worthy their serious attention. In England they are mentioned under the name of *Motions* by many of our early authors, and frequent allusions occur to them in the plays of Shakspeare, Ben Jonson, and the older dramatists. The earliest exhibitions of this kind consisted of representations of stories taken from the Old and New Testament, or from the lives and legends of saints. They thus seem to have been the last remnants of the *Moralities* of the 16th century. We learn from Ben Jonson and his contemporaries that the most popular of these exhibitions at that time were the *The Prodigal Son*, and *Nineveh with Jonas and the Whale*. Even the Puritans, with all their hatred of the regular stage, did not object to be present at such representations. In the reign of Queen Elizabeth puppet-plays were exhibited in Fleet Street and Holborn Bridge—localities infested by them at the period of the Restoration. The most noted exhibitions of the kind were those of Robert Powel in the beginning of the 18th century. (See Chambers's *Book of Days*, vol. ii. 167). So recently as the time of Goldsmith, scriptural 'Motions' were common, and, in *She Stoops to Conquer*, reference is made to the display of Solomon's Temple in one of these shows. The regular performances of the stage were also sometimes imitated; and Dr. Samuel Johnson has observed that puppets were so capable of representing even the plays of Shakspeare, that *Macbeth* might be represented by them as well as by living

actors. These exhibitions, however, much degenerated, and latterly consisted of a wretched display of wooden figures barbarously formed, and decorated without the least degree of taste or propriety, while the dialogues were jumbles of absurdities and nonsense.

The mechanism of puppet-plays is simple. The exhibitor is concealed above or below the stage, works the figures by means of wires, and delivers the dialogues requisite to pass between the characters. The exhibition of Punch (q. v.) is perhaps the only example of this species of acting which exists in this country at the present time.

PURAN'A (literally 'old,' from the Sanscrit *purâ*, before, past) is the name of that class of religious works which, besides the Tantras (q. v.), is the main foundation of the actual popular creed of the Brahminical Hindus (see HINDU RELIGION under INDIA). According to the popular belief, these works were compiled by *Vyâsa* (q. v.), the supposed arranger of the *Vedas* (q. v.), and the author of the *Mahâbhârata* (q. v.), and possess an antiquity far beyond the reach of historical computation. A critical investigation, however, of the contents of the *existing* works bearing that name must necessarily lead to the conclusion, that in their present form they do not only belong to a remote age, but can barely claim an antiquity of a thousand years. The word *Purân'a* occurs in some passages of the *Mahâbhârata*, the law-books of Yâjnavalkya and Manu (q. v.); it is even met with in some *Upanishads* and the great Brâhman'a portion of the White-Yajur-Veda; but it is easy to show that in all these ancient works it cannot refer to the existing compositions called P., and therefore that no inference relative to the age of the latter can be drawn from that of the former, whatever that may be. Nevertheless, it must be admitted that there are several circumstances tending to show that there existed a number of works called P., which preceded the actual works of the same name, and were the source whence these probably derived a portion of their contents. The oldest known author of a Sanscrit vocabulary, Amara-Sinha, gives as a synonym of P. the word *Panchalakshan'a*, which means 'that which has five (*panchan*) characteristic marks' (*lakshan'a*); and the scholiasts of that vocabulary agree in stating that these *lakshan'as* are:

1. Primary creation, or cosmogony; 2. Secondary creation, or the destruction and renovation of worlds; 3. Genealogy of gods and patriarchs; 4. *Manwantaras*, or reigns of Manus; and 5. The history of the princes of the solar and lunar races. Such, then, were the characteristic topics of a P. at the time, if not of Amara-Sinha himself—which is probable—at least of his oldest commentators. Yet the distinguished scholar most conversant with the existing Purân'as, who, in his preface to the translation of the *Vishn'u*-P., gives a more or less detailed account of their chief contents (Professor H. H. Wilson), observes, in regard to the quoted definition of the commentators on Amara-Sinha, that in no one instance do the actual Purân'as conform to it exactly; that 'to some of them it is utterly inapplicable; to others, it only partially applies.' To the *Vishn'u*-P., he adds, it belongs more than to any other P.; but even in the case of this P. he shows that it cannot be supposed to be included in the term explained by the commentators. The age of Amara-Sinha is, according to Wilson, the last half of the century preceding the Christian era; others conjecture that it dates some centuries later. On the supposition, then, that Amara-Sinha himself implied by Pancha-lakshan'a the sense given to this term by his commentators, there would have been Purân'as about 1900 or 1600 years ago; but none of these have descended to our time in the shape it then possessed.

Various passages in the actual Purân'as furnish proof of the existence of such elder Purân'as. The strongest evidence in this respect is that afforded by a general description given by the *Matsya-P.* of the extent of each of the Purân'as (which are uniformly stated to be 18 in number), including itself; for, leaving aside the exceptional case in which it may be doubtful whether we possess the complete work now going by the name of a special P., Professor Wilson, in quoting the description from the *Matsya-P.*, and in comparing with it the real extent of the great majority of Purân'as, the completeness of which, in their actual state, does not admit of a reasonable doubt, has conclusively shown that the *Matsya-P.* speaks of works which are not those we now possess. We are then bound to infer that there have been Purân'as older than those preserved, and that their number has been 18, whereas, on the contrary, it will be hereafter seen that it is very doubtful whether we are entitled to assign this number to the actual P. literature.

The modern age of this latter literature, in the form in which it is known to us, is borne out by the change which the religious and philosophical ideas, taught in the epic poems and the philosophical Sûtras, have undergone in it; by the legendary detail into which older legends and myths have expanded; by the numerous religious rites—not countenanced by the Vedic or epic works—which are taught, and, in some Purân'as at least, by the historical or quasi-scientific instruction which is imparted, in it. To divest that which, in these Purân'as, is ancient, in idea or fact, from that which is of parasitical growth, is a task which Sanscrit philology has yet to fulfil; but even a superficial comparison of the contents of the present P. with the ancient lore of Hindu religion, philosophy, and science, must convince every one that the picture of religion and life unfolded by them is a caricature of that afforded by the Vedic works, and that it was drawn by priestcraft, interested in submitting to its sway the popular mind, and unscrupulous in the use of the means which had to serve its ends. The plea on which the composition of the Purân'as was justified even by great Hindu authorities—probably because they did not feel equal to the task of destroying a system already deeply rooted in the national mind, or because they apprehended that the nation at large would remain without any religion at all, if, without possessing the Vedic creed, it likewise became deprived of that based on the Purân'as—this plea is best illustrated by a quotation from Sâyan'a, the celebrated commentator on the three principal *Vedas*. He says (*Rigv.*, ed. Müller, vol. i. p. 33): 'Women and S'ûdras, though they, too, are in want of knowledge, have no right to the Veda, for they are deprived of (the advantage of) reading it in consequence of their not being invested with the sacred cord; but the knowledge of law (or duty) and that of the supreme spirit arises to them by means of the Purân'as and other books (of this kind).' Yet to enlighten the Hindu nation as to whether or not these books—which sometimes are even called a fifth Veda—teach that religion which is contained in the *Vedas* and *Upanishads*, there would be no better method than to initiate such a system of popular education as would reopen to the native mind those ancient works, now virtually closed to it.

Though the reason given by Sâyan'a, as clearly results from a comparison of the Purân'as with the oldest works of Sanscrit literature, is but a poor justification of the origin of the former, and though it is likewise indubitable, that even at his time (the middle of the 15th C.A.D.), they were, as they still are, not merely an authoritative source of religion for 'women and S'ûdras,' but for the great majority of the males of other castes also, it nevertheless explains the great variety of matter of which the present Purân'as are composed, so great and so multifarious indeed, that, in the case of some of them, it imparts to them a kind of cyclopædical character. They became, as it seems, the source of all popular knowledge; a substitute to the masses of the nation, not only for the theological literature, but for scientific works, the study of which was gradually restricted to the leisure of the learned few. Thus, while the principal subjects taught by nearly all the P. are cosmogony, religion, including law, and the legendary matter which, to a Hindu, assumes the value of history, in some of them we meet with a description of places, which gives to them something of the character of geography; while one, the *Agni-P.*, also pretends to teach archery, medicine, rhetoric, prosody, and grammar; though it is needless to add that the teaching has no real worth.

One purpose, however, and that a paramount one, is not included in the argument by which Sâyan'a endeavored to account for the composition of the Purân'as—it is the purpose of establishing a sectarian creed. At the third phase of Hindu Religion (q. v.), two gods of the Hindu pantheon especially engrossed the religious faith of the masses, Vishn'u (q. v.) and S'iva (q. v.), each being looked upon by his worshipers as the supreme deity, to whom the other as well as the remaining gods were subordinate. Moreover, when the power or energy of these gods had been raised to the rank of a separate deity, it was the female S'akati, or energy, of S'iva, who, as Durgâ, or the consort of this god, was held in peculiar awe by a numerous host of believers. Now, apart from the general reasons mentioned before, a principal object, and probably *the* principal one of the Purân'as, was to establish, as the case might be, the supremacy of Vishn'u or S'iva, and it may be likewise assumed of the female energy of S'iva, though the worship of the latter belongs more exclusively to the class of works known as Tantras. There are, accordingly, Vaishn'ava-Purân'as, or those composed for the glory of Vishn'u, S'aiva-P., or those which extol the worship of S'iva; and one or two Purân'as, perhaps, but merely so far as a portion of them is concerned, will be more consistently assigned to the S'âkta worship, or that of Durgâ, than to that of Vishn'u or S'iva.

'The invariable form of the Purân'as,' says Professor Wilson, in his *Preface to the Vishn'u-Purân'a*, is that of a dialogue in which some person relates its contents in reply to the inquiries of another. This dialogue is interwoven with others, which are repeated as having been held, on other occasions, between different individuals, in consequence of similar questions having been asked. The immediate narrator is commonly, though not constantly, Lomaharshan a, or Romaharshan'a, the disciple of Vyâsa, who is supposed to communicate what was imparted to him by his preceptor, as he had heard it from some other sage. . . . Lomaharshan'a is called Sûta, as if it was a proper name; but it is, more correctly, a title; and Lomaharshan'a was "a Sûta," that

is, a bard or panegyrist, who was created, according to the *Vishn'u-Purân'a*, to celebrate the exploits of princes, and who, according to the *Váyu* and *Padma Purân'as*, has a right, by birth and profession, to narrate the Purân'as, in preference even to the Brahmans.'

The number of the actual Purân`as is stated to be 18, and their names, in the order given, are the following: 1. *Brahma-;* 2. *Padma-;* 3. *Vishn'u-;* 4. *S'iva-;* 5. *Bhâgavata-;* 6. *Náradîya-;* 7. *Mârkan'd'eya-;* 8. *Agni-;* 9. *Bhavishya-;* 10. *Brahma-vaivartta-;* 11. *Linga-;* 12. *Varâha-;* 13. *Skanda-;* 14. *Vámana-;* 15. *Kûrma-;* 16. *Matsya-;* 17. *Garud'a-;* and *Brahmân'da-Purân'a*. In other lists, the *Agni-P.* is omitted, and the *Vayu-P.* inserted instead of it; or the *Garud`a* and 18. *Brahmân'da* are omitted, and replaced by the *Vayu* and *Nr'isinha Purân'as*. Of these Purân'as 2, 3, 5, 6, 10, 12, 17, and probably 1, are Purân'as of the Vaishn'ava sect; 4, 8, 11, 13, 15, 16, of the S'aiva sect; 7 is, in one portion of it, called Devîmâhâtmya, the text-book of the worshipers of Durgâ; otherwise, it has little of a sectarian spirit, and would therefore neither belong to the Vaishn'ava nor to the S'aiva class; 14, as Professor Wilson observes, 'divides its homage between S'iva and Vishn`u with tolerable impartiality; it is not connected, therefore, with any sectarial principles, and may have preceded their introduction.' The *Bhavishya-P.* (9), as described by the *Matsya-P.*, would be a book of prophecies; but the *Bhavishya-P.* known to Professor Wilson consists of five books, four of which are dedicated to the gods Brahmâ, Vishn'u, S'iva, and Twashtr`i; and the same scholar doubts whether this work could have any claim to the name of a P., as its first portion is merely a transcript of the words of the first chapter of Manu, and the rest is entirely a manual of religious rights and ceremonies. There are similar grounds for doubt regarding other works of the list.

If the entire number of works, nominally, at least, corresponding with those of the native list, were taken as a whole, their contents might be so defined as to embrace the five topics specified by the commentators on the glossary of Amara-Sinha; philosophical speculation on the nature of matter and soul, individual as well as supreme; small codes of law; descriptions of places of pilgrimage; a vast ritual relating to the modern worship of the gods; numerous legends; and, exceptionally, as in the *Agni-P.*, scientific tracts. If taken, however, individually, the difference between most of them, both in style and contents, is so considerable that a general definition would become inaccurate. A short description of each P. has been given by the late professor H. H. Wilson, in his preface to his translation of the *Vishnu-P.;* and to it, as well as to the detailed account of some Purân'as in separate essays (collected in his works), we must therefore refer the reader who would wish to obtain a fuller knowledge of these works.—The age of the P., though doubtless modern, is uncertain. The *Bhâgavata*, on account of its being ascribed to the authorship of the grammarian Vopadeva, would appear to yield a safer computation of its age than the rest; for Vopadeva lived in the 12th c., or, as some hold, 13th c., after Christ; but this authorship, though probable, is not proved to a certainty. As to the other Purân'as, their age is supposed by Professor Wilson to fall within the 12th and 17th centuries of the Christian era, with the exception, though, of the *Markan`d'eya-P.*, which, in consideration of its unsectarian character, he would place in the 9th or 10th century. But it must be borne in mind that all these dates are purely conjectural and given as such by the scholar whose impressions they convey.

Besides these eighteen Purân'as or great Purân'as, there are minor or *Upapuran'as*, 'differing little in extent or subject from some of those to which the title of Purân'a is described.' Their number is given by one Purân'a as four; another, however, names the following 18: 1. *Sanatkumara-;* 2. *Narasinha-;* 3. *Naradîya-;* 4. *S'iva-;* 5. *Durvasasa-;* 6. *Kapila-;* 7. *Manava-;* 8. *Aus`anasa-;* 9. *Varun'a-;* 10. *Kalika-;* 11. *S'amba-;* 12. *Nandi-* 13. *Saura-;* 14. *Paras'ara-;* 15. *Aditya-;* 16. *Mahes'wara-;* 17. *Bhagavata-* (probably, however, a misreading for *Bhargava*); and 18. *Vas'istha-Upapuran'a*. Another list, differing from the latter, not in the number, but in the names, of the Upapurân'as, is likewise given in Professor Wilson's *Preface to the Vishn'u-Puran'a*. Many of these Upapurân'as are apparently no longer procurable, while other works so called, but not included in either list, are sometimes met with; for instance, a *Mudgala* and *Ganes`a* Upapurân'a. The character of the Upapurân'as is, like that of the Purân'as, sectarian; the *S`iva-Upapuran'a*, for instance, inculcates the worship of S'iva, the *Kalika-Upapuran`a* that of Durgâ or Devî.

Both Purân'as and Upapurânas are for a considerable portion of their contents largely indebted to the two great epic works, the *Mahabharata* (q. v.) and *Ramayan'a* (q. v.), more especially to the former of them. Of the Purâna's, the original text of three has already appeared in print: that of the *Bhagavata* in several native editions, published at Bombay, with the commentary of S`ridharaswâmin, and partly in a Paris edition by Eugène Burnouf, which remained incomplete through the premature death of that distinguished scholar; that of the *Markan`-d'eyæ-P.*, edited at Calcutta in the *Bibliotheca Indica*, by the Rev. K. M. Banerjea; and that of the *Linga-P.*, edited at Bombay; for, regarding a fourth, the *Garud`a-P.*, edited at Benares and Bombay, it seems doubtful whether that little work is the same as the P. spoken of in the native list. Besides these, small portions from the *Padma, Skanda, Bhavishyottara, Markan'd'eya*, and other Purân'as have been published in India and Europe. Of translations, we have only to name the excellent French translation by Burnouf of the first nine books of the *Bhagavata*, and the elegant translation of the whole *Vishn'u-P.*, together with valuable notes by the late Professor H. H. Wilson, which has recently been republished in his works, in a new edition, amplified with numerous notes, by Professor F. E. Hall.—For general information on the character and contents of the Purân'as, see especially Wilson's preface to his translation of the *Vishn'u-P.* (Works, vol. vi., Lond. 1864), Burnouf's preface to his edition of the *Bhagavata* (Paris, 1840), Wilson's *Analysis of the Puran'as* (Works, vol. iii. Lond. 1864, edited by Professor R. Rost), K. M. Banerjea's *Introduction to the Markan`d'eya* (Calcutta, 1862), and John Muir's *Original Sanscrit Texts on the Origin and History of the People of India*, vols. 1—5 (Lond. 1858—1871).

PU'RBECK, Isle of, a district in the south of Dorsetshire, 14 miles in length from west to east, and 7 miles in breadth, is bounded on the N. by the river Frome and Poole Harbor, on the E. and S. by the English Channel, and on the W. by the stream of Luckford Lake, which, rising in the park of Lulworth Castle, flows north, and joins the Frome. On the west, however, the water-boundary is not complete, the district being connected with the main portion of the county at East Lulworth; and the so-called Isle of P. is therefore really a peninsula. In ancient times, the Isle of P. was a royal deer-forest. See Purbeck Beds and Purbeck Marble.

PURBECK BEDS, a group of strata forming the upper members of the Oolitic Period (q. v.), and so named because they are well developed in the peninsula called the Isle of Purbeck (q. v.), south of Poole Estuary in Dorsetshire. They are, like the Wealden beds above them, chiefly fresh-water formations; but their organic remains join them more closely to the marine-formed Oolites below, than to the superior Wealden series. Though of a very limited geographical extent, the Purbeck beds have yet considerable importance, from the changes in animal life that took place during their deposition. Generally less than 200 feet in thickness, they, however, exhibit three distinct and peculiar sets of animal remains. This has caused them to be arranged into three corresponding groups, known as the Upper, Middle, and Lower Purbecks.

The Upper Purbecks are entirely fresh-water, and the strata are largely charged with the remains of shells and fish; the cases of the Entomostraca Cyprides are very abundant and characteristic. The building-stone called Purbeck Marble belongs to this division.

The Middle Purbecks record numerous changes during their deposition. The newest of the strata consists of fresh-water limestone, with the remains of Cyprides, turtles, and fish. This rests on brackish water-beds—Cyrena with layers of Corbula and Melania. Below this, there are marine strata, containing many species of sea-shells. Then follow some fresh and brackish-water limestone and shales, which again rest on the cinder-bed, a marine argillaceous deposit, containing a vast accumulation of the shells of a small oyster. This is preceded by fresh-water strata, abounding in the remains of Entomostraca, and containing some beds of cherty limestone, in which little bodies, believed to have been the spore-cases of species of Chara, have been found. At the base of this sub-group, a marine shale occurs, containing shells and impressions apparently of a large Zostera.

The Lower Purbecks begin with a series of fresh-water marls, containing Entomostraca and shells. These rest on strata of brackish-water origin; and then follows a singular old vegetable soil, containing the roots and stools of Cycads, and the stems of coniferous trees. From its black color and incoherent condition, this layer has received from the quarrymen the name of the 'Dirt-bed' (q. v.). This rests on the basement bed of the whole group; which is a fresh-water limestone, charged with Entomostraca and shells, and contains the thin layer in which Mr. Beckles has lately found the remains of several species of mammalia.

PURBECK MARBLE is an impure fresh-water limestone, containing immense numbers of the shells of Paludina, from which it derives its 'figure' when polished. It was formerly much used in the internal decoration of churches and other buildings in the southern counties of England. It is quarried in the peninsula of Purbeck, in Dorsetshire, and belongs to the upper section of the Purbeck Beds (q. v.).

PURCELL, Henry, the most eminent of English musicians, was born at Westminster in 1658, and was son of Henry Purcell, one of the gentlemen of the Chapel-royal appointed after the restoration. He lost his father at the age of six, and was indebted

for his musical training to Cook, Humphreys, and Dr. Blow. His compositions at a very early age showed evidence of talent. In 1676 he was chosen to succeed Dr. Christopher Gibbons as organist of Westminster Abbey; and in 1682 he was made organist of the Chapel-royal. He wrote numerous anthems and other compositions for the church, which were eagerly sought after for the use of the various cathedrals, and have retained their place to the present day. P.'s dramatic and chamber compositions are even more remarkable. Among the former may be mentioned his music to the *Tempest*, his songs in Dryden's *King Arthur*, his music to Howard's and Dryden's *Indian Queen*, to Urfey's *Don Quixote*, &c. A great many of his cantatas, odes, glees, catches, and rounds are yet familiar to lovers of vocal music. In 1683, he composed twelve sonatas for two violins and a bass. P. studied the Italian masters deeply, and often made reference to his obligations to them. In originality and vigor, as well as harmony and variety of expression, he far surpassed both his predecessors and his contemporaries. His church music has been collected and edited from the original MS. by Mr. Vincent Novello, in a folio work which appeared in 1826—1836, with a portrait and essay on his life and works. He died of consumption in 1695, and was buried in Westminster Abbey.

PURCHASE-SYSTEM, a highly unpopular and much misunderstood arrangement in the British army, by which a large proportion—more than half—of the first appointments of officers and their subsequent promotion used to be effected. It dates from the first formation of an English standing army, and was formally recognized in the reign of Queen Anne. The system itself was very simple. A price was fixed by regulation for each substantive rank (see PROMOTION), viz.—

	Price.	Difference.
Lieutenant-colonel	£4500	£1300
Major	3200	1400
Captain	1800	1100
Lieutenant	700	250
Cornet or Ensign	450	

When any officer holding one of these regimental commissions desired to retire from the army, he was entitled to sell his commission for the price stipulated in the above table—£4500, in the case of a lieutenant-colonel. This sum was made up by the senior major, who was willing and able to purchase, buying the rank of lieutenant-colonel for £1300; the senior captain, willing and able to purchase, buying a majority for £1400; a lieutenant purchasing his company for £1100; a cornet or ensign becoming lieutenant on payment of £250; and lastly by the sale to some young gentleman of an ensigncy or cornetcy for £450. In practice, fancy prices higher than the above were usually given, according to the popularity of a regiment, and vested interests in these over-regulation prices caused most serious complications whenever the government made any change affecting the promotion of purchase officers. The value of commissions in the Guards was also greater; but as they constitute but a few regiments, and are mostly officered from the nobility, they do not need particular description.

No commission could be purchased by one officer unless another officer vacated his commission by its sale. Death-vacancies, vacancies caused by augmenting a regiment, vacancies resulting from the promotion of colonels to be major-generals, were filled without purchase, usually by seniority. No rank above lieutenant-colonel could be purchased.

It is alleged with truth that purchase enabled the rich man to step over the head of the poorer, but perhaps better-qualified non-purchasing officer; and that money decided where merit should be the only guide. These disadvantages, however, it is replied, were not unmixed. Purchase, it is argued, introduced into the army men of a very high class in society, who gave a tone to the whole of military life. A great proportion of these wealthy men entered with the intention of merely spending a few years in the army. This tended to keep the officers young—a great advantage; and, further, provided in the country, among its gentlemen, a body of men well adapted for commands in the militia and volunteers. Moreover, selection exercised arbitrarily, as it must be when the men from whom the selection is to be made are scattered all over the world, away from the selecting power, is liable to create dissatisfaction. Under purchase, exchange was a common thing; for the rich officers, for private reasons of locality, &c., were glad to change frequently from regiment to regiment, entering in each case at the *bottom* of the list of officers of their rank in their new regiment. This, of course, was an advantage to the non-exchanging officer, as it pushed him to the top; and the first death or other non-purchase promotion then fell to him. An officer who had not purchased at all, might nevertheless sell his commission for its full value if he had served twenty years, or for a sum less than the regulated price after shorter service. This was also a spur to promotion. On the whole, though exposed to the disadvantage and annoyance of being passed over by younger officers, the non-purchasing, i. e., the poor officers benefited pecuniarily by the purchase-system. This is proved by the slow progress officers made in corps where purchase did not exist, as, for instance, in the Royal Marines.

Few would counsel the formation of a new army with such a system as purchase; but, on the other hand, it had its advantages in its working. Purchase did not exist in the artillery, engineers, marines, 19th to 21st regiments of cavalry, or 101st to 109th regiments of foot. The purchase-system was abolished by royal warrant in July 1871; and by the Regulation of the Forces Act of the same year, parliament laid down a scheme for the gradual compensation of officers who had lost their selling rights. Under that scheme, it was estimated that a sum-total amounting to about £12,000,000 would ultimately be required.

PURCHASER. See SALE.

PU'RFLED, or PURFLEWED, in Heraldry, a term used with reference to the lining, bordering, or garnishing of robes or ornamentation of armor.

PURGA'TION. See ORDEAL.

PU'RGATIVES are medicines which, within a definite and comparatively short time after exhibition, produce the evacuation of the bowels. The remedies included under this head have, however, various modifications of action, which adapt them for the fulfilment of different therapeutic application. They are divided by Pereira into five groups, viz.:

1. *Laxatives.*—A purgative is said to be laxative when it operates so mildly as merely to evacuate the intestines without occasioning any general excitement of the system, or any extraordinary increase of watery secretion from the capillaries of the alimentary canal. This group includes manna, sulphur, cassia pulp, castor oil, &c.; and purgatives of this kind are employed when we wish to evacuate the bowels with the least possible irritation, as in children and pregnant women; in persons suffering from hernia, piles, stricture or prolapsus of the rectum, &c.

2. *Saline or Cooling Purgatives*, such as sulphate of magnesia, and potassio-tartrate of soda, either in simple solution, or in the form of Seidlitz Powder (q. v.). They give rise to more watery evacuations than the members of the preceding group, and are much employed in inflammatory and febrile cases.

3. *Milder Acrid Purgatives*, such as senna, rhubarb, and aloes. They possess acrid and stimulating properties, and are intermediate in activity between the last and the next group. Senna (generally in the form of Black Draught) is employed when we want an active but not very irritant purgative. Rhubarb is especially adapted for patients when there is a want of tone in the alimentary canal. Aloes is used in torpid conditions of the large intestine; but as this drug irritates the rectum, it should be avoided in cases of piles and of pregnancy, especially if there is any threatening or miscarriage.

4. *Drastic Purgatives*, such as jalap, scammony, gamboge, croton oil, colocynth, and elaterium, when swallowed in large doses, act as irritant poisons, and are employed in medicine when the bowels have resisted the action of milder purgatives, or when we wish to exert a powerful derivative action upon the intestinal mucous membrane (as in cases of apoplexy when croton oil is commonly used), or when it is necessary to remove a large quantity of water from the system, as in dropsical affections, in which case, elaterium, from its hydragogue power, is usually employed.

5. *Mercurial Purgatives*, the chief of which are calomel, blue pill, and gray powder. They are commonly given with the view of increasing the discharge of bile, although their power in this respect has recently been denied. As their action is uncertain, they are usually combined with or followed by other purgatives. Podophyllin (q. v.) has recently been much used for the purpose of exciting bilious evacuations. Hamilton's book *On Purgative Medicines*, which was published more than half a century ago, is still the standard work on the subject of this article.

PU'RGATORY (Lat. *purgatorium*, from *purgo*, I cleanse) is the name given, in the Roman Catholic and oriental churches, to a place of purgation, in which, according to their religious system, souls after death either are purified from venial sins (*peccata venalia*), or undergo the temporal punishment which, after the guilt of mortal sin (*peccata mortalia*) has been remitted, still remains to be endured by the sinner. The ultimate eternal happiness of their souls is supposed to be secured; but they are detained for a time in a state of purgation, in order to be permitted to appear in that Presence into which nothing imperfect can enter. As there is some obscurity and much misunderstanding on this subject, we shall briefly explain the doctrine of Catholics, as collected from authentic sources, distinguishing those things which are held by them as 'of faith,' from the opinions which are freely discussed in their schools. Catholics hold as articles of their faith (1) that there is a purgatory in the sense explained above, and (2) that the souls there detained derive relief from the prayers of the faithful and from the sacrifice of the mass. The Script-

ural grounds alleged by them in support of this view are 2d Macc. xii. 43—46 (on which they rely, not merely on the supposition of its being inspired, but even as a simple historical testimony), Matt. xii. 32, 1st Cor. iii. 11—15, 1st Cor. xv. 29; as well as on certain less decisive indications contained in the language of some of the Psalms—as xxxvii. (in Auth. Vers. xxxviii.) 1, and lxv. 12. And in all these passages they argue not alone from the words themselves, but from the interpretation of them by the Fathers, as containing the doctrine of a purgatory. The direct testimonies cited by Catholic writers from the Fathers to the belief of their respective ages as to the existence of a purgatory, are very numerous.

We may instance among the Greeks: Clement of Alexandria, *Stromata*, vii. 12; Origen, *Hom.* xvi. c. 5, 6 *in Jeremiam;* vi. *Hom. in Exod.;* xiv. *Hom. in Levit.;* xxviii. *Hom. in Numb.;* Eusebius, *De Vita Constantini*, iv. 71; Athanasius, *Quæst.* xxxiv. *ad Antioch.;* Cyril of Jerusalem, *Cat. Mystag.* v. 9; Basil, *Hom. in Psalm*, v. 7; Gregory of Nazianzen, xli. *Orat. de Laude Athanasii;* Gregory of Nyssa, *Orat. de Bapt.;* as also Epiphanius, Ephrem, Theodoret, and others. Among the Latins: Tertullian, Cyprian, Arnobius, Lactantius, Hilary, Ambrose, and above all, Augustine, from whom many most decisive passages are cited; Paulinus of Nola; and Gregory the Great, in whom the doctrine is found in all the fulness of its modern detail. The epitaphs of the catacombs, too, supply Catholic controversialists with some testimonies to the belief of a purgatory, and of the value of the intercessory prayers of the living in obtaining not merely repose, but relief from suffering, for the deceased; and the liturgies of the various rites are still more decisive and circumstantial. Beyond these two points, Catholic faith, as defined by the Council of Trent, does not go; and the council expressly prohibits the popular discussion of the 'more difficult and subtle questions, and everything that tends to curiosity, or superstition, or savors of filthy lucre.' Of the further questions as to the nature of purgatory, there is one of great historical importance, inasmuch as it constitutes one of the grounds of difference between the Greek and Latin churches. As to the existence of purgatory, both these churches are agreed; and they are further agreed that it is a place of suffering; but, while the Latins commonly hold that this suffering is 'by fire,' the Greeks do not determine the manner of the suffering, but are content to regard it as 'through tribulation.' The decree of union in the Council of Florence (1439) left this point free for discussion. Equally free are the questions as to the situation of purgatory; as to the duration of the purgatorial suffering; as to the probable number of its inmates; as to whether they have, while there detained, *a certainty* of their ultimate salvation; and whether a 'particular judgment' takes place on each individual case immediately after death. See Bellarminus, *De Purgatorio;* Suaresius, *De Purgatorio;* and on the Greek portion of the subject, Leo Allatius, *De utriusque Ecclesiæ in Dogmate de Purgatorio perpetua Consensione.*

The medieval doctrine and practice regarding purgatory were among the leading grounds of the protest of the Waldenses and other sects of that age. The Reformers as a body rejected the doctrine.

What is called the 'historical' or critical view of its genesis, is well given by Neander (*Dogmengeschichte*, vol. i.). He conceives that its source is to be sought for in the ancient Persian doctrine of a purifying conflagration which was to precede the victory of Ormuz, and consume everything that was impure. From the Persians it passed with modifications to the Jews, and from them found its way into the ethical speculations of the more cultivated Christians. It harmonized admirably with the wide-spread philosophical notion borrowed by the Gnostic Christians from Neo-Platonism, that matter is inherently evil. If then the *body* was to rise, it must be purged of evil, and the instrument of purification—fire, was at hand far the purpose. Moreover, the high and pure conception of the character of God revealed in the New Testament, necessitating a corresponding moral excellence on the the part of his worshippers—'without holiness shall no man see the Lord'—must have greatly assisted in the establishment of the doctrine, for how could men, only lately gross heathens, possessing yet but the rudiments of the new faith, and with most of their heathen habits still clinging about them, be pronounced 'holy' or 'fit for the presence of God?' Their 'faith' in Christ was sufficient to save them, but the work of sanctification was incomplete when they died, and must go on. Probably it was a strong Christian feeling of this sort that determined the reception of the doctrine of purgatory into the creed of the Catholic church rather than any Gnostic philosophisings, though the Neo-Platonic divines of Alexandria are the first to mention it.

Protestants generally reply to the arguments of Roman Catholics on the subject of purgatory, by refusing to admit the authority of tradition or the testimonies of the Fathers, and at the same time by alleging that most—if not all—of the passages quoted from the Fathers, as in favor of purgatory, are insufficient to prove that they held any such doctrine as that now held by the Roman Catholic Church, some of them properly relating only to the subject of prayer for the dead, and others to the doctrine of Limbus (q. v.). That the doctrine of purgatory is the fair development of that which maintains that prayer ought to be made for the dead, Protestants generally acknowledge, but refuse to admit that the Fathers carried out their views to any such consequence. As to the alleged evidences from Scripture, they are commonly set aside by Protestants as merely ridiculous. The much vaunted argument from the second book of Maccabees, is of course contemned, as being from an apocryphal book, and not one of the best books of the Apocrypha; besides, that the passage relates to nothing more than prayer for the dead. The text Matt. xii. 32, is explained as relating to the final judgment; and 1 Cor. iii. 11—15, as relating to a trial of *works*, and not of persons; whilst 1 Cor. xv. 29 is regarded as having nothing more to do with the subject than any verse taken at random from any part of the Bible.

PURGING NUT. See PHYSIC NUT.

PURIFICA'TION, in a Biblical sense, is the act through which an individual became fit to approach the Deity, or to mix freely in the community, in cases where a certain bodily or other disability had kept him out of the pale of the latter. The purification consisted chiefly in expiations, ablutions, sometimes accompanied by special sacrifices. Priests and Levites were consecrated for the Divine service by 'purification;' proselytes had to undergo it at baptism; and special religious acts could only be performed by those who had 'bathed their bodies.' Generally, no one was allowed to enter the Temple or synagogue without having washed or 'sanctified' himself; and in the post-exilian period, bathing was considered (chiefly by the Pharisees and Essenes) as one of the chief duties of piety. In general, the Mosaic Law distinguishes between 'clean' and 'unclean' persons as well as things, calling 'unclean' all that with which an Israelite is not to come in contact. It has been erroneously assumed that all the Levitical laws of purity and purification have a physical or medical reason—that is, that infection was to be prevented through them; but this can only have been the case in some instances. At the same time we cannot deny that we are at a loss for the general principle on which they were based. There can be no doubt that cleanness, like every other virtue, if not enforced on religious grounds, would have had few devotees in those days, and among an eastern people; while, again, a hot climate requires a much greater attention to outward purity than more temperate zones. Compared with the Indian and Persian laws in this respect, the Jewish ones seem much less minute and harassing. For the purification from the severer kinds of uncleanness, a certain 'water of uncleanness' (Lev. xv.) was prepared; and the different acts to be performed for the readmission of the leper into the community (Lev. xiv. 4—32), show plainly that his was considered the last stage of impurity. Identical with the first stage of the leper's purification are the ceremonies to be performed in the case of infected houses and garments. The sixth Seder of the Mishnah, in 11 treatises (there is no Gemara to this portion, except to Niddah), contains the most detailed regulations (as fixed by tradition) on this point. The washing of hands, we may add in conclusion, was in later times considered ritually necessary, in accordance with the Talmudical maxim, that 'every table should properly be sanctified into an altar.' See UNCLEANNESS.

All the Jewish ceremonial purifications are commonly regarded by Christian theologians as emblematic of the necessity of holiness in the people of the Lord, and particularly in all acts of worship.

PURIFICATION OF THE BLESSED VIRGIN MARY, FEAST OF, a festival in commemoration of the 'purification' of the Blessed Virgin Mary, in accordance with the ceremonial law of Lev. xii. 2. This ceremony was appointed for the fortieth day after childbirth, which, reckoning from December 25 (the Nativity of our Lord), falls upon February 2, on which day the purification is celebrated. The history of Mary's compliance with the law is related in Luke ii. 22—24; and on the same occasion she complied also with the law of Numb. xviii. 15, by the offering prescribed in redemption of the first-born, the festival is also called by the name of the 'Presentation of the Child Jesus,' or the 'Feast of Simeon,' and sometimes, also, 'of the Meeting' (*occursus*), in allusion to Simeon's meeting the Virgin mother, and taking the child into his arms (Luke ii. 25). The date of the introduction of this festival is uncertain. The first clear trace of it is about the middle of the 5th c., during the reign of Marcia, and in the Church of Jerusalem. Its introduction in the Roman Church in 494, was made, by Pope Gelasius, the occasion of transferring to a Christian use the festivities which at that season were annexed to the pagan festival of the Lupercalia.

PU'RITANS, a name first given, according to Fuller, in 1564, and according to Strype, in 1569, to those clergymen of the Church of England who refused to conform to its liturgy, ceremonies, and discipline as arranged by Archbishop Parker and

his Episcopal coadjutors. But in point of fact, the Puritan tendency in the Church of England is as old as the church itself; and to seek for its true origin we must go back to the period of Cranmer, who, when laying the foundations of English Protestantism in a nation only half-prepared for the change, found it necessary to make concessions to the older religion, and to build the new church on an elaborate system of compromise. This feature of 'Anglicanism'—its essential *broad-churchism*—gave great offence to the stricter and more doctrinal of the English reformers, who neither cared nor were competent to look at the thing from a statesman's point of view. The reign of Edward VI., brief though it was, showed quite clearly that if the party in the English Church who had acquired not only their theology, but their opinions of church-government from Calvin, ever got the upper hand, they would not stop till they had reconstructed, on a much simpler basis, the whole ecclesiastical fabric. The reaction under Mary drove most of them to seek safety in exile on the continent. It was here the first definite step in the history of Puritanism was taken. A number of the exiles resident at Frankfurt determined to adopt the Genevan service-book in preference to that appointed by King Edward, and though their attempt proved a failure, partly on account of the opposition of others of the exiles, yet it showed the pertinacity with which they tried to carry their convictions into practice. On their return to England, after the accession of Elizabeth, the struggle was renewed. But the virile queen would not tolerate their notions, and during her whole reign, punished in the most stringent style all who refused to obey the Episcopal ordinances.

The position assumed by the P. was that the liturgy, ceremonies, and discipline of the Church of England required further reformation; that the church, as then constituted, did not separate itself markedly enough from Roman Catholicism; and that it was desirable, in the interests of religion, to abandon everything that could boast of no other authority than tradition or the will of man, and to follow as far as possible the 'pure' word of God. Hence their name, which was probably given in derision. In spite of the sharpest repressive measures, their principles gradually spread among the serious portion of the laity, who were also called Puritans. But the name appears not to have been confined to those who wished for certain radical changes in the forms of the church. The character that generally accompanied this wish led naturally enough to a wider use of the term; hence, according to Sylvester, 'the vicious multitude of the ungodly called all Puritans that were strict and serious in a holy life, were they ever so conformable.' This is the sense in which the Elizabethan dramatists use the word. From this very breadth of usage, one sees that there were different degrees of Puritanism. Some would have been content with a moderate reform in the rites, discipline, and liturgy of the church; others (like Cartwright of Cambridge) wished to abolish Episcopacy altogether, and to substitute Presbyterianism; while a third party, the Brownists or Independents (q. v.), were out-and-out dissenters, opposed alike to Presbyterianism and Episcopacy.

During the reigns of James I. and Charles I., the spirit of Puritanism continued more and more to leaven English society and the English parliament, although the most violent efforts were made by both monarchs to extirpate it. The tyrannical proceedings of Laud and of the Laudian bishops, and the outrages practised by Charles on the English constitution, led many who were not at all Genevan in their ideas to oppose both church and king for the sake of the national liberties. Hume distinguishes three kinds of P.: 1. The *Political P.*, who disliked the bishops, not so much on ecclesiastical grounds, as on account of their servility towards the king, and their priestly antipathy to civil liberty; 2. The *P. in Church Discipline*, who were for the most part in favor of Presbyterianism; 3. The *Doctrinal P.*, who were strong Calvinists on such points as predestination, free-will, grace, &c., but were not opposed to Episcopacy or to the ecclesiastical authority of the monarch, and who contented themselves with assailing the Arminianism that was encouraged at court. The attitude of this third class was certainly anomalous, and it is not wonderful that they exercised so little influence or control on the march of events in the great civil struggle. The second class was by far the most numerous—at least among the clergy; and at first it seemed as if the clergy were going to have things all their own way. For example, in the memorable 'Westminster Assembly of Divines' (1643), the great majority of the ministers were Presbyterians, and their *Confession of Faith* is quite Presbyterian in spirit. But genius, energy—the arms of victory—belonged to the more advanced P., who were predominant in the army and the parliament, and ultimately triumphed in the person of Cromwell (q. v.).

But the Restoration (1660) brought back Episcopacy, and the Act of Uniformity (1662) threw the P. of the church into the position of dissenters. Their subsequent history is treated under the different forms of dissent. Before the civil war broke out, so great were the hardships to which the P. were exposed, that many of them emigrated to America, to seek liberty and peace on the solitary shores of the New World. There they became the founders of the New England States, and cultivated unmolested that form of Christianity to which they were attached. Nowhere did the spirit of Puritanism in its evil as well as its good more thoroughly express itself than in Massachusetts and Rhode Island; nor have its traces wholly disappeared even yet. In Scotland, Puritanism, in the shape of Presbyterianism, was from the first the established religion; hence it does not present itself to us in that country as a struggling, suffering, antagonistic, and protesting force; nor, in point of fact, was the name of P. ever given even to the extremest sect of Covenanters.—See Neale's *History of the Puritans;* Price's *History of Nonconformity;* Macaulay's *History of England;* and *Dr. Stoughton's Works.*

PURL, a beverage now little used except among the lower classes in and around London. It is made by warming a pint of ale with a quarter of a pint of milk, and adding some sugar and a wine-glassful of gin, rum, or brandy.

PU'RLINS, pieces of timber used in framed roofs, between the principals, for the support of the common rafters.

PU'RMEREND, a flourishing little town in North Holland, 10 miles north of Amsterdam, and on the line of the great canal from that city to the North Sea. Pop. (1880) 5000. It has a large trade in cheese, butter, eggs, cattle, and wood, upwards of 1,500,000 lbs. of cheese being annually sold in the market. In the neighborhood of P. are to be found the richest meadows, the finest cattle, the neatest farmhouses, and the most perfect dairies and cow-stables. P. has also a considerable shipping trade, and imports timber. The town, which has sprung up under the protection of the castle of Purmerstein (built at the beginning of the 15th c.), derives its name from being situated at the end of the Purmer, formerly a sheet of water, by drainage made a fertile tract of land containing 6701 acres.

PU'RNEAH, a large town of British India, capital of an extensive and populous district of the same name in the presidency of Bengal, on the north bank of the Ganges, stands on both banks of the Little Kosi river, 230 miles north-north-west of Calcutta. It covers a considerable area, but it is not compactly built, there being numerous plantations, gardens, and other open places within the boundaries. Around the town are numerous straggling villages. A considerable quantity of indigo is grown in the vicinity. The civic establishment consists for the most part of Europeans. Pop. (1872) of town, 16,057; of district, 1,714,795.

PURPLE OF CASSIUS, or GOLD PURPLE, a beautiful coloring material of a vitreous character, which was made known in Germany in the 17th c. by an artist named Andrew Cassius, whose father was secretary of the Duke of Schleswig. Its property is to give a beautiful ruby red to glass, and it was therefore, and still is, employed to make imitation rubies. It is made by combining one part of neutral chloride of gold with a mixture of one part of protochloride and two parts of perchloride of tin, all in solution. When mixed together, a beautiful purple precipitate is the result, which is the Purple of Cassius. The French recipe, which is said to be the best, is 10 parts of acid chloride of gold dissolved in 2000 parts of distilled water. To this add a solution, carefully prepared, in another vessel, of 10 parts of pure tin in 20 parts of muriatic acid diluted with 1000 parts of water. On mixing the two, the purple precipitate is thrown down, and is separated by filtering and decantation.

PURPLE COLORS. Painters in oil and water colors produce the various shades of purple by the admixture of pure red and pure blue colors. Dyers obtain this color from various sources, all of which are curious and interesting. From a very early period, purple has been one of the most highly prized of all colors, and came to be the symbol of imperial power. Probably one great reason for this was the enormous cost of the only purple color known to the ancients, the Tyrian purple, which was obtained in minute quantities only from a Mediterranean species of molluscous animal or shell-fish, the *Murex trunculus*, and perhaps also *Purpura lapillus*. In the time of Cicero, wool double-dyed with this color was called *dibapha*, and was so excessively dear, that a single pound-weight cost a thousand denarii, or about £35 sterling. A single murex only yields a small drop of the secretion, consequently very large numbers had to be taken in order to obtain enough to dye even a small amount of wool. Tarentum, the modern Otranto, was one of the great murex fisheries of the Romans, and there they have a number of large dyeing establishments. Vast heaps of the shells have been discovered there, the remains of its former industry. With the decline of the Roman empire, the employment of this purple color ceased, and it was not until a Florentine of the name of Orchillini discovered the dyeing properties of the lichen now called Orchella Weed, that a simple purple color was known in Europe. The discovery was kept secret in Italy for nearly a century, and that country supplied the rest of Europe with the prepared dye, which received the name

of Orchil or Archil (q. v.). The color was very fugitive, and soon ceased to be used by itself; it, however, was found very useful in combination, and has a remarkable power of brightening up other colors. Many improvements have been lately made in archil dyeing, especially in fixing it. Its value, however, has been greatly lessened by the discovery of the beautiful series of purples yielded by coal-tar as results of the combination of one of its products called aniline with other bodies. See DYEING.

PURPLE EMPEROR (*Apatura Iris* or *Nymphalis Iris*), one of the largest of British butterflies, and one of the most richly col-



Purple Emperor (larva and pupa shown below).

ored. The expanse of wings is from 2¼ to 3¼ inches. The wings are strong and thick, and the flight more sustained than that of many butterflies. The P. E. is very often to be seen about the tops of oak trees.

PURPLE WOOD, or PURPLE HEART, the heart-wood of *Copaifera pubiflora* and *C. bracteata*, a very handsome wood of a rich plum color. The trees producing it are natives of British Guiana, where the wood is called generally *Mariwayana*. The trees are rather rare on the coast, but in the upland forests are common. The chief interest of the wood is its remarkable adaptation to the purposes of artillery and fire-arms. It is said no wood is better adapted for mortar-beds and gun-carriages, as it sustains better than any other the violent concussions to which they are subjected. Its chief use in this country has been for making ramrods for muskets. Its great beauty and smooth grain would insure its extensive employment in cabinet-work in this country, if it were better known.

PURPLES. See EAR-COCKLES.

PU'RPURA, a genus of gasteropodous molluscs, of the family *Buccinidæ*. The species are very similar to those of the genus *Buccinum* (see WHELK), but have a less elongated shell, and a flattened columella, which is pointed at the base, and forms there, with the outer lip, a canal excavated as a notch in the shell, and not projecting. The species are numerous, mostly natives of the shores of warm climates. *P. lapillus* is a species pretty common on most parts of the British coast. It is smooth and whitish, with bands of reddish-brown, and sometimes two inches long. It feeds on mussels and other molluscs, boring their shells with its proboscis. The genus is interesting, because some species of it were amongst those which yielded the famous *Tyrian purple* of the ancients. *P. patula* is supposed to have been one of those from which this dye was obtained, but it may have been obtained from others, as *P. lapillus*. The dye is contained in a small vein-like sac near the head. See PURPLE COLORS.

PURPURA, or THE PURPLES, is a malady which is often erroneously placed amongst the diseases of the skin. It is in reality a blood disease, and is characterized by the appearance of small round spots, of deep purple color, which are seen first and most abundantly on the legs, and afterwards extend to the arms and trunk. They are accompanied by no local pain, are not effaced by pressure (being due to a drop of blood extravasated beneath the cuticle, or in the structure of the skin itself), do not rise above the surrounding surface, and are sometimes intermixed with livid patches resembling bruises, and, before disappearing, both the round spots and the patches undergo the same change of color which a bruise undergoes. These spots are not peculiar to the skin, but occasionally occur upon internal surfaces, and in the tissues of viscera. Passive hæmorrhages from the mucous membranes frequently accompany the external systems. There is usually much debility, and often a great tendency to faintness. The duration of the disease varies from a few days to a year or more. Slight cases are devoid of danger, and even the hæmorrhagic cases usually recover, unless the bleeding has been excessive, or the blood has been extravasated into a vital organ.

The causes of this disease are obscure. The mode of treatment varies in different cases, but the main indication always is to correct the condition of the blood. When there is reason to believe that the disease is dependent upon depressing influences, a nutritious diet, tonics, and stimulants are required; and chalybeates, or the mineral acids, and quinine, with plenty of exercise in the open air, should be prescribed. When, however, there is no evidence of the operation of any debilitating cause, and the pulse is hard, the most efficient treatment consists in abstinence, venesection, and purgatives. In cases of a mixed nature, a mixture of the oil of turpentine and castor-oil, in free doses (2 drachms of the former to 5 or 6 drachms of the latter), and iced drinks, or the sucking of small pieces of ice, have been strongly recommended. If the hæmorrhage is not stopped by the oil of turpentine, gallic acid, or acetate of lead and opium, must be prescribed; and if it proceeds from accessible parts, local measures, such as the employment of ice or strong astringents, should also be employed.

PU'RPURE, in Heraldry, the color purple expressed in engravings by lines in bend sinister. It is of unfrequent occurrence in British heraldry.

PU'RPURINE. See MADDER.

PURRE. See DUNLIN.

PURSE-CRAB (*Birgus*), a genus of *Crustacea*, of the order *Decapoda*, and suborder *Anomoura* (see CRAB), allied to Hermit-crabs (q. v.), but having the abdomen or *tail* shorter and almost orbicular, its under surface soft and membranous, its upper surface covered with strong plates, which overlap one another as in lobsters. The first pair of legs have large and powerful pincers; the pair of legs nearest the abdomen are very small, but terminated by rudimentary pincers; the pair next to them larger, with small pincers; the second and third pair of legs are terminated by a single nail. A species of P. (*B. latro*) is found in Mauritius and in the more eastern islands of the Indian Ocean. It is one of the largest of crustaceans, sometimes two or three feet in length when fully stretched out, and capable of erecting itself to the height of a foot from the ground, which it readily does if irritated, retreating backward, and exhibiting to the utmost its powers of offence or defence. It is of a yellowish-brown color, its limbs covered with little blackish projections.

It is never found far from the sea, to which it is said to pay visits, in order to moisten its gills; but it resides on land, and often in holes under the roots of trees, where it accumulates great quantities of the fibres of the cocoa-nut husk, as if to keep itself warm, or for a soft bed. The Malays rob these stores to supply themselves with junk. The gills of the P. are contained in a very large cavity, of which they fill only a very small part. Its food consists of cocoa-nuts and other nuts, which it climbs trees to procure. Its manner of dealing with a cocoa-nut is described as exhibiting a remarkable instinct, as it always begins to tear off the husk at the end where the *eyes* are. It is variously stated that it makes a hole through the eye from which the nut would germinate, and then scoops out the nut with the small pincers of its fourth pair of legs; and that having made this hole, it seizes the nut by one of its great pincers, and breaks it against a stone. Both statements may perhaps be true.

PU'RSER, in the Royal Navy, was formerly a warrant, and subsequently a commissioned officer, in charge of the provision, clothing, pay, and necessaries of a ship-of-war. His title was changed in 1844 to that of Paymaster (q. v.).

PU'RSLANE (*Portulaca*), a genus of plants of the natural order *Portulaceæ*, having a bifid calyx, 4 or six petals, 8 or 16 stamens, and a capsule dividing around the middle. COMMON P. (*P. oleracea*) grows in cultivated and waste grounds on the sea-shore, in almost all tropical and subtropical parts of the world. It is cultivated as a pot-herb. It is a short-lived annual, with spreading and rather procumbent stems, and obovate fleshy leaves, which, as well as the young shoots, are frequently used in salads. The young and tender shoots are pickled in France like gherkins. P. is not so common in British gardens as it once was.

PU'RSUIVANT (Fr. *poursuivant*, follower), the third and lowest order of heraldic officers. The office was instituted as a novitiate, or state of probation through which the offices of herald and king-at-arms were ordinarily to be attained, though it has been held that a herald or king-at-arms may be made *per saltum*. There are four pursuivants belonging to the English College of Arms: *Rouge Croix*, the oldest, so named from the Cross of St. George; *Blue-mantle*, instituted either by Edward III. or Henry V., and named in allusion to the robes of the Order of the Garter, or perhaps to the color of the arms of France; *Rouge Dragon*, deriving his title from King Henry VII.'s dexter supporter, a red dragon, assumed in allusion to his descent from Cadwaladyr; and *Portcullis*, named from a badge of the same monarch. There are three pursuivants in the heraldic establishment of Scotland, known by the names of *Bute*, *Carrick*, and *Unicorn*—titles which,

as well as those of the heralds, seem to have originated in the reign of James III. The Scottish pursuivants take precedence according to seniority in office.

In ancient times any great nobleman might institute his own pursuivant with his own hands and by his single authority. The Dukes of Norfolk had a pursuivant, called *Blanch-lyon*, from the white lion in their arms; the pursuivant of the Dukes of Northumberland was styled *Espérance*, from the Percy motto; and Richard Nevil, Earl of Salisbury, had a pursuivant called *Egle vert*. We even find Sir John Lisle, in 1442, making Thomas de Launey his pursuivant, by the title of *Blanch Sanglier*. The ancient costume of a pursuivant of the king was a surcoat, embroidered with the royal arms, and worn with one sleeve hanging down in front, and another behind. In 1576, Rouge Croix was severely censured for wearing his coat as a herald. In later times, however, a pursuivant's coat is worn exactly as a herald's, the latter officer being distinguished by the collar of SS.

PURURAVAS, a celebrated legendary king of ancient India. According to tradition, he was a son of the planet Budha, or Mercur, by Ilâ—a name of the earth, a prince renowned for liberality, devotion, magnificence, truthfulness, and personal beauty; but still more so on account of his love for the Apsaras Urvas'î. This heavenly nymph having incurred the imprecation of some gods, and therefore having been compelled to descend from heaven, saw P., and was seen by him. The king having, in consequence, fallen in love with Urvas'î, she consented to return his affection, on the condition that he would never suffer two rams, which she loved as children, and always kept near her bedside, to be carried away from her, and also that he should never be seen by her undressed. To these terms the king gave his assent; but the Gandharvas, the choristers in Indra's heaven, and the husbands of the Apsarasas, being jealous of P., instigated one of their tribe to carry away one of the rams during the night; and after he had accomplished their design, other Gandharvas came and stole the second ram. Upon this P., highly incensed, and trusting that the nymph would not see his person, as it was dark, rose in pursuit of the robbers. At that moment, however, the Gandharvas caused a flash of lightning to irradiate the scene, and Urvas'î beheld the king undressed. The compact was violated, and Urvas'î disappeared, while the Gandharvas, abandoning the rams, departed to the sky. P. recovered the animals, but could find Urvas'î nowhere. Like one insane, the king now wandered over the world, until he saw her, at Kurukshetra, sporting with four other nymphs of heaven in a lake beautified with lotuses. Urvas'î, however, told him to keep away from her until, at the end of the year, she should be delivered of the son with whom she was pregnant by him. He obeyed; and after Ayus was born, these annual interviews between P. and Urvas'î were repeated, until she had born him five other sons—Dhimat, Amâvasu, Vis'wavasu, S'atayus, and S'rutayus. But the king, now longing for an uninterrupted re-union with his wife, Urvas'i endeavored to propitiate the Gandharvas who had caused their separation.

Her efforts were successful; and they taught the king how to produce by attrition, from the wood of the fig-tree, a sacrificial fire, and how to divide it into the three fires required for sacrificial acts. By this means, they enabled him then to celebrate many sacrifices, and, by virtue of these, to be transferred to the sphere where Gandharvas and Apsarasas dwell together. This legend is adverted to in the Vedas, and related with more or less detail in the *Mahabharata* and the *Puran'as* (see, for instance, Wilson's *Vishn'u Puran'a*); it is likewise the subject of the celebrated drama of Kâlidâsa, the *Vikramoras'i*, where, however, the incidents that, according to the *Puran'as*, cause the separation of P. and Urvas'i, are not mentioned by the poet, her disappearance being ascribed by him to a fit of jealousy, in which she trespassed on the proscribed bounds of a divine hermitage. It deserves notice, too, that, in the drama, Urvas'i is transformed into a creeper, and discovered in that condition by P., when franticly roaming in search of her in the forest of Akalusha—a transformation pointing to some affinity between this latter myth and that of Daphne when pursued by Apollo.—The idea, however, on which the original Hindu myth is based—apart from the semi-historical and fanatastical detail by which it was overgrown—seems to have been suggested by the (supposed) motion or wanderings (Purûravas, from *puru*, much, and *ravas*, going—from *ru*, go, move) of the sun (*Gandharva*, in the Vedas, also being a personification of the fire of the sun), attracting or absorbing, and thus uniting, as it were, with the vapors floating in the sky (*Apsaras*—from *ap*, water, and *saras*, going, arising, hence 'water-born'—being originally 'personifications of the vapors which are attracted by the sun, and form into mists or clouds;' see Goldstücker's *Sanskrit Dictionary*, under 'Apsaras;' and Urvas'i, from *uru*, large, wide, and *as*, pervade, hence 'the far-prevading'—being identified in one passage of the *Mahabharata* with the river Ganges).

PURVEYORS, ARMY, were officers charged with superintending the civil affairs of army hospitals, as the payment of men, procuring provisions, medical comforts, bedding, &c. In 1868, the department was merged with others in the Control Department; and on the abolition of the latter in 1875, its functions passed to the Commissariat and Transport Department.

PUS is a well-known product of inflammation, and occurs as a thick yellow creamy fluid, differing from all other morbid exudations in containing a large number of corpuscles, having a soft and fatty feeling when rubbed between the fingers, a peculiar odor, usually an alkaline reaction, and a specific gravity of about 1·032. Like the blood, it consists of certain definite microscopic elements, and of an intercellular fluid or serum in which they swim.

The microscopic elements are: 1. The pus-corpuscles, which, both in their microscopical and chemical relations, seem to be identical with the lymph-corpuscles, or colorless blood-cells; in diameter, they range from 0·004 to 0·005 of a line, and each corpuscle consists of a cell-wall, which often appears granular, of viscid transparent contents, and of a nucleus which is adherent to the cell-wall, and which can be rendered much more apparent by the addition of acetic acid. 2. Molecular granules, and 3, Fat-globules. The serum of pus is perfectly clear, of a slightly yellow color, and coagulates on heating into a thick white mass.

The chemical constituents of P. are water (varying from 769 to 907 in 1000 parts), albumen (from 44 to 180); fats (from 9 to 25); extractive matter (from 19 to 29); and inorganic salts (from 6 to 13); in addition to which, mucin, pyin, glycin, urea, &c., are occasionally present. Of the inorganic or mineral constituents, the soluble salts are to the insoluble in the ratio of 8 to 1, and the chloride of sodium (the chief of the soluble salts) is three times as abundant as in the serum of the blood. The mode of formation of pus is described in the article SUPPURATION.

PUSEY, REV. EDWARD BOUVERIE, D.D., Regius Professor of Hebrew at Oxford, and Canon of Christ-church, a celebrated English divine, and one of the chief promoters of the High Church movement in the Church of England. He is the second son of the Honorable Philip Bouverie (younger brother of the first Earl of Radnor, who assumed the name of P.), by Lady Lucy Sherard eldest daughter of Robert, fourth Earl of Harborough. He was born in the year 1800, was educated at Eaton, and thence proceeded to Christ-church, where he obtained a first class in Classics in 1822, and gained the university prize for a Latin Essay in 1824. He was afterwards elected Fellow of Oriel; and in 1828, succeeded Dr. Nicoll in the Regius Professorship of Hebrew, to which a canonry at Christ-church is annexed.

Dr. P.'s first publication was on the *State of Religion in Germany*, the result of a visit to that country, which appears to have greatly influenced his subsequent course, and led him to devote himself to resist the progress of Rationalism. In 1835, he became a contributor to the *Tracts for the Times* (in union with Messrs. J. H. Newman, Keble, Williams, &c.), of which Nos. 67, 69, *On Holy Baptism*, and Nos. 18 and 66, *On the Benefit of Fasting*, were written by him (see TRACTARIANISM). He was also one of the editors of the *Library of the Fathers*, and of the *Library of Anglo-Catholic Theology*. In consequence of a sermon on *The Holy Eucharist, a Comfort to the Penitent*, preached before the university in 1843, he was suspended from preaching by the Vice-chancellor for three years, on the allegation that his language on the subject of the Real Presence was beyond what is sanctioned by the Formularies of the Church of England. Dr. P., however, protested against the proceeding, and appealed to the teaching of English divines.

His other principal works are: *Remarks on the Benefits of Cathedral Institutions;* two treatises on the *Royal Supremacy in Spiritual Matters;* a treatise on the *Ancient Doctrine of the Real Presence; Letters to the Archbishop of Canterbury, the* (late) *Bishop of Oxford, and the* (late) *Bishop of London, in Defence of Church Principles; On Marriage with a Deceased Wife's Sister; On the Use of Private Confession in the English Church;* Translations of several foreign devotional works adapted to the use of the English Church; *History of the Councils of the Church;* a *Commentary on the Minor Prophets; Lectures on the Prophet Daniel;* a *Catalogue of Arabic MSS. in the Bodleian Library;* and numerous sermons. P. was for more than half a century one of the chief powers in the church of England and in English religious life, being regarded by some as a reformer, and by others as the heresiarch. He died 16th Sept. 1882. Puseyism was long the more usual name for the Tractarian movement (see TRACTARIANISM), and Puseyite was used even by Ritualists (see RITUALISM), though P. had little personal sympathy with this outcome of the Tractarian tendency.

PUSHKIN, ALEXANDER SERGEJEVITCH, a Russian poet of good family, was born at Moscow, 26th May 1799, and educated at the imperial lyceum of Tsarskoe Selo, where he acquired more reputation for his liberal opinions than for his attention to study. In 1817, he entered the service of government, and soon became

one of the most prominent figures in fashionable society. In 1820, he published a popular romantic poem, *Ruslan and Liudmila*. Next came his *Prisoner of the Caucasus*, 1822; and his *Fountain of Bakhtchiserai* (1824); *Tzigani* (The Gipsies, 1827); and *Eugeni Onegin* (1828, Eng. transl. 1881), a humorously sarcastic description of Russian society—after the fashion of Byron's *Beppo*. In 1829, he published *Pultava*, which has Mazeppa for its hero. About the same time, he wrote a dramatic poem entitled *Boris Godunov*, one of the best of all his works; but subsequent to this he appears to have addicted himself almost wholly to prose; and from being or seeming an enthusiastic 'liberal,' he passed—after his appointment to the office of imperial historiographer, with a pension of 6000 rubles—to the extreme of Russian conservatism. He was mortally wounded in a duel, and expired at St. Petersburg, January 29 (February 10), 1837. P. is reckoned the finest poet that Russia has produced in the present century. His countrymen call him the 'Russian Byron,' and he has not a little of the bold and brilliant genius of his prototype, excelling like him in vigor of imagery and impassioned sentiment.

PU'STULAR DISEASES. Under this head are included the cutaneous diseases which are characterized by *pustules*, or circumscribed elevations of the cuticle, containing pus; they are Ecthyma, Impetigo, Acne, and Sycosis, all of which are noticed in special articles. Pustules also occur in small-pox, and occasionally in chicken-pox, but these are on good grounds regarded as febrile diseases, in which the eruption on the skin is not the primary disorder. Boils (q. v.), although not included under the head of 'pustular diseases,' are in their nature pustular.

PUSTULE, MALIGNANT. See MALIGNANT PUSTULE.

PU'TCHUK, an aromatic root, a considerable article of commerce in India, where it is used both as a perfume and as a medicine, and of export to China, where it is much used for incense, as it gives out a very pleasant odor when burned. It appears to be the *Costus* (q. v.) of the ancients.

PUTEAUX, a town of France, in the dep. of Seine, at a distance of about two miles from the western boundary of Paris. It is situated on the left bank of the Seine, opposite to the Bois de Boulogne. The situation of P. is a very pleasant one, and many Parisians have fine villas here. The population and industrial activity of the place have of late greatly increased. Pop. (1876) 11,387.

PU'TLOGS, small timbers used in the construction of buildings. They lie between the wall and the poles of the scaffolding, and on them the floor of the scaffolding rests. Apertures called 'putlog-holes' are common in buildings of all ages.

PUTREFACTION is the term applied to the decomposition of organic substances, when such decomposition is accompanied by an offensive odor. In other respects it is identical with Fermentation (q. v.). In the process of putrefaction the organic compounds break up, producing others of lower order, inorganic compounds, and even simple elements. It may be prevented by exclusion of oxygen and moisture, by maintaining a freezing or boiling temperature, by the use of antiseptic substances, &c.

Putrefaction was long believed to be *spontaneous*—i. e., to depend upon the supposed peculiar instability of organic matter and its affinity for oxygen. In all cases, however, certain organic ferments, the schizomycete fungi known as Bacteria (q. v.)—excessively minute, non-nucleated rods or spheres of protoplasm, inclosed in a cellulose envelope, and multiplying rapidly by transverse division—are found in enormous quantity. That their presence is not merely a concomitant, but the exclusive cause of the putrefactive process, is readily demonstrated by experiment. If we take an extremely putrescible fluid, such as infusion of fish or hay, and cork it up, it soon becomes turbid with bacteria, and acquires a characteristic odor; but if plugged with cotton wool, and boiled for a few minutes, so as to kill the bacteria and their germs present in the flask and its stopper, it may then be put aside for any number of years without a symptom of putrefaction; but if the plug be then removed, even for a second or two, in the air of an ordinary room and then replaced, germs enter, develop, and multiply, and decomposition immediately sets in. This explains how the minutest taint of decomposing matter is able to set up putrefaction on the largest scale; since it contains living bacteria, which multiply with incredible rapidity, at the expense of the organic matter which they decompose. If the protoplasm of the bacteria be coagulated by heat, or poisoned by the application of anti-septics, no such inoculation can be effected, hence the putrefactive power is restricted to the living ferment, and does not exist in the products of its life. Hence the paradox, 'putrefaction is not the result of death, but of life.'

We are still far from fully understanding the chemistry of the putrefactive disintegration of organic compounds. Probably the bacteria act, in the first place, by removing oxygen and by causing the assimilation of water.

Numerous forms and varieties of bacteria exist in nature, and each doubtless differs in its physiological activities. Many are known to enter the blood, causing definite diseases, splenic fever, phthisis, &c., while others poison wounds. The practice of medicine, and still more of surgery, has of late years been revolutionized through this knowledge, as well as has the art of brewing; and our notions of hygiene, as well as of domestic and civic cleanliness, are consequently in process of rapid change. See ANTISEPTICS, GERM THEORY, &c.

PUTTEEALA (*Patiála*), a native state in the Punjab, partly in the plain south of the Sutlej, partly amongst the hills near Simla. Pop. 1,586,000. P., the capital, is a walled town.

PUTRID FEVER. See JAIL FEVER.

PUTTING TO SILENCE, in the Law of Scotland, is the title of a suit or action of declarator, the object of which is to put an end to certain pretended claims of marriage. The suit corresponds to what is called in England a suit of Jactitation (q. v.).

PUTTU'N, PATTAN, or ANHULWAR PATTAN, a town of India, in the territory of the Guicowar, Guzerat, 64 miles north-west from Allahabad. It stands on the Saraswati, a small river, which is a tributary of the Banas; and is a town of considerable importance, having manufactures of swords, spears, pottery of a light fine kind, and silk and cotton goods. P. occupies part of the site of the ancient city of Anhulwara, the traces of the walls of which may still be seen, extending to about five miles in circuit. Pop. estimated at 30,000.

PU'TTY a composition of *whiting* and *drying* oil worked into a thick paste. It is used by painters and glaziers—by the former for filling up holes in surfaces, previous to their being painted with oil-colors; and by the latter, for fixing panes of glass in windows, &c. It becomes remarkably hard in time, and fixes the glass immovably.

PUTTY-POWDER, a material, consisting of peroxide of tin, in great use for polishing stone and metal work. It is also used as a coloring material for white glass, and for the white enamels of porcelain, &c. It is made by melting tin; as the surface oxidizes, the scum, which is the peroxide, is raked off and when cold, is reduced to a fine powder, which is white in color, and the particles are extremely hard.

PUY is the name commonly given in the highlands of Auvergne and the Cevennes to the truncated conical peaks of extinct volcanoes.

PUY, LE, or LE PUY-EN-VELAY, a town of France, department of Haute-Loire, about 70 miles south-west of Lyon, is one of the most picturesque towns in Europe. It stands on the steep southern slopes of Mount Anis, from the summit of which starts up precipitously the huge basaltic mass called *Rocher de Corneille*, crowned by a colossal figure of the Virgin, made of captured Russian cannon. The most notable buildings of Le P. are the cathedral, a splendid but heavy-looking structure of the 10th or 11th c., situated in the highest part of the town, and chiefly remarkable for a wonder-working image of the Virgin (*Notre Dame du Puy*). Lace, bells, silk, and wool are manufactured. Pop. (1876) 19,010.

PUY-DE-DOME, a large central department of France, containing an area of 3070 sq. m., and a population (1881) of 566,064. Plateau and mountain occupy three-fourths of it; plain and valley the rest. Branches of the Cevennes and of the Auvergne mountains overspread the east and west of the department. The multitude of conical hills or puys, of basaltic and lava masses, and of craters, shows the volcanic nature of the soil. See AUVERGNE. The famous volcanic group of the Puy-de-Dome, west of Clermont, has two main peaks, the highest 4617 feet. Mont Dore is the chief summit of a southern group of mountains, and is 5885 feet high. The principal river is the Allier, a tributary of the Loire. The soil is, in general, light and poor; but its volcanic character fosters vegetation; and the splendid valley of Limagne is fertile throughout. The climate is uncertain, and severe in the mountains. The principal minerals are iron, antimony, and lead. Hot and cold mineral springs are abundant; among the most frequented are those of St. Myon and Chateldon. The department is subdivided into the arrondissements of Ambert, Clermont, Issoire, Riom, and Thiers.

PUZZOLA'NA, or POZZOLANA, a mineral substance, produced by volcanoes, and abundant in volcanic countries, is named from Pozzuoli, near Naples. It is earthy in character, with particles in a very loose state of aggregation, but is chemically like Basalt (q. v.). It is found of various colors—brown, yellow, reddish, and gray. See CEMENTS.

PWLHELI, a brisk little seaport and popular watering-place in Caernarvon. Pop. (1871) 3009.

PYÆ'MIA (from the Gr. *pyon*, pus, and *hæma*, blood), or purulent infection of the blood, is a disease whose exciting cause is the introduction of decomposing pus and wound discharges into

the circulation, through an ulcer or a wound, or an imperfectly closed vein (see PHLEBITIS and PUERPERAL FEVER). The term *Septicæmia* is applied by some to the same disease, by others only to very grave cases of P., while by many it is restricted to cases of blood-poisoning by putrid animal matters in general, such as those obtained from decomposing hides or dead bodies, or borne on foul air or septic gases. The two conditions have a general resemblance to each other. The poison is rapidly absorbed and diffused, and the blood undergoes certain changes, the nature of which chemistry has as yet failed to detect; it is certain, however, that the blood contains micro-organisms (micrococci and bacteria; see GERM THEORY). Within twenty-four hours, in very acute cases, there are severe shiverings, headache, and giddiness, followed by heat, perspiration, and accelerated circulation. In twenty-four hours more, the patient may be in a hopeless condition, delirious, and rapidly sinking. In less acute cases, the symptoms closely resemble those of typhoid fever, and in this form, the disease is a common cause of death, after surgical operations; such cases are invariably characterized by the formation of secondary abscesses in the lungs, liver, kidneys, and other internal organs, in the various glands (the parotid gland, in President Garfield's case), in the joints, and the tissues immediately under the skin. The pus of such abscesses always contains bacteria. There is usually more or less delirium. The patient usually dies of exhaustion. Recovery is rare. It is chiefly, however, in the presence of *predisposing causes*, such as previous illness, prostration from organic disease or surgical complaints, or from difficult parturition, unhealthy occupations, &c., that the poison acts so severely; these, with the occurrence of putrefaction in a wound, may convert a comparatively slight local mischief into infection of the whole mass of the blood.

Bearing in mind the manner in which P. originates, it is clear that this disease is one to be prevented rather than cured. Until comparatively recently, when it was acknowledged that P. was the cause of death in 10 per cent. of *all* cases of amputation, and of 43 per cent. of *all fatal* primary amputations, the careful preparation of a patient before operation was, with justice, most strenuously insisted on. 'Patients must be strengthened,' said Mr. Callender, 'by tonics, such as quinine and iron; and their secretions must be set right by appropriate alteratives; this treatment must be continued for a considerable period.' Diet should be attended to, and intemperate patients 'should be accustomed to a more healthy mode of life.' After operation, also, patients should be adequately supported with nutritious diet, and stimulants and opium if necessary. No judicious surgeon will ever neglect such measures. But the really essential matter in the prevention of P. is the prevention of putrefaction in the wound discharges. This has been clearly proved by the brilliant results achieved by Mr. Lister and other surgeons at home and abroad, who have adopted the antiseptic method of treating wounds (see ANTISEPTICS; CARBOLIC ACID). For several years Mr. Lister's wards in Glasgow Royal Infirmary, formerly ravaged by P., remained free of the disease after the adoption of the antiseptic system; Prof Létiévant, of Lyons, states that, as a result of two years' practice of this mode of treatment, purulent infection had *disappeared from his wards*, where it formerly had a permanent home; and similar testimony might be quoted from every quarter and to any extent. The use of antiseptics, then, adopted early and followed out intelligently, may be said to have abolished absolutely the risk of purulent infection in wounds from operation or injury.

Even when the disease has shown itself, the use of antiseptics (carbolic acid, boracic acid, boro-glyceride, iodoform, thymol, eucalyptol, &c.) should be resorted to locally. The bowels, skin, and kidneys may be acted on by suitable purgatives, diaphoretics, and diuretics, with a view to the elimination of the poison; but the patient must be carefully watched for signs of depression, which must be combated with opium and stimulants, both of which should be given in small and frequently-repeated doses. Various drugs having antiseptic properties have also been recommended for internal use; salicylic acid and the salicylates, the hyposulphite of soda, and the hyposulphites generally, may be mentioned. This mode of treatment, combined with the most assiduous nursing and generous dieting, and the appropriate surgical management of such secondary abscesses as form, will sometimes prove successful.

PYAT, FELIX, a French journalist and communist, born 4th Oct. 1810. He studied law, was admitted to the bar, but chiefly wrote articles, feuilletons and plays, often with strong political allusions. In 1848, he was a socialist secretary of the constituent assembly. He escaped to Switzerland and Belgium, and was a member of the 'European revolutionary committee,' returning to France in 1869. In 1870, he was condemned to five years' imprisonment, but had already escaped. In 1870, he became a leader of the Paris communists, and on the fall of the Commune escaped to London. He was tried and condemned to death, in absence, for his share in the misdeeds of the Communal Government.

PYCNOGO'NIDÆ, a very remarkable family of *Crustacea*, of the section *Edentata* of Milne-Edwards, and forming the order *Araneiformes* (Spider-like) of some authors. By Cuvier and many other naturalists, a place was assigned them among *Arachnida;* and it is only of late that they have been decidedly referred to *Crustacea*, in consequence of the discovery that they undergo metamorphoses. They are all marine, and some of them live among algæ, or are to be found under stones on the beach, whilst others are dredged from deep water. They seem to prey by suction on molluscs, but probably on many kinds of marine animals. The legs of many, as in the genus *Pycnogonum*, are furnished with hooks for taking hold, and Linnæus believed *P. littorale* to be parasitic on whales; but it is not uncommon among sea-weeds on the British coasts. The suctorial proboscis of these creatures may be said to form the whole head. The abdomen is almost rudimentary. Their most remarkable characteristic is in their digestive cavity. The stomach gives off from its circumference ten long cæca, four of which on each side extend into the proper or locomotive legs, the other two into the pincer-like rudimentary foot-jaws. These ramifications of the alimentary canal seem to serve all the purposes of the circulatory, respiratory, and chyliferous systems of higher animals. Hock, in the *Challenger Reports*, and Dohrn, in *Fauna u. Flora d. Golfes v. Neapel*, have thoroughly reinvestigated the structure and development of this remarkable group, and give systematic descriptions and figures of all the new and more important forms. For summary, see Huxley's *Comp. Anat. Invertebr. Anim.*, and Balfour's *Embryology*, vol. i.

PY'CNOSTYLE. See INTERCOLUMNIATION.

PY'GMIES (Gr. *pygme*, a measure—from the elbow to the hand), a fabulous race of dwarfs in whose existence the ancients believed. Homer says that every spring they were attacked by the cranes on the coast of Oceanus. Later writers place them at the mouths of the Nile, but we also read of northern Pygmies inhabiting the region of Thule, and of Pygmies who lived in subterranean dwellings on the eastern side of the Ganges. Greek fancy worked hard to paint the Lilliputian dimensions of these creatures. It was said that they cut down every corn-ear with an axe; that when Hercules came into their country, they climbed up his goblet, by the help of ladders, to drink from it; and that, when he was asleep, two whole Pygmy armies fell upon his right, and another on his left, hand, but were all rolled up by the hero in his lion's skin. Aristotle did not believe that the stories about Pygmies were utterly fabulous, however much they had been overlaid by fancy with the marvelous. His 'rationalistic' (if not rational) interpretation was, that they were probably some diminutive tribe in Upper Egypt, who rode very small horses, and lived in caves. A race of very small men was encountered by Schweinfurth in his travels in the heart of Africa (1868—1871).

PYGMIES OF WESTERN AFRICA. The existence of pygmy races of human beings in Africa has been often asserted, and many circumstances less easily credible than their diminutive size have been reported. See PYGMIES. Du Chaillu some time ago discovered the actual existence of a pygmy race, but of whom the diminutive size is the only remarkable characteristic. He found them in the mountainous country on the east of the southern great branch of the Ogobai. They are called Obongos, are about 4½ feet in height, and live in the midst of negro tribes of ordinary stature. They subsist chiefly on animal food, but partly also on the roots, berries, and nuts which they find in the forests. Schweinfurth, in his travels in the heart of Africa, 1868—1871, also came into contact with a nation of pygmies.

PYM, JOHN, famous as the leader of the popular party in the House of Commons in the reign of Charles I., was born in 1584. He came of a good family in Somersetshire, and had considerable property in that county. He was for some years a gentleman commoner of Pembroke College, Oxford, and afterwards studied law at one of the Inns of Court. Having been sent to parliament as a member for Tavistock, in Devonshire, he attached himself to the popular party; and, during the later part of the reign of James I., became noted for his vigorous opposition to the arbitrary measures of the court. In 1626, the year after the accession of Charles I., he distinguished himself by taking a prominent part in the impeachment of the king's favorite, the Duke of Buckingham. In 1640, the functions of parliament having been in abeyance for 13 years, during which time the popular discontents had gradually been growing to a head, the celebrated Long Parliament was convened; and from the first, P. was by common consent recognized in it as the leader of the opposition to the despotic policy of the monarch. For the position which he thus occupied, his qualifications were eminent. In temper, he was bold and fearless; he was master of an eloquence, close, terse, and vigorous; and in knowledge of parliamentary form and business procedure, it was considered he had scarcely his equal in the House. On

November 3, as soon as business had opened, he set forth to the House, in a long and elaborate address, the intolerable grievances under which the nation labored; and a week after, he boldly denounced the Earl of Strafford as the 'great promoter of tyranny,' to whose evil influence on the mind of the king these grievances were in the main to be attributed. In the impeachment of Strafford which followed, resulting in his execution under a bill of attainder passed upon him, Pym took the leading part. Of this master-stroke of policy, which deprived the king of the one man of resolute temper and powerful genius who adhered to his cause, the credit must be chiefly awarded to Pym. In the subsequent proceedings against Laud, he was also conspicuous, as in every other crisis of moment, up to the time when war became inevitable between the king and the parliament. On the breaking out of hostilities, he remained at his post in London, and in the exercise of the functions of the executive there, rendered services to the cause not less valuable and essential than those of a general in the field. While the strife was yet pending, he died somewhat suddenly at Derby House, on December 8, 1643, having been appointed to the important post of Lieutenant of the Ordnance only the month previous. He was buried at Westminster Abbey with great pomp on the 13th; and was borne to his last resting-place by six members of the House of Commons. The House of Commons also voted £10,000 in payment of his debts.

PYNE, Louisa, a popular English singer, daughter of a well-known singer, Mr. G. Pyne, was born in 1824, received instruction from Sir George Smart, and first appeared in public in London in 1842. She appeared in Paris in 1847, made her *début* in opera in 1849, and has since visited America. She is chiefly known from her being chief soprano of an English opera company, in which she was associated with Mr. Harrison at the Lyceum, Drury Lane, and Covent Garden.

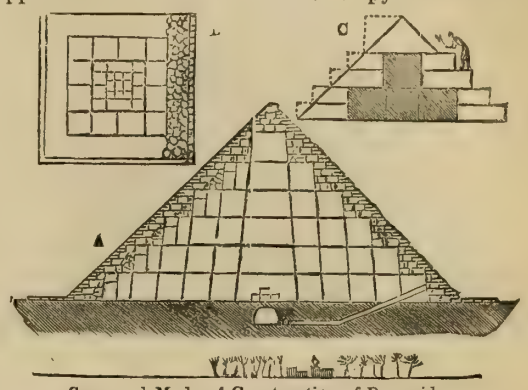
PYRACA'NTHA. See Cratægus.

PY'RAMID, in Geometry, is a solid figure, of which the base is a plane rectilinear figure, and the sides are triangles, converging to a point at the top or 'apex.' Pyramids, like prisms, are named from the form of their bases; thus, a pyramid having a triangle for its base is a triangular pyramid, with a square base, a square pyramid, with any four-sided figure for its base, a quadrangular pyramid; or it may be pentagonal, hexagonal, &c. Pyramids may be either 'right' or 'oblique.' See Prism. A right pyramid, with an equilateral figure for its base, has all its sloping edges equal; but this is not the case if the pyramid be oblique. The most remarkable property of the pyramid is, that its volume is exactly one-third of that of a prism having the same base and vertical height; and it follows from this, that all pyramids having the same base and height are equal to each other.

PYRAMID, a structure of the shape of the geometric figure so called, erected in different parts of the Old and New World, the most important being the Pyramids of Egypt and Mexico. Those of Egypt were considered one of the seven wonders of the world, are seventy in number, of different sizes, are between 29° and 30° N. lat., and are masses of stone or brick, with square bases, and triangular sides.

Although various opinions have prevailed as to their use, as that they were erected for astronomical purposes, for resisting the encroachment of the sand of the desert, for granaries, reservoirs, or sepulchres, the last mentioned hypothesis has been proved to be correct in recent times by the excavations of the late General Howard Vyse, who is said to have expended nearly £10,000 in investigating their object and structure. They were all the tombs of monarchs of Egypt who flourished from the fourth to the twelfth dynasty, none having been constructed later than that time; the subsequent kings being buried at Abydos, Thebes, and other places, in tombs of a very different construction. The meaning of the word pyramid is involved in great obscurity; although atttempts have been made to derive it from the Coptic *pharam*, yet, as in the hieroglyphs, it is found in connection with the words *ben ben* or *ber ber*, forms of the Coptic *beebe mahou*, or tomb, and *abmer*, or sepulchre, it is probably an ancient Greek word. The pyramids are solid mounds raised over the sepulchral chambers of the kings, the first act of an Egyptian monarch being to prepare his future 'eternal abode.' For this purpose, a shaft of the size of the intended sarcophagus was first hollowed in the rock at a suitable incline to lower it, and at a convenient depth a rectangular chamber was excavated in the solid rock. Over this chamber, a cubical mass of masonry, of square blocks, was then placed, leaving the orifice of the shaft open. Additions continued to be made to this cubical mass both in height and breadth as long as the monarch lived, so that at his death all that remained to be done was to face or smooth the exterior of the step-formed mound. But in some cases, the masonry passed beyond the orifice of the shaft, which involved the construction of a new shaft, having its orifice beyond it.

The Pyramid was faced by adding courses of long blocks on each layer of the steps, and then cutting the whole to a flat or even surface, commencing from the summit. The outer masonry, however, or casing, as it is called, has in most instances been partially stripped off. Provision was made for protecting the vertical joints by placing each stone half way over another. The masonry is admirably finished; and the mechanical means by which such immense masses of stone were raised to their places has long been a mystery; the discovery, however, of large circular holes in some of the stones has led to the conclusion that they were wound up by machines. The stones were quarried on the spot; sometimes, however, granite taken from the quarries of Syene was partially employed. The entrances were carefully filled up, and the passage protected by stone portcullises and other contrivances, to prevent ingress to the sepulchral chamber. There appears to have been also a door or pylon at the entrance



Supposed Mode of Construction of Pyramids:
(From Gliddon's *Egyptian Archæology*).
A, Section of a Pyramid; B, horizontal section of the base, rubble work, and casing of a Pyramid; C, apex of a Pyramid, showing the process of finishing from the top downwards.

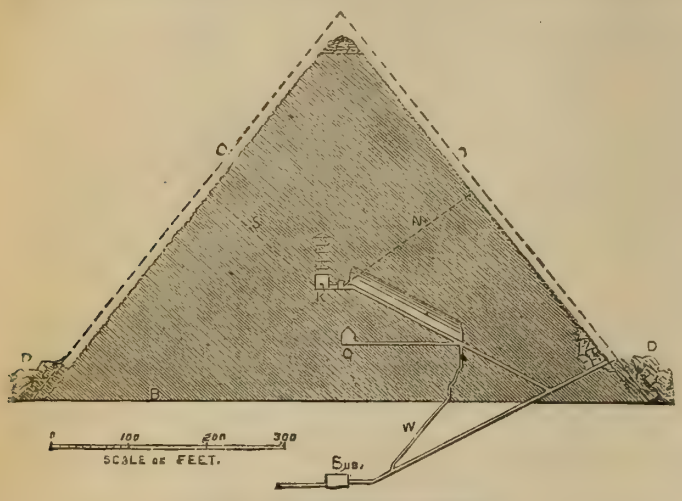
of the shaft, ornamented with Egyptian sculptures and hieroglyphs. The sides of the pyramids face the cardinal points, and the entrances face the north. The work of the larger Pyramids was executed by corvées of laborers. The most remarkable and finest Pyramids are those of Gizeh, situated on a level space of the Libyan chain at Memphis, on the west bank of the Nile. The three largest are the most famous.

The first or Great Pyramid, as appears from the excavations of Vyse, was the sepulchre of the Cheops of Herodotus, the Chembes, or Chemmis, of Diodorus, and the Suphis of Manetho and Eratosthenes. Its height was 480 feet 9 inches, and its base 764 feet square; in other words, it was higher than St. Paul's Cathedral, on an area the size of Lincoln's Inn Fields. Its slope or angle was 51° 50′. It has been, however, much spoiled and stripped of its exterior blocks for the building of Cairo. The original sepulchral chamber, called the Subterranean Apartment, 46 feet × 27 feet, and 11 feet 6 inches high, has been hewn in the solid rock, and was reached by the original passage of 320 feet long, which descended to it by an entrance at the foot of the Pyramid. The excavations in this direction were subsequently abandoned, on account of the vast size attained by the Pyramid, which rendered it impracticable to carry on the entrance on a level with the natural rock, which had been cut down and faced for that purpose. Accordingly, a second chamber, with a triangular roof, was constructed in the masonry of the pyramid, 17 feet × 18 feet 9 inches, and 20 feet 3 inches high. This was reached by a passage rising at an inclination of 26° 18′, terminating in a horizontal passage. It is called the Queen's Chamber, and occupies a position nearly in the center of the Pyramid. The monument—probably owing to the long life attained by the monarch—still progressing, a third chamber, called the King's, was finally constructed, by prolonging the ascending passage of the Queen's Chamber for 150 feet further into the very center of the Pyramid, and after a short horizontal passage, making a room 17 feet 1 inch × 34 feet 3 inches, and 19 feet 1 inch high. To diminish, however, the pressure of the superincumbent masonry on the flat roof, five small chambers were made vertically in succession above the roof, the last one pointed, varying in height from 1 foot 4 inches to 8 feet 7 inches, the apex of the top one being rather more than 69 feet above the roof of the King's Chamber. The end of the horizontal passage was finished in a superior style, and cased with red syenitic granite; and in the King's Chamber was the granite sarcophagus of the king Cheops, 7 feet 6½ inches long, 3 feet 3 inches broad, and 3 feet 5 inches high, for whom the Pyramid was built.*

As the heat of this chamber was stifling, owing to want of ventilation, two small air channels, or chimneys, about nine inches

* Piazzi Smyth thinks that this coffer was not a sarcophagus, but a standard measure of capacity, of which the British quarter is the fourth part. (*Our Inheritance in the Great P.*, 1864.) Proctor (in *The Great P.*, 1882) holds that the pyramid was primarily an astrological observatory, and only secondarily a tomb. Without doubt it is carefully oriented, and most of its constructive details manifestly bear relation to astronomical facts.

square, were made, ascending to the north and south sides of the Pyramid. They perfectly ventilate this chamber. After the mummy was deposited in the King's Chamber, the entrance was closed with granite portcullises, and a well made at the junction of the upward-inclined and horizontal passages, by which the workmen descended into the downward-inclined passage. Subsequently there arose various traditions, even in the days of Herodotus, Cheops being reported to lie buried in a chamber surrounded by the waters of the Nile. It took a long time for its construction—100,000 men being employed on it for thirty years, or more



Section of Great Pyramid of Gizeh:
(From Vyse's *Pyramid of Gizeh.*)

D, debris and remains of casing; Q, queen's chamber; K, king's chamber; O, outer casing line; S, N, air channels; W, well; sub., subterranean apartment.

probably for above half a century, the duration of the reign of Cheops, which is dated by different chronologists at 3229, 3095, or 2123 B.C. The operations in this Pyramid by General Vyse gave rise to the discovery of marks scrawled in red ochre in a kind of cursive hieroglyphs on the blocks brought from the quarries of Tourah. These contained the name and titles of Khufu (the hieroglyphic form of Cheops); numerals and directions for the position of materials; with them were masonic marks.

The second Pyramid is situated on a higher elevation than the first, and was built by Suphis II., or Kephren, who reigned 66 years, according to Manetho, and appears to have attained a great age. It has two sepulchral chambers, and appears to have been broken into by the Calif Alaziz Othman Ben-Yousouf, 1196 A.D. Subsequently, it was opened by Belzoni. The masonry is inferior to the first, but it was anciently cased below with red granite.

The third Pyramid, built by Menkara, or Mycerinus, who reigned sixty-three years, is much smaller than the other two, being only 218 feet high by 354 feet 6 inches square. It has also two sepulchral chambers, both in the solid rock. The lower sepulchral chamber, which held a sarcophagus of rectangular shape, of whinstone, had a pointed roof cut like an arch inside; but the cedar coffin, in shape of a mummy, had been removed to the upper or large apartment, and its contents there rifled. Amongst the débris of the coffin and in the chambers were found the legs and part of the trunk of a body with linen wrapper, supposed by some to be that of the monarch, but by others to be that of an Arab, on account of the anchylosed right knee. This body and fragments of the coffin were removed to the British Museum; but the stone sarcophagus was unfortunately lost off Carthagena, by the sinking of the vessel in which it was being transported to England. The masonry of this Pyramid is most excellent, and it was anciently cased half-way up with black granite.

There are six other Pyramids of inferior size and interest at Gizeh; one at Abou Rouash, five miles to the north-west of the same spot, is ruined, but of large dimensions; another Zowyet El Arrian, also made of limestone, is still more ruined; another at Reegah, a spot in the vicinity of Abooseer, also much ruined, and built for the monarch User-en-Ra, by some supposed to be Busiris. There are five of these monuments at Abooseer, one with a name supposed to be that of a monarch of the third dynasty; and another with that of the king Sahura.

A group of eleven Pyramids remains at Sakkara; the exploration of some of these in 1881 by M. Maspero gave some very interesting results. Five other Pyramids are at Dashour, the northernmost of which is supposed to be that of the king Asychis of Herodotus, and has a name of a king apparently about the twelfth dynasty. Others are at Meydoon and Illahoon; and two at Biahmo, at Medinat El Fyoum, apparently the sepulchres of the last kings of the twelfth dynasty. Some small brick Pyramids of the kings of the eleventh dynasty are at the Drah Aboo Negger at Thebes. In Nubia, the ancient Æthiopia, are several Pyramids, the tombs of the monarchs of Meroë, and of some of the Ethiopian conquerors of Egypt. They are taller in proportion to their base than the Egyptian Pyramids, and generally have a sepulchral hall, or propylon, with sculptures, which faces the east. The principal groups of these Pyramids are at Bege Rauie, or Begromi, 17° N. lat., in one of which, gold rings and other objects of late art, resembling that of the Ptolemaic period, were found.

In Assyria, the Birs Nimrud, or Tower of Belus, was a kind of step-shaped Pyramid of seven different-colored bricks, dedicated to the planets by Nebuchadnezzar. The Mujellibe, another mound, was of pyramidal shape. The Pyramid also entered into the architecture of the tomb of Sardanapalus at Tanus, and of the Mausoleum of Artemisia at Halicarnassus. A small Pyramid, the sepulchre of C. Cestius, imitated from the Egyptian in the days of Augustus, still exists within the wall of Aurelian at Rome. Temples and other monuments of pyramidal shape are found in India, China, Java, the Polynesian Islands, and elsewhere. The Toltecs and Aztecs erected temples in Mexico, called *Teocalli*, or abodes of gods, of pyramidal shape, with steps or terraces by which to ascend and reach an altar, generally placed on the summit, where they performed human sacrifices and other rites. These, however, are not true Pyramids, the pure and simple form of which is restricted to Egypt.

The Pyramid entered extensively into the architecture of the Egyptians, and appears on the tops of Obelisks and tombs as a kind of roof. Small models of Pyramids, with inscribed adorations to the sun, or having royal names, were also placed in the Tombs. —Lepsius, *Ueber den Bau der Pyramiden*, 1843; *Briefe* pp. 143, 217; Wilkinson, *Topogr. of Thebes* (Lond. 1835); Vyse, *Operations carried on at Gizeh in* 1837 (1842); Gliddon, *Otia Ægyptiaca* (1849); Piazzi Smyth, *Life and Work at the Great Pyramid* (1867).

PY'RAMUS AND THI'SBÉ. The tragical history of these two lovers is told by Ovid in the 4th book of his *Metamorphoses*. They were natives of Babylon, and tenderly attached to each other, but as their parents would not hear of their marriage, they had to content themselves with clandestine interviews by night. On one occasion they arranged to meet at the tomb of Ninus, where Thisbe, who was first at the trysting-spot, was startled to discover a lioness. She immediately ran off, but in her terror and haste, dropped her garment, which the fierce animal, that had just torn an ox in pieces, covered with blood. Soon after, Pyramus appeared, and seeing his mistress's robe, came to the conclusion that she had been murdered, whereupon he killed himself. Thisbe now returned, and beholding her lover lying dead on the ground, put an end to her own life. The story was a favorite one during the middle ages, when a couple, unhappy in their love, were termed a *Pyramus and Thisbe*. Shakspeare, in his *Midsummer Night's Dream*, has introduced it—but in a way that has the effect of caricature.

PY'RENEES, the name of that mountain-range which, separating France from Spain, extends 270 miles in length, and from 30 to 70 miles in breadth, from the Gulf of Rosas, in the Mediterranean, to the south-east corner of the Bay of Biscay. This mountain-system, covering an area estimated at 12,600 sq. m., consists of two great chains, one of which runs east from the Bidassoa to the west bank of the Noguera Pallaresa; and the other originating in the Pic du Midi d'Ossau (9510 feet), lat. about 0° 25′ W., a little to the north of the former, extends eastward, and, after being intersected at the Val d'Aran by the Garonne and many smaller streams, reaches the Mediterranean, on the shores of which, immediately north of the Gulf of Rosas, it terminates in the promontories of Norfeo and Creuz. The *northern* slopes of these mountains to the plains and undulating districts of the south-west of France, are of gradual descent; while the southern slopes descend to the mountainous regions of Northern Spain by steep terraces. That portion of this mountain-system in which the eastern part of the southern, and the western part of the northern chains run parallel to each other, is called the High or Middle P.—a district about 16 miles in length, and forming the wildest and most elevated portion of the whole system. In the south-west of the Middle P. is a series of lofty summits, beginning with the Pic du Midi de Pau (9544 feet), and ending with the barren Maladetta, whose highest point, the Pic de Nethou or Malahite (11,168 feet), is the highest summit in the system. Between these two summits, there are several upwards of 10,000 feet high, as Mont Perdu (10,994 feet). The north-eastern and less elevated portion of the Middle P. forms a rampart, frequently interrupted by transverse valleys, and of which the principal summits are the Pic de Gavisos (8170 feet) and the Pic du Midi de Barèges (9307 feet).

The Eastern P. rise in their highest summits into the region of perpetual snow, and as far as the sources of the Segre, form a mighty unbroken wall of rock. From this point, however, they assume a different character, decreasing in height, and being in-

tersected by valleys. The West P. nowhere reach the snow-line, as their highest summit, the Pic d'Anie, does not rise above 7500 feet. Forming at first ridges of from 6000 to 7000 feet, they decrease in height as they extend west, until, on the lower Bidassoa, they take the form of isolated masses about 3000 feet high. The average height of the P. is from 6000 to 7210 feet. At an almost equal elevation are most of the mountain-passes. These passes, called in some places *cols*, in others *ports* (Span. *puerto*), are about 100 in number, though only seven of them are practicable for wagons and cannon. The most important are the roads of St. Jean de Luz over the Bidassoa to Vittoria, St. Jean Pied du Port to Pampluna, and that from Perpignan over Junquera to Gerona. The P. comprise no extensive and long valleys. Generally, the valleys are small and caldron-shaped, and communicate by means of narrow passes. The rivers are inconsiderable. The region of perpetual snow, which on the northern slopes of the mountains, begins at the height of 8137 feet, and on the southern slopes at 8858 feet, comprises no extensive snow or ice tracts. Glaciers are few and small, and nowhere occur lower than 7800 feet. On the warm and dry southern slopes, no glaciers occur. Few forests exist, and the steep walls of rock, parched by the sun and mid-day winds, are either quite bare, or are covered with low brushwood and meagre pasture. The more gradually declining northern slopes, on which snow and springs are more abundant, show a richer vegetation, and are for the most part covered with lofty forests, and beautiful mountain pasture. Granite forms the kernel of the Pyrenean mountain-system, and is overlaid by chalk and sandstone masses. The P. are not rich in metals, but abound in mineral springs, of which the chief are those of Bagnères de Bigorre (q. v.) and Barèges.

PYRÉNÉES, BASSES, a department forming the south-west corner of France. Area, 2940 sq. m.; pop. (1881) 434,366. The department is divided into the five arrondissements of Pau, Oloron, Orthez, Bayonne, and Mauléon. Chief town Pau. The Basses-P. occupies the northern slopes of the Western Pyrenees, offshoots from which divide the department into a number of valleys, each traversed by a clear mountain stream, locally known as a *gave*. The chief of these are the Gave d'Oloron, Gave de Pau, the Bidouze, and Nivelle. The high valleys and slopes are generally fertile, and well adapted for the growth of the vine, chestnut, various other fruits, and maize, though not for wheat. The best wines are those of Jurançon and Gau, Pontac and Auberlin. Flax and hemp, rye, barley, oats, and millet are also grown; but the principal source of industry, after the making of wine, is the rearing of horses, cattle, sheep, and mules for the Spanish markets, and the raising of swine in the great beech-forests, together with the preparation of hams of excellent quality and high flavor. Marble, alabaster, slate, ophite, copper, iron, sulphur, and cobalt, constitute the chief mineral products; but their importance as sources of wealth falls short of that of the numerous mineral springs, the most important of which are those of Biarritz, Cambo, Eaux-Bonnes and Eaux-Chaudes.

PYRÉNÉES, HAUTES, a department of France, lying east of the Basses-Pyrenees, is a part of the old province of Gascony. The Hautes-P., which, as its names implies, contains the loftiest summits of the Pyrenean chain, is divided into the three arrondissements of Tarbes, Argèles, and Bagnères, and the chief town is Tarbes. The aspect of the scenery is, moreover, very varied —savage mountains and precipitous rocks in the south, an agreeable diversification of hill with dale in the center, softening down to fertile plains in the north. The principal rivers, none of which, however, are navigable in the department, are the Adour and the Gave de Pau. The climate is generally mild in the plains and sheltered valleys, but even there, storms are of frequent occurrence. The well-cultivated and artificially watered low lands, yield good crops of cereals, leguminous plants, flax, fruits of every kind, including the grape, from which excellent wine and brandy are made. Horses, mules, cattle, sheep, swine, and poultry, are much reared. This department, which is the richest part of the Pyrenees in mineral products, especially marble of various kinds, copper, iron, zinc, lead, antimony, slate, granite, &c., contains also the most celebrated springs, as the sulphur springs at St. Sauveur, and the hot-baths of Bagnères, Barèges, and Cauterets. The very limited commercial industry of Hautes-P. embraces the manufacture of woollen and mixed fabrics, including barèges, coloring matters, leather, paper, cutlery, &c. There is also a smuggling trade with Spain. Area, 1742 sq. m.; pop. (1881) 236,474.

PYRÉNÉES-ORIENTALES, a maritime department of France, is bounded on the E. by the Mediterranean, and on the S. by the Pyrenees. Area, 1590 sq. m.; pop. (1881) 208.855. It is divided into the three arrondissements of Perpignan, Prades, and Céret. The chief town is Perpignan. Like the two previously described, this department presents a series of parallel valleys formed by spurs from the Pyrenees, but in this case the valleys run east and west. They are three in number, and are watered by the Gly, Tet (the principal river), and Techs. The south-west corner is drained by the Segre (Segura), a tributary of the Ebro. An extended plain occupies all the north and east of the department. The climate is good, and in the plains is seldom disturbed by great extremes of heat or cold. The vegetable products include fine grain and some of the choicest fruits of this latitude. Wines constitute the wealth of the district, and include the red wines of Roussillon, the white muscatel of Rivesaltes, and other approved kinds. The chief exports are wine, cocoons, the surplus live stock and its products, sardines, anchovies, &c. The mineral wealth of the district is not remarkable.

PYRI'TES, a name employed by mineralogists to designate a large group or *family* of minerals, compounds of metals with sulphur, or with arsenic, or with both. They are crystalline, hard, generally brittle, and generally yellow. The name P. originally belonged to the sulphuret of iron, known as IRON P.; and was given to it in consequence of its striking fire with steel (Gr. *pyr*. fire), so that it was used for kindling powder in the pans of muskets before gun-flints were introduced. Iron P. is commonly of a bright brass-yellow color; it is often found crystallized in cubes, in which form small crystals of it are abundantly disseminated in some roofing-slates; and very large ones occur in some of the mines of Cornwall; it is also found crystallized in dodecahedrons and other forms, more rarely in oblique four-sided prisms; and it often occurs massive, globular, stalactitic, capillary, or investing other minerals as an incrustation. Beautiful specimens of globular iron P. are found in the chalk of England. It is a very widely diffused and plentiful mineral, and seems to belong almost equally to all geological formations. It is too abundant in many coal-fields, the action of water and air changing it into sulphate of iron (vitriol), during which change so much heat is evolved that the coal is frequently kindled by it, mines become unworkable, and the progress of the fire can only be stopped, if at all, by building up portions of them to cut off the access of air, or by the admission of a plentiful supply of water. At Quarreltown, in Renfrewshire, a deep hollow may still be seen, where, about a century ago, the ground fell in, in consequence of a subterranean fire thus kindled. The color of Iron P. has often caused it to be mistaken for gold, a mistake which its hardness and comparative lightness should prevent, or its ready solubility in nitric acid, and its burning before the blowpipe on charcoal with bluish flame and smell of sulphur. But it sometimes does contain a small proportion of gold, sometimes even in visible grains. This auriferous Iron P. is found in Siberia and in South America.

Iron P. is never used as an ore of iron, but is much used for the manufacture of sulphuric acid, and sulphur is obtained from it by sublimation. It is also used for the manufacture of alum.—A variety of Iron P. of a very pale color is called *Marcasite*. There is also a magnetic variety.—COPPER P., also called *Yellow Copper* and *Chalcopyrite*, is the most abundant of all the ores of copper, and yields a large proportion (perhaps a third) of the copper used in the world. It is brass-yellow, the color varying with the amount of copper which it contains, a rich color indicating much copper, and a pale color the presence of a comparatively large amount of iron; for this ore is not a sulphuret of copper, but of copper and iron. It occurs massive and disseminated in rocks of almost every class; and is often found crystallized in octahedrons and tetrahedons, but generally in very small crystals. It may at once be distinguished from Iron P. by its comparative softness, yielding readily to the knife, and by the green color of its solution in nitric acid. Before the blowpipe, with borax and soda, it yields a bead of copper. COBALT P., or *Cobaltine*, a sulphuret and arseniuret of copper, is a principal ore of cobalt. It is generally of a silver-white color, and occurs massive, disseminated, or crystallized in cubes, octahedrons, dodecahedrons, and polyhedrons, in primitive rocks.—NICKEL P., also called *Copper-Nickel* and *Nickeline*, used as an ore of nickel, is a compound of nickel and arsenic. It generally found massive, and is of a copper-red color.

PY'RITZ, a very ancient town of Prussian Pomerania, in the government of Stettin, 25 miles south-east of the town of Stettin. There are standing five high towers on the town-walls, built by the Wends, under whom it was a place of great strength. There is a seminary named after Otto, Bishop of Bamberg, near the spring where it is said he, in 1124, baptized the first Pomeranian converts. P. has manufactures of woollen cloth and leather. Pop. (1880) 8123.

PYRMONT. See WALDECK-PYRMONT.

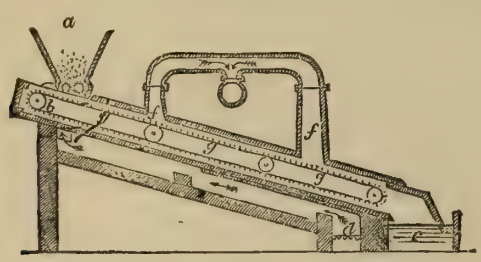
PY'ROLA AND PYROLA'CEÆ. See WINTER GREEN.

PYROLI'GNEOUS ACID, or WOOD VINEGAR, a crude commercial form of Acetic Acid (q. v.). It is made by the destructive distillation of wood, and contains, besides acetic acid, tar and other products, which have to be removed if it is required in a

very pure state. Generally, it is obtained in Britain from oak branches, which, after being stripped of their bark, are too small for timber purposes. These are cut into short billets, which are placed in cast-iron retorts, and a sufficient heat applied to drive off the volatile constituents and carbonize the wood. The best woods for the distiller are 'hard' woods, although all will yield it. This will be seen from the following table, which partly summarizes the experiments of Stolze:

	100 Parts of Dried Wood give	
	Crude Pyroligneous Acid.	Pure Hydrated Acetic Acid.
Birch (*Betula alba*)	45·0	4·47
Beech (*Fagus sylvatica*)	44·0	4·29
Oak (*Quercus robur*)	43·0	3·88
Ash (*Fraxinus excelsior*)	46 8	3·72
White Poplar (*Populus alba*)	45·8	3·23
Bird Cherry (*Prunus padus*)	47·3	2 92
Juniper (*Juniperus communis*)	45·8	2·34
Spruce Fir (*Pinus abies*)	41·2	2·16
Scotch Fir (*Pinus sylvestris*)	42·4	2·14

Quick distillation is always found to be much more productive than slow, and the acid is also freer from impurities; for the slower the process, the thicker and darker is the tarry matter. Hence two separate plans have been invented, one by Mr. Halliday, and the other by Mr. W. H. Bowers, both of Manchester, in which sawdust, chips, shavings, and spent dye-woods are used. In Mr. Halliday's plan, the retort is a long tube, with the fire acting along its entire length; inside is an Archimedean screw, worked by machinery, which passes the sawdust or other material slowly from the commencement to the end, where, by a particular contrivance it falls out in the state of thoroughly carbonized wood. It is supplied by means of a hopper. The volatile matters pass up an outlet-pipe in the upper part of the tubular retort. In Mr. Bowers's plan, the principle is similar, though differently carried out, as seen in the wood-cut. *a* is the hopper through



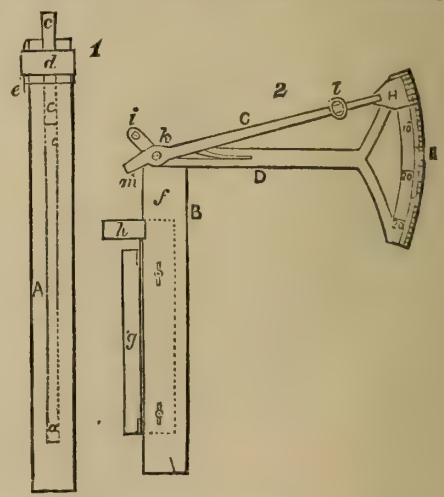
which the sawdust is fed; and it is always kept well supplied, so that, by the pressure of the supply, the escape of vapor may be prevented; *ggg* is an endless chain worked over the four rollers by a small steam-engine, and carrying the materials from the hopper by means of projections on the chain along the lower side of the retort, so as to bring them in contact with the furnace *d*, which, after passing along in the direction of the arrow, has its flue at *e*. By the time the material reaches the bottom, all the volatile matters have been vaporized, and have passed up into the condenser at *ff*, and the carbonized material falls into a cistern of water at *c*, into which the open end of the retort dips, the water closing it sufficiently. One of these retorts will yield about 200 gallons per day of pyroligneous acid. This acid is of great use in the arts, especially in making the acetates used by dyers and calico printers; and it is also, when very carefully purified and properly diluted with water, used extensively as a substitute for common vinegar in pickling, and even for table use.

PY'ROMANCY. See DIVINATION.

PYROMA'NIA is an involuntary, motiveless tendency to destroy by means of fire. The blind instinct to burn is often manifested in children before reason or a knowledge of property can actuate them, and with no other object than mischievous destructiveness, or to enjoy the blaze of a conflagration. In a large number of the cases, where legal investigation has disclosed the mental condition of the incendiary, and where the motive could not be determined, or was obscure or inadequate, the perpetrators were youthful, of the female sex, and about the period of puberty. It is to be observed that the most remarkable example in modern times of this morbid tendency appearing epidemically, was presented in Normandy in 1830, where barns, granges, and vineyards over a large tract of country were consumed, and where the actors were exclusively girls. When apprehended in numbers, they confessed that, though prompted by *internal sensations*, they had no other explicable purpose than to see the light. But this is the pure and typical form of the propensity. In general, insane incendiarism is the result of, or is complicated with, a very obvious incentive. Jonathan Martin, being insane, but impelled by superstition, set fire to York Minster (1829); and passions and delusions of every character, personal and political antipathies, and the spirit of agrarian outrage, may seek gratification in this kind of desolation. Like other outbursts of frenzy, it has been observed to accompany famines, pestilences, and great social convulsions.—Feuchtersleben, p. 293; Marc, *De la Folie*, t. ii. p. 305.

PYRO'METER (Gr. *pyr*, fire, and *metron*, a measure) is a term originally applied by Muschenbroek in 1731, to an instrument which he invented for measuring the changes produced in the dimensions of solid bodies by the application of heat. It is, however, now applied to any instrument the object of which is to measure all gradations of temperature above those that can be indicated by the mercurial Thermometer (q. v.). Desaguliers gives a description of Muschenbroek's instrument, as improved by himself, in his *Experimental Philosophy*. Numerous pyrometers have since been invented, amongst which may be noticed those of Ellicott (described in *The Philosophical Transactions* for 1736 and 1751), Graham (in Do. for 1754), Wedgwood (in Do. for 1782, 1784, and 1786), and Guyton (in the *Annales de Chimie*, tome 46). None of these instruments, however, gave accurate results for very high temperatures; and it was not till the year 1821 that Professor Daniell announced the invention of his pyrometer, which has supplanted all others, and for which, in an improved form, he received the Rumford Medal from the Royal Society. It consists of two distinct parts, the *register* (1) and the *scale* (2). The register is a solid bar of black-lead earthenware, A, eight inches long, cut out of a common black-lead crucible. In the axis of this, a hole is drilled, reaching from one end of the bar to within half an inch of the other extremity; and in this cylindrical cavity a bar, *aa*, of metal (as platinum or iron, for example) is placed.

A cylindrical piece of porcelain, *cc*, sufficiently long to project a short distance beyond the extremity of the black-lead bar, is placed on the top of the metallic bar. This is termed the index, and it is kept firmly in its position by a ring or strap of platinum, *d*, which is tightened by a wedge of porcelain, *e*. When the register is exposed to a high temperature, the expansion of the metallic rod, *aa*, forces the index forward; and when the register has afterwards cooled, the tension of the strap will retain the index at the furthest point to which it has been protruded. The scale (2) consists of a frame composed of two rectangular plates of brass, *f*, *g*, joined together by their edges at a right angle, and fitting square upon two sides of the register. Near the end of this frame is a small brass plate, *h*, which projects at a right angle. To the



Daniell's Pyrometer.

extremity of the frame nearest the brass plate is attached a movable arm, D, turning round a fixed center, *i*, and at its free end carrying the arc of a circle, E, the radius of which is five inches, and which is accurately graduated into degrees and thirds of a degree. Upon this arm, at the center, *k*, another lighter arm, C, is made to turn, carrying at its longer part a Vernier (q. v.), H, which moves on the face of the arc, and divides it into minutes, together with an eye-glass, *l*, to assist the reading; while the shorter part terminates in a knife-edge, *m*, turned inwards at a right angle.

To use the instrument, the scale is carefully applied, the brass plate, *h*, being pressed upon the shoulder of the register, and the lighter arm being so placed that the steel point, *m*, may rest on the top of the index in a notch cut for it which coincides with the axis of the rod. The position of the index being then read off on the scale, the register is detached and exposed to the heat to be measured; after it is removed and cooled, it is again placed in the

scale, and the new position of the index read off; the difference of the two readings determining the expansion of the metallic bar above that of the black-lead. In order to employ the instrument as a measure of temperature as well as of expansion, Professor Daniell adopted the doubtful assumption that equal increments of length are the effects of equal increments of temperature. For further information on this instrument and its uses, we must refer to the original memoir in the *Philosophical Transactions* for 1830—1831.

In the Great Exhibition of 1851, Mr. Ericsson exhibited in the United States' department a pyrometer in which temperatures were indicated by the tension of a permanent volume of air or of nitrogen gas, which was measured by the reading of a column of mercury under a vacuum. For a description of the instrument, we must refer to the Jury Report. M. Edmund Becquerel published, in 1864, a very complete essay on pyrometry in the *Annales du Conservatoire*.

PY'ROPE, a beautiful and much-prized gem, often called *Carbuncle* and *Hyacinth* by lapidaries. It is nearly allied to a garnet. It is composed of silica, alumina, magnesia, lime, and the protoxides of iron, chrome, and manganese. It is always of a deep red color, and is transparent, or at least translucent. It generally occurs in roundish grains, but rarely in imperfectly cubical crystals. It is found chiefly in Saxony and Bohemia; also at Elie, in Fife, Scotland. The specimens found at Elie are popularly called *Elie Rubies*.

PYRO'PHORUS (from the Gr. *pyr*, fire, and *phero*, I bear) is a term applied to any substances which take fire from the rapidity with which they are oxidized. If iron, cobalt, or nickle be reduced by hydrogen from its oxide at a low red heat, it is obtained in a state of such extreme division as to become incandescent by the oxidizing action of the atmosphere; and the tendency to rapid oxidation is much increased by the interposition of some infusible matter, as a little alumina or magnesia, between the particles of the oxide. This is probably due to the cohesion of the minute particles of the reduced metal being thus mechanically prevented, and the access of air to the surface of each particle being thus facilitated. If tartrate of lead be heated in a tube till the organic portion becomes charred, the metallic lead is reduced to a state of extreme subdivision, and usually takes fire when poured into the air. If finely-powdered sulphate of potash be mixed with half its weight of lampblack, and heated in a covered crucible, the sulphate is reduced to sulphide of potassium, which remains in a finely-divided state, mixed with the excess of carbon, and takes fire spontaneously in the air from the rapid absorption of oxygen. These are amongst the best examples of pyrophori.

PYRO'SIS, or WATERBRASH, is a modification of dyspepsia, or indigestion, characterized by a burning sensation at the pit of the stomach, followed by the eructation of a considerable quantity of a thin, watery fluid, which is generally tasteless, but sometimes sour, and is often described by the patient as being cold. It occurs in paroxysms, which usually come on in the morning or forenoon, when the stomach is empty. The first symptom of it is a pain at the pit of the stomach, and a sense of constriction, as if the stomach were drawn towards the back. The pain is often very severe, and after continuing for some time it brings on the discharge of fluid which has been already mentioned, after which it lessens, and gradually disappears. When the attack has once occurred, it is commonly repeated at intervals for a considerable time. It is usually accompanied with other symptoms of dyspepsia, and is sometimes associated with organic disease of the stomach, or of the liver. It seems to be due in a great measure to indigestible diet, and the too free use of spirits. When no organic disease is present, the affection usually disappears under the use of well-regulated diet, and the administration of opium, combined with astringents (as in the Compound Kino Powder), care being taken to guard against the constipating effect of these drugs by the prescription of a mild aperient daily, as, for example, a little confection of senna, or three grains of the Compound Colocynth Pill, combined with two grains of Extract of Hyoscyamus. If this treatment fail, nitrate of bismuth, or oxide of silver, in appropriate doses, may be tried. In some cases a cure has been effected by the use of lime-water and milk.

PYROSO'MIDÆ, a family of tunicated molluscs forming the order *Dactylobranchiata* of Owen. They are marine, and swim freely in the water, many individuals usually combined together, by their elastic integument or *tunic*, into a mass of definite form and arrangement, nearly cylindrical, hollow, closed at one end, and open at the other. The individuals which form this group or mass have each a gill-sac with two gills, and inhale water by an orifice on the outer surface of the cylinder, expelling it by another orifice on the inner surface; and by the action of the stream of water which thus constantly flows from the open end of the cylinder, the whole mass is slowly compelled through the water with the closed end foremost. The P. are plentiful in warm seas. *Pyrosoma Atlanticum* is usually from three to seven inches long. The P. are brightly luminous.

PY'ROTECHNY, the art of making fireworks, is of unknown antiquity. It was practised amongst the Chinese from the earliest times, and has attained with them a perfection unknown in other countries. So much is this the case, that they treat as insignificant the most brilliant of our European displays. In their fireworks they introduce many surprises, such as figures of men and animals darting out, but they are somewhat deficient in the mechanical arrangements. Fireworks, as the name is now understood, were hardly known in Europe until the discovery of the composition of gunpowder, and for a long time only very simple pyrotechnic contrivances were used. At present they may be divided into two kinds—the simple hand-pieces, such as squibs, crackers, rockets, &c.; and the other, the fixed contrivances which have often very ingenious mechanical arrangements for making some of their parts revolve rapidly when being discharged. The materials used are gunpowder, sulphur, charcoal, saltpetre, filings of steel, iron, copper, &c., and several salts, such as nitrate of strontian, acetate of copper, common salt, &c.

The ingredients of fireworks are usually filled into paper cases, made by rolling pasted paper round a cylinder of wood of the proper diameter, until the case is of sufficient thickness, and then cutting the paper tube so formed into the required lengths for squibs, Roman candles, small rockets, and similar articles; they seldom exceed ten inches; one end of each is closed by drawing a piece of string tightly round, so as to pinch it in, or *choke* it as it is technically called, and then dipping it into melted resin, which effectually seals it (*a*, figs. 1, 2, and 3). The combustible ingredients are filled in at the open end, and, if necessary, are rammed down with a wooden ramrod; the opening is afterwards covered with a piece of touch-paper, to prevent the composition falling out, and to ignite it by (*b*, figs. 1, 2, and 3). The effects

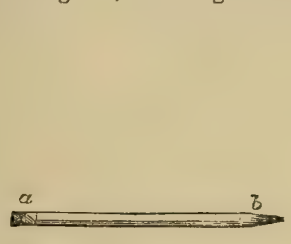
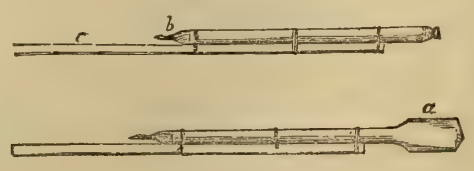


Fig. 1.



Fig. 2.

produced by fireworks are either streams of fire issuing straight out of the cases, and much varied with sparks in the form of stars, &c., and colored with brilliant colors; or wheels of beautiful sparks produced by making the cases revolve rapidly. Revolving pieces are made by coiling the paper tube, when not too tightly filled, around a flat wooden center (*c*, fig. 2); the force with which the combustion of the materials is carried on, is sufficient to make the board revolve with great rapidity. Small wheels of this kind are called *Catharine Wheels* (fig. 2). *Squibs* or *serpents* are made by filling tubes, eight to ten inches in length (fig. 1), with a composition of 1 lb. of nitre, 2 oz. of charcoal powder (rather coarse), 4 oz. of gunpowder, 4 oz. of sulphur, and 6 oz. of steel filings. The last is an important ingredient in many fireworks, producing brilliant, feather-like coruscations, which are the more beautiful the larger and cleaner the filings are. *Rockets* are tied to a wooden stick (*c*, fig. 3).



Figs. 3 and 4.

When they are about to be discharged, this stick is stuck in the ground, and in that position the igniting point of the rocket, *b*, is downward; when lighted, it rushes into the air with great velocity, and reaches a considerable height, discharging as it goes a brilliant stream of sparks. Rockets require a hollow center all down the tube; without this, they will not rise. At the end of their course, they often discharge brilliant clusters of golden, ruby, emerald, sapphire-like stars, or showers of golden or colored rain, or of fiery serpents. This is produced by a supplementary part, called the *garniture* of the rocket, consisting of a shorter and broader paper tube called the *pot*, attached to the end of the fusee part of the rocket (as in fig. 4, *a*), and filled with a composition made into a paste with pure alcohol, and cut into stars, or granu-

lated into small round bodies for drops. The serpents for rockets are small fusees, with the same composition as squibs; they are so packed in as to ignite all at once. The white stars are made of nitre, 16 parts; sulphur, 8 parts; gunpowder, 3 or 4 parts; nitrate of strontian added, makes them ruby red; sulphate or acetate of copper, and sulphate and carbonate of barytes, green; zinc filings give a blue color. *Yellow stars* and *yellow showers* are made of nitre, 16 parts, 10 of sulphur, 4 of charcoal, 16 of gunpowder, and 2 of lamp-black. A deeper and richer golden color is produced by a very slight variation in the composition—viz., 2 parts less of sulphur and charcoal, and four additional of gunpowder. Many other ingenious devices are used by masters in the art of pyrotechny, but they are too numerous and too technical to come within the limits of this work. The *Roman candle* is a favorite firework; it is a tube which is held on the ground, and discharges upwards a continuous stream of blue or white stars or balls. *Bengal lights* are cases of about an inch or more in diameter, filled with a composition of 7 parts nitre, 2 of sulphur, and 1 of antimony. These are much used as signals at sea; they diffuse an immense glare of bluish-white light. *Chinese* or *jasmine fire*, which is used by itself or in combination with other mixtures, consists of 16 parts of gunpowder, 8 of nitre, 3 of finely-powdered charcoal, 3 of sulphur, and 10 of small cast-iron borings; the last must be finer or coarser in proportion to the bore of the case to be filled. The compound devices in fixed fireworks, such as are seen at public entertainments, are very complicated in their structure, and are varied more or less by every artist. One nice point in the arrangement is to insure simultaneous ignition of all the various parts.

PY'ROXENE. See AUGITE.

PYROXY'LIC SPIRIT, WOOD SPIRIT, or METHYLIC ALCOHOL, a peculiar alcohol obtained by the destructive distillation of wood in the manufacture of Pyroligneous Acid (q. v.). It is one of numerous volatile products of that distillation, and has to be separated from the others by saturating it with the chloride of calcium, with which it combines, and is no longer volatile, except at a greater temperature than 212° F. It is therefore easily separated by means of a steam-bath from its more volatile associates, which are carried off at a temperature below boiling water. A higher temperature is afterwards applied to the residue, which is the compound of chloride of calcium and pyroxylic spirit, and the spirit is thus distilled off. Commercially, the discovery of this substance was of great importance, as many of its properties are the same as those of common alcohol; and now, notwithstanding a long opposition from the Revenue Board, its manufacture and importation are regularly allowed. It is of nearly equal value to alcohol in making varnishes, as it dissolves the resins, oils, and other similar substances. It has a peculiar naphtha-like odor, which is inseparable from it, and prevents its use as a potable spirit at present; but it has been asserted lately that some makers have almost made it odorless, and that it is consequently taking the place of common alcohol in the manufacture of cheap perfumes.

PYRO'XYLIN, a name for Gun Cotton (q. v.).

PY'RRHIC DANCE, the most famous of all the war-dances of antiquity, is said to have received its name from one Pyrrichos, or, according to others, from Pyrrhus or Neoptolemus, the son of Achilles. Critical scholars, however, content themselves with a general inference deduced from the substantial harmony of the various mythical or legendary accounts given of its origin—viz., that it was a Doric invention. It was danced to the flute, and its time was both quick and light, as may be seen from the Pyrrhic foot, composed of two shorts (⏑⏑), and the Prokeleusmatic, or challenging-foot, of two double shorts (⏑⏑ ⏑⏑). According to Plato, it aimed to represent the nimble motions of a warrior either avoiding missiles and blows, or assaulting the enemy; and in the Doric states, it was as much a piece of military training as an amusement. Elsewhere, in Greece, it was purely a mimetic dance, in which the parts were sometimes represented by women. It formed part of the public entertainments at the Panathenaic festivals. Julius Cæsar introduced it at Rome, where it became a great favorite. The *Romaika*, still danced in Greece, is said to be a modern relic of the ancient Pyrrhic dance; but if the accounts of recent travelers in the Hellenic kingdom are to be relied on, it is not easy to see the resemblance.



Pyrrhic Dance.
(Copied from Sir W. Hamilton's work on *Greek and Roman Vases*.

PY'RRHON (Lat. *Pyrrho*), the founder of a school of Greek scepticism, named after him, was a native of Elis, and was born in the first half of the 4th c. B.C. In his youth he is said to have been a painter, but was subsequently attracted to philosophy by the study of the writings of Democritus. Diogenes Laertius tells us that, along with Anaxarchus (one of his teachers, according to Aristocles), he joined Alexander the Great's eastern expedition; and it has been conjectured that, at this period, he obtained some knowledge of the opinions and beliefs of the Persian Magi and the Indian Gymnosophists. He died about the age of 90, after spending a great part of his life in retirement. P.'s scepticism was by no means of the thorough-going kind that is usually associated with his name, which is synonymous with absolute and unlimited infidelity. He certainly disbelieved in the possibility of acquiring a scientific knowledge of things, but (like Kant) he appears to have tenaciously maintained the reality of virtue and the obligations of morality. So greatly was he reverenced by his townsmen, on account of his personal excellences, and so little did they consider his philosophical scepticism a barrier to his holding a religious office, that they chose him high-priest of their sacred city, and for his sake declared all philosophers exempt from public taxes. Cicero (not so far wrongly either) ranks him among the Socratics; and, indeed, he was as much opposed to the pretensions of the Sophists as Socrates himself, though from a different point of view. P., so far as we know, wrote nothing; and the works of his friend and follower, Timon, are lost.

PY'RRHUS, king of Epeirus, born about 318 B.C., a Greek warrior, whose personal bravery and passion for adventurous exploits equals anything recorded of the knights of chivalry, was the son of Æacides, who succeeded to the throne of Epeirus by the death of his cousin, Alexander, 326 B.C. Alexander was the brother of Olympias, the mother of Alexander the Great; and thus young P. was a distant kinsman of the Macedonian hero, whose career of far-stretching conquest he dared to dream of imitating. After experiencing many vicissitudes of fortune in his youth, he became sole king of Epeirus in 295 B.C.; and, in the following year, increased his territories by the addition of the western parts of Macedonia, which he obtained in reward for aiding Alexander, son of Cassander, against his brother, Antipater, in their struggle for the paternal inheritance. In 281 B.C., a glorious prospect opened up before the eyes of the restless warrior —nothing less than the conquest of Rome and the western world, which (if he should achieve it) would confer on him a renown equal to that of his Macedonian kinsman. The Tarentines, a Greek colony in Lower Italy, then at war with the Romans, sent an embassy to P., in the name of all the Greek colonies in Italy, offering him the command of all their troops against their enemies. The king was overjoyed at the proposal; instantly accepted it; and in the beginning of 280 B.C. sailed for Tarentum with 20,000 foot, 3000 horse, 2000 archers, 500 slingers, and a number of elephants. The gay, pleasure-loving Tarentines had no great relish for the rigorous service of war, and were far from pleased at the strict measures taken by P. to inure them to its hardships.

The first battle between P. and the Romans (who were commanded by the consul M. Valerius Laevinus) took place at the river Siris in Lucania. The contest was long, obstinate, and bloody; and P. only succeeded by bringing forward his elephants, whose strange appearance and gigantic size excited a sudden panic among the Romans. It was a hard-bought victory for P., who said, as he looked upon the field, thick-strewn with his numerous dead: 'Another such victory, and I must return to Epeirus alone.' Many of the Italian nations now joined P. (for Rome was not liked by her neighbors and dependents), and he proceeded on his march towards Central Italy. The Roman senate was thoroughly frightened, and would have come to terms with P., but for the stirring speech of old Ap. Claudius Cæcus, which made them re-

solve to 'fight it out' with the foreigner. P., after penetrating to within 20 miles of Rome, found it impossible to proceed further with safety, as one Roman army occupied the city, and another hung upon his flanks and rear. He therefore withdrew to Campania, and thence to Tarentum, where he wintered. The campaign of 279 B.C. was carried on in Apulia, and the principal engagement took place near Asculum. The Romans were again defeated; but P. himself lost so heavily, that he felt it impossible to follow up his victory; and again withdrew to Tarentum. Here a truce was entered into between the belligerents; and P. passed over into Sicily to assist the Sicilian Greeks against the Carthaginians, 278 B.C. His first exploits in that island were both brilliant and successful; but the repulse which he sustained in his attack on Lilybæum broke the spell which invested his name.

Soon afterwards he became involved in misunderstandings with the Greeks; and in 276 B.C. he quitted the island in disgust, to renew his war with Rome. While crossing over to the mainland the Carthaginians attacked him, and destroyed 70 of his ships; and although he reached Tarentum in safety, his prospects were now much more clouded than at first. In 274 B.C. he fought a great battle with the Romans, under the consul Curius Dentatus, near Beneventum, and was utterly defeated, escaping to Tarentum with only a few personal attendants. He now saw himself forced to abandon Italy and return to Epeirus, where he almost immediately engaged in war with Antigonus Gonatas, son of Demetrius, and king of Macedonia. His success was complete, for the Macedonian troops deserted to him *en masse*, and he once more obtained possession of the country; but nothing could satisfy his love of fighting, and in less than a year he was induced to enter on a war with the Spartans. He marched a large force into the Peloponnesus, and tried to take their city, but was repulsed in all his attempts. He then proceeded against Argos, where he met his death, 272 B.C., in the 46th year of his reign.

PY'RUS, a genus of trees and shrubs of the natural order *Rosaceæ*, suborder *Pomeæ*, having a 5-celled fruit, with a cartilaginous endocarp and two seeds in each cell. It includes species differing very much in appearance, in foliage, and in almost everything except the characters of the flower and fruit, and formerly constituting the genera *Sorbus*, *Aria*, *Aronia*, &c.; or included in *Mespilus* (see MEDLAR) and *Cratægus*. Some botanists separate the Apples (*Malus*) as a distinct genus. Amongst the species of P. are some of the most valuable fruits of temperate climates, and some highly ornamental trees and shrubs. See APPLE, PEAR, SERVICE, ROWAN, BEAM-TREE.

PYTHA'GORAS. The life of this celebrated man, the founder of what is known as the Italic School of Philosophy, has been so greatly obscured by the mass of legends and incredible stories which gathered in later ages round his name, that it is very difficult to arrive at anything like certainty regarding his history and character. That he was a native of the island of Samos, the son of Mnesarchus, a merchant, or, according to other accounts, a signet-engraver, we know on good authority. The date of his birth is very uncertain, but is usually placed about the year 570 B.C.; and all authorities agree that he flourished in the times of Polycrates and Tarquinius Superbus (540—510 B.C.). He is said to have been a disciple of Pherecydes of Syros, of Thales, and Anaximander, and, like other illustrious Greeks, to have undertaken extensive travels for the purpose of adding to his knowledge; in the course of which—lasting, we are told, for nearly 30 years—he visited Egypt (bringing with him, according to the usual story, letters of introduction from Polycrates to Amasis the king) and the more important countries of Asia, including even India. We have every reason to believe that he did, at all events, visit Egypt, and there availed himself of all such mysterious lore as the priests could be induced to impart; from whom possibly he learned the doctrine of Metempsychosis, or the transmigration of souls (which was, as is well known, one of the most famous tenets of the Pythagorean school), and whose influence may perhaps be traced in the mystic rites, asceticism, and peculiarities of diet and clothing which formed some of its chief characteristics—though we may consider it as nearly certain that his philosophic and religious system was much less indebted to the influence of other countries than the ancients generally believed.

During his travels, we may believe, P. matured the plans which he afterwards carried into action; but finding, on his return to his native island, that the tyranny established there by Polycrates unfitted it for his abode, he quitted Samos, and eventually settled in the city of Croton, in Southern Italy. Here he is said to have acquired in a short time unbounded influence over the inhabitants, as well as over those of the neighboring states; and here he established the famous Pythagorean fraternity or order, which has often been compared with the still more celebrated order founded by Ignatius Loyola in modern times. The adherents of P. were chiefly found among the noble and the wealthy; these, to the number of 300, he formed into a select society, bound by a sort of vow to himself and to each other, for the purpose of studying the philosophical system of their master, and cultivating the ascetic observances and religious rites enjoined by him. They thus formed at once a philosophical school and a religious brotherhood, which gradually assumed the character and exercised the power of a political association also. This political influence, which undoubtedly became very great, was constantly exerted on the side of aristocracy; and to carry out the principles of this form of government, understood in the best sense of the word, seems to have been the ultimate aim of Pythagoras. He is said also to have increased his influence by a practice unknown to the other sages of the ancient world—the admission of women, not probably into his society, but to attendance on his lectures and teaching. Of the internal arrangement and discipline of this fraternity we really know but little. All accounts agree that what was done and taught among the members was kept a profound secret from the outer world.

In the admission of members, P. is said to have exercised the greatest care, and to have relied much on his skill in physiognomy. They then had, it is said, to pass through a long period of probation, intended apparently to test especially their powers of endurance and self-restraint—though probably the assertion that they had to maintain silence for two or even five years is an exaggeration of later times. Among the members of the society we are told there were several gradations, and there was also a more general division of his disciples under the names *Esoteric* and *Exoteric*—the former being applied to all who were admitted to the more abstruse doctrines and sublimer teaching of their master, the latter to those who received only the instruction open to all. The mode of life seems to have been regulated by P. in its minutest details. It is well known that he is said to have forbidden all animal food—a consequence, perhaps, of the doctrine of Metempsychosis—and also particularly beans (but these statements cannot be relied on), and there is no doubt that temperance of all kinds was strictly enjoined. In the course of instruction, great attention was paid to mathematics, music and astronomy; and gymnastics formed an important part of the training. Religious teaching was inculcated in the so-called Pythagorean *Orgies* or *Mysteries;* and while he outwardly conformed to the usual mode of worship, there is reason to believe that in secret he taught a purer faith. The result of the whole system seems to have been an unbounded reverence on the part of the disciples for their master (of which the well-known *ipse dixit* is a sufficient attestation); in the members of the order an elevated tone of character, exhibited in serenity of mind and self-possession, extreme attachment to each other, and also supreme contempt for all the outer world.

But it was natural that political power uniformly exercised in one direction by an aristocratic and exclusive society such as this should in the end excite a wide-spread feeling of jealousy and hatred, which at length, when opportunity was given, caused the overthrow of the fraternity. A war between the cities of Croton and Sybaris, in which the Pythagoreans took a prominent part, ended in the total destruction of the latter city (510 B.C.); and on this success they seemed to have presumed so greatly, that they proceeded to more active measures against the popular party than they had yet attempted. A violent outbreak was the consequence; the house in which the leading Pythagoreans were assembled was set on fire, and many perished in the flames. Similar commotions ensued in other cities of Southern Italy in which Pythagorean clubs had been formed, and the result was that, as a political organization, the Pythagorean order was everywhere suppressed; though, as a philosophical sect, it continued to exist for many years after. Of the fate of P. himself different accounts are given; but he is generally supposed to have escaped to Metapontum, and died there (504 B.C.) where his tomb was shown in the time of Cicero.

P. is said to have been the first to assume the title of *Philosopher* ('Lover of wisdom') in place of the name *Sophos* ('Wise'), by which the sages had before been known. Various discoveries in music, astronomy, and mathematics are attributed to him; among others, the proposition now known as the 47th of Euclid, Book I. We have good ground for believing that he was a man of much learning and great intellectual powers, which were specially exerted in the way of mathematical research, as is evinced by the general tendency of the speculations of his school. There is no doubt that he maintained the doctrine of the transmigration of souls into the bodies of men and other animals—which seems to have been regarded in the Pythagorean system as a process of purification—and he is said to have asserted that he had a distinct recollection of having himself previously passed through other stages of existence. We are told that on seeing a dog beaten, and hearing him howl, he bade the striker desist, saying, 'It is the soul of a friend of mine, whom I recognize by his voice.'

Respecting the system of philosophy actually taught by P., we have but little trustworthy testimony. P. himself, it is all but certain, wrote nothing, and the same seems to have been the case with his immediate successors; we are therefore, in endeavoring

to form an idea of the Pythagorean philosophy, obliged to rely almost entirely on the compilations of later writers (mainly Diogenes Laërtius, and the Neo-Platonists, Porphyrius and Iamblichus, all of them long subsequent to the Christian era), who often but imperfectly understood the details they gave. The tendency of the school was 'toward the consideration of abstractions as the only true materials of science' (Lewes's *Biographical History of Philosophy*), and to *Number* was allotted the most prominent place in their system. They taught that in Number only is absolute certainty to be found; that Number is the Essence of all things; that things are only a copy of Numbers; nay, that in some mysterious way, Numbers are things themselves. This Number theory was probably worked out from the fundamental conception, that, after destroying or disarranging every other attribute of matter, there still remains the attribute Number; we still can predicate that the thing is *one*. With this doctrine of Number was intimately connected that of the *Finite* and the *Infinite*, corresponding respectively with the *Odd* and the *Even* in Number; and from a combination of this Finite and Infinite it was taught that all things in the Universe result. The abstract principle of all perfection was *One* and the *Finite;* of imperfection, the *Many* and the *Infinite*. Essentially based also on the same doctrine, was the Theory of Music; the System of the Universe, which was conceived as a *Kosmos*, or one harmonious whole, consisting of ten heavenly bodies revolving round a Central Fire, the *Hearth* or *Altar* of the Universe; and the celebrated doctrine of the Harmony of the Spheres—the music produced, it was supposed, by the movement of these heavenly bodies, which were arranged at intervals according with the laws of harmony—forming thus a sublime Musical Scale. The Soul of Man was believed to partake of the nature of the Central Fire, possessing three elements, Reason, Intelligence, and Passion; the first distinctive of Man, the two last common to Man and Brutes.

The Ethical teaching of the Pythagoreans was of the purest and most spiritual kind; Virtue was regarded as a harmony of the soul, a conformity with, or approximation to, the Deity; Self-Restraint, Sincerity, and Purity of Heart were especially commended; and Conscientiousness and Uprightness in the affairs of life would seem to have been their distinguishing characteristics.

The Pythagorean system was carried on by a succession of disciples down to about 300 B.C., when it seems to have gradually died out, being superseded by other systems of philosophy; it was revived about two centuries later, and lasted for a considerable time after the Christian era—disfigured by the admixture of other doctrines, and an exaggeration of the mysticism and ascetic practices, without the scientific culture of the earlier school.

In addition to the writers above mentioned, scattered and scanty notices—affording, however, really the most trustworthy information that we possess, as to the life and doctrines of P.—occur in Herodotus, Plato, Aristotle (the latter especially), and a few other authors. Fuller details on the subject will be found in the Histories of Greece by Thirlwall and Grote, in the works of Ritter, Brandis, Tennemann, Erdmann, Ueberweg, and Lewes on the *History of Philosophy;* in Zeller's *Philosophie der Griechen*, and Ferrier's lectures on the same subject; and in Smith's *Dictionary*.

PY'THIAN GAMES, one of the four great national festivals of the Greeks, held in the Crissæan plain, near Delphi, are said (according to the prevalent mythological legend) to have been instituted by Apollo after vanquishing the snaky monster, Python, and were certainly in the earliest times celebrated in his honor every ninth year. They were at first under the management of the Delphians, but about 590—586 B.C. the Amphictyons were intrusted with the conduct of them, and arranged that they should be held every fifth year. Some writers state that it was only *after* this date that they were called Pythian. Originally, the contests were restricted to singing, with the accompaniment of cithern-playing, but the Amphictyons added the flute, athletic contests, and horse-racing. By and by, contests in tragedy, and other kinds of poetry, in historical recitations, and in works of art, were introduced, and long continued a distinguishing feature of these games, which are believed to have lasted down to nearly the end of the 4th c. A.D. The prize was a laurel wreath and the symbolic palm-branch. Several of Pindar's extant odes relate to victors in the Pythian Games.

PY'THON, a genus of serpents of the family *Boidæ* (see BOA), differing from the true boas in having the plates on the under surface of the tail double. The tip of the muzzle is plated; the lips are grooved. The species are all natives of the Old World. They are all large; some of them very large, and rivalled in size by no serpents except the boas of America. The name Boa is often popularly given to the pythons, and in its ancient use belongs to them. Some of the pythons are known in the East Indies by the name of ROCK SNAKE, as *P. molurus*, a species very extensively diffused. This name is given to some species which belong to the genus or subgenus *Hortulia*, one of which, the NATAL ROCK SNAKE (*H. Natalensis*), is said to attain so large a size that its body is as thick as that of a man. Although a native of Natal, it is already unknown in the settled parts of the colony. *Python reticulatus* is probably the largest snake of India and Ceylon. It is found also in more eastern regions. What size it attains is not well known. Specimens of 15 or 20 feet long are common, but it certainly attains a much larger size. It seems to be this snake which is sometimes called ANACONDA. It is rather brilliantly colored; its body being covered with gold and black, finely intermixed. The forehead is marked by a longitudinal brown stripe. Although sluggish for some time after a repast, it is at other times very active, and easily scales the highest garden walls. It feeds on deer and smaller animals; but the largest pythons are said to seize buffaloes, tigers, and even elephants, and to crush them in their coils. In this there is perhaps some exaggeration; but there are well-authenticated stories of snakes in the East Indies quite capable of killing at least the buffalo and the tiger (see *My Indian Journal*, by Colonel Walter Campbell; Edin. 1864, pp. 126, 127).



Python, or Rock Snake (*Hortulia Natalensis*).

PYX (Gr. *pyxis*, a box, properly of boxwood), the sacred vessel used in the Catholic Church to contain the consecrated eucharistic elements, which are preserved after consecration, whether for the communion of the sick or for the adoration of the faithful in the churches. Its form has varied very much at different times. Anciently it was sometimes of the form of a dove, which was hung suspended over the altar. More commonly, however, it was, as its name implies, a simple box, generally of the precious metals, or, at least, of metal plated with gold or silver. At present, the pyx is commonly cup-shaped, with a close-fitting cover of the same material. The interior is ordered to be of gold, or at least plated with gold. Like all the other sacred utensils connected with the administration of the eucharist, it must be blessed by a bishop, or a priest delegated by a bishop.

PYX, TRIAL OF THE, the final trial by weight and assay of the gold and silver coins of the United Kingdom, prior to their issue from the Mint. It is so called from the Pyx, i. e., box or chest, in which are deposited specimen coins. When the coins are weighed into bags at the Mint, two pieces are taken out of each bag, one for assay within the Mint, the other for the pyx. The latter are sealed up by three officers and deposited in the chest or pyx. The trial takes place about once in three years by a jury of goldsmiths, summoned by the Lord Chancellor. The jury are charged by the Lord Chancellor, at the Exchequer Office, Whitehall, in presence of several privy councillors, and of the officers of the Mint. Being furnished with a piece of gold and silver from the trial plates deposited in the Exchequer, they are required to declare to what degree the coin under examination deviates from them. The jury then proceed to Goldsmiths' Hall, where assaying apparatus is in readiness, and the sealed packets of coin being delivered to them by the officers of the Mint, are first tried by weight, after which a certain number of pieces taken from the whole are melted into a bar, from which the assay trials are taken. A favorable verdict relieves the officers of the Mint from responsibility, and constitutes a public attestation of the standard purity of the coin.

Q.



THE seventeenth letter of the Latin, English, and other western alphabets, is identical in power with the letter K (q. v.). It is always followed by *u*.

QUADRAGE'SIMA (Lat. 'fortieth day'), the name of the Lenten season, or more properly of the first Sunday of the Lent. It is so called by analogy with the three Sundays which precede Lent, and which are called respectively Septuagesima, 70th; Sexagesima, 60th; and Quinquagesima, 50th.

QUADRA'NGLE, an open square, or courtyard having four sides. Large public buildings—such as Somerset House and the colleges of Oxford and Cambridge—are usually planned in this form.

QUA'DRANT (Lat. *quadrans*, a fourth part), literally the fourth part of a circle, or 90°; but signifying, in Astronomy, an instrument used for the determination of angular measurements. The quadrant consisted of a limb or arc of a circle equal to the fourth part of the whole circumference graduated into degrees and parts of degrees. The quadrant employed by Ptolemy was of stone, with one smooth and polished side, on which the graduations were made; the quadrant was firmly placed in a meridian plane, with one radius vertical, and the other horizontal.

Tycho Brâhe, who has a right to be considered as the first great practical astonomer of modern times, fixed his quadrant on a wall, and employed it for the determination of meridian altitudes; he also adjusted others on vertical axes for the measurement of azimuths. Picart was the first who applied telescopic sights to this instrument. About this time the large mural quadrant (of 6 to 8 feet radius) began to be introduced into observatories. These quadrants were adjusted in the same way as the mural circle (see CIRCLE, MURAL). Various innate defects of the quadrant as an instrument—such as the impossibility of securing exactness of the whole arc, concentricity of the center of motion with the center of division, and perfect stability of the center-work—led to its being superseded by the repeating circle, otherwise called the *Mural Circle*.

Hadley's Quadrant is more properly an *octant*, as its limb is only the eighth part of a circle, though it measures an arc of 90°. Its principle is that of the SEXTANT (q. v.).

QUDRA'TIC EQUATIONS. See EQUATIONS.

QUA'DRATURE. This term is employed in Mathematics to signify the process of determining the area of a surface. Its derivation sufficiently indicates its nature—i. e., it consists in determining a *square* (the simplest measure of surface) whose area is equal to that of the assigned surface. In many cases, of which the Triangle (q. v.), the Parabola (q. v.), and the Cycloid (q. v.) are perhaps the simplest, the area is easily assigned in terms of some simple unit. Thus, the area of a triangle is half that of the rectangle with the same base and height; that of any parabolic segment is two-thirds of the corresponding triangle, whose sides are the chord and the tangents at its extremities; that of the cycloid three times that of its generating circle, &c.

The term is also applied in a special sense in cases in which an area or other quantity is expressed by an integral, whose value cannot be determined exactly; and it then means the process of approximation by which the value of the integral can be gradually arrived at.

All the practical rules for approximating to the areas of curvilinear figures and the volumes of various solids—such as occur in land-measuring, gauging, engineering, &c.—are, in this sense, cases of quadrature, except in those very special cases in which an area or a volume can be assigned exactly as a finite function of its dimensions. See MENSURATION.

QUADRATURE OF THE CIRCLE. This is one of the grand problems of antiquity, which unsolved and probably unsolvable, continue to occupy even in the present day the minds of many curious speculators. The trisection of an angle, the duplication of the cube, and the perpetual motion have found, in every age of the world since geometry and physics were thought of, their hosts of patient devotees. The *physical* question involved in the Perpetual Motion (q. v.) is treated of under that head; and we shall now take the opportunity of noticing the *mathematical* questions involved in the other problems above mentioned; but more especially that of the quadrature of the circle, in which the difficulty is of a different nature from that involved in the other two geometrical ones. A few words about them, however, will help as an introduction to the subject.

According to the postulates of ordinary geometry, all constructions must be made by the help of the circle and straight line. Straight lines intersect each other in but *one* point; and a straight line and circle, or two circles, intersect in *two* points only. From the analytical point of view we may express these facts by saying that the determination of the intersection of two straight lines involves an equation of the *first* degree only; while that of the intersection of a straight line and a circle, or of two circles, is reducible to an equation of the second degree. But the trisection of an angle, or the duplication of the cube, requires for its accomplishment the solution of an equation of the *third* degree; or geometrically, requires the intersections of a straight line and a curve of the third degree, or of two conics, &c., *all of which are excluded by the postulates of the science*. If it were allowed that a parabola or ellipse could be described with a given focus and directrix, as it is allowed that a circle can be described with a given radius about a given center, the trisection of an angle and the duplication of the cube would be at once brought under the category of questions resolvable by pure geometry; so that the difficulty in these cases is one of mere restriction of the postulates of what is to be called geometry.

It is very different in the case of the quadrature of the circle, which (the reader of the preceding article will see at once) means the determination of the area of a circle of given radius—literally, the assigning of the side of a square whose area shall be equal to that of the given circle.

The common herd of 'squarers of the circle,' which grows more numerous every day, and which includes many men of undoubted sanity, and even of the very highest business talents, rarely have any idea of the nature of the problem they attempt to solve. It will, therefore, be our best course to show first of all *what has been done* towards the solution of the problem; we shall then venture a few remarks as to *what may yet be done*, and in what direction philosophic 'squarers of the circle' must look for real advance.

In the first place, then, we observe that *mechanical processes are utterly inadmissible*. A fair approximation may, no doubt, be got by measuring the diameter of a circular disc of uniform material, and comparing the weight of the disc with that of a square portion of the same material of given side. But it is almost impossible to execute any measurement to more than six places of significant figures; hence as will soon be shown, this process is at best but a rude approximation. The same is to be said of such obvious processes as wrapping a string round a cylindrical post of known diameter, and comparing its length with the diameter of the cylinder: only a rude approximation to the ratio of the circumference of a circle to its diameter can thus be obtained.

Before entering on the history of the problem, it must be remarked that the Greek geometers knew that the area of a circle is half the rectangle under its radius and circumference (see CIRCLE), so that the determination of the length of the circumference of a circle of given radius is precisely the same problem as that of the quadrature of the circle.

Confining ourselves strictly to the best ascertained steps in the history of the question, we remark that Archimedes proved that the ratio of the diameter to the circumference is greater than 1 to $3\frac{10}{71}$, and less than $1\frac{10}{70}$ to 3. The difference between these two extreme limits is less than the $\frac{1}{1500}$ of the whole ratio. Archimedes's process depends upon the obvious truth, that the circumference of an inscribed polygon is less, while that of a circumscribed polygon is greater, than that of the circle. His calulations were extended to regular polygons of 96 sides.

Little more seems to have been done by mathematicians till the end of the 16th c., when P. Métius gave the expression for the ratio of the circumference to the diameter as the fraction $\frac{355}{113}$, which, in decimals, is true to the seventh significant figure inclusive. Curiously enough, it happens that this is one of the convergent fractions which express in the lowest possible terms the best approximations to the required number. Métius seems

to have employed, with the aid of far superior arithmetical notation, a process similar to that of Archimedes.

Vieta shortly afterwards gave the ratio in a form true to the tenth decimal place, and was the first to give, though of course in infinite terms, an exact formula. Designating, as is usual in mathematical works, the ratio of the circumference to the diameter by π, Vieta's formula is—

$$\frac{1}{\pi} = \tfrac{1}{2}\sqrt{\tfrac{1}{2}} \times \sqrt{\tfrac{1}{2}+\tfrac{1}{2}\sqrt{\tfrac{1}{2}}} \times \sqrt{\tfrac{1}{2}+\tfrac{1}{2}\sqrt{\tfrac{1}{2}+\tfrac{1}{2}\sqrt{\tfrac{1}{2}}}} \times \&c.$$

Shortly afterwards, Adrianus Romanus, by calculating the length of the side of an equilateral inscribed polygon of 1073741824 sides, determined the value of π to 16 significant figures; and Ludolph von Ceulen, his contemporary, by calculating that of the polygon of 36893488147419103232 sides, arrived (correctly) at 36 significant figures. It is scarcely possible to give, in the present day, an idea of the enormous labor which this mode of procedure entails even when only 8 or 10 figures are sought; and when we consider that Ludolph was ignorant of logarithms, we wonder that a lifetime sufficed for the attainment of such a result by the method he employed.

The value of π was thus determined to $\frac{1}{3 \times 10^{35}}$ of its amount, a fraction of which, after Montucla, we shall attempt to give an idea, thus: Suppose a circle whose radius is the distance of the nearest fixed star (250,000 times the earth's distance from the sun), the error in calculating its circumference by Ludolph's result would be so excessively small a fraction of the diameter of a human hair as to be utterly invisible, not merely under the most powerful microscope yet made; but under any which future generations may be able to construct.

These results were, as we have pointed out, all derived by common arithmetical operations, based on the obvious truth that the circumference of a circle is greater than that of any inscribed, and less than that of any circumscribed polygon. They involve none of those more subtle ideas connected with Limits, Infinitesimals, or Differentials, which seem to render more recent results suspected by modern 'squarers.' If one of that unhappy body would only consider this simple *fact*, he could hardly have the presumption to publish his 3.125, or whatever it may be, as the accurate value of a quantity which by common arithmetical processes, founded on an obvious geometrical truth, was several centuries ago shown to be greater than

3.14159265358979323846264338327950288,

and less than

3.14159265358979323846264338327950289.

We now know, by far simpler processes, its exact value to more than 600 places of decimals; but the above result of Von Ceulen is much more than sufficient for any possible practical application even in the most delicate calculations in astronomy.

Snellius, Huyghens, Gregory de Saint Vincent, and others, suggested simplifications of the polygon process, which are in reality some of the approximate expressions derived from modern trigonometry.

In 1668 the celebrated James Gregory gave a demonstration of the impossibility of effecting exactly the quadrature of the circle, which, although objected to by Huyghens, is now received as quite satisfactory.

We may merely advert to the speculations of Fermat, Roberval, Cavalleri, Wallis, Newton, and others as to quadrature in general—their most valuable result was the invention of the Differential and Integral Calculus by Newton, under the name of Fluxions and Fluents. Wallis, however, by an ingenious process of interpolation, showed that

$$\frac{\pi}{4} = \frac{2.4.4.6.6.8.8.10.10.\ \&c.}{3.3.5.5.7.7.9.9.11.\ \&c.}$$

which is interesting, as being the first recorded example of the determination, in a finite form, of the value of the ratio of two infinite products.

Lord Brouncker, being consulted by Wallis as to the value of the above expression, put it in the form of an infinite continued fraction, thus:

$$\frac{\pi}{4} = \cfrac{1}{1+\cfrac{1}{2+\cfrac{9}{2+\cfrac{25}{2+\cfrac{49}{2+\&c.}}}}}$$

in which 2 and the squares of the odd numbers appear. This formula has been employed to show that not only π, but its square, is incommensurable.

Perhaps the neatest of all the formulas which have been given for the quadrature of the circle, is that of James Gregory for the arc in terms of its tangent—namely,

$$\theta = \text{tan. } \theta - \tfrac{1}{3}\text{ tan. }^3\theta + \tfrac{1}{5}\text{ tan. }^5\theta - \&c.$$

This was appropriated by Leibnitz, and formed perhaps the first of that audacious series of peculations from English mathematicians which have for ever dishonored the name of a man of real genius.

If we notice that, by ordinary trigonometry, the arc whose tangent is unity (the arc of 45° or) $\frac{\pi}{4}$ falls short of four times the arc whose tangent is $\frac{1}{5}$ by an angle whose tangent is $\frac{1}{239}$, we may easily calculate $\frac{\pi}{4}$ to any required number of decimal places by calculating from Gregory's formula the values of the arcs corresponding to $\frac{1}{5}$ and $\frac{1}{239}$ as tangents. And it is, in fact, by a slight modification of this process (which was originally devised by Machin), that π, has been obtained, by independent calculators, to 600 decimal places.

It is not yet proved, and it may not be true, that the area or circumference of a circle cannot be expressed in finite terms; if it can be, these must (of course) contain irrational quantities. The integral calculus gives, among hosts of others, the following very simple expression in terms of a definite integral:

$$\frac{\pi}{2} = \int_0^\infty \frac{dx}{1+x^2}.$$

Now it very often happens that the value of a definite integral can be assigned, when that of the general integral cannot; and it is not impossible, so far as is yet known, that the above integral may be expressed in some such form as

$$\sqrt{x} + \sqrt{y},$$

where $\sqrt{x}$ and $\sqrt{y}$ are irrational numbers. Such an expression, if discovered, would undoubtedly be hailed as a solution of the grand problem.

But this, we need hardly say, is *not* the species of solution attempted by 'squarers.' We could easily, from our own experience alone, give numerous instances of their helpless absurdities, but we spare the reader, and refer him, for further information on this painful yet ridiculous subject, to Prof. De Morgan's *Budget of Paradoxes;* and to the very interesting work of Montucla, *Histoire des Recherches sur la Quadrature du Cercle.*

QUADRIE'NNIUM U'TILE, in Scotch Law, means the four years after majority during which a person is entitled to reduce or set aside any deed made to his prejudice during minority. This protection was also given by the Roman law to minors, to enable them to neutralize any unfair advantage that may have been taken of their inexperience during minority. The injury or lesion must have been caused, not by an accident, but by the imprudence or negligence, of themselves or of their curators. The proceeding, therefore, must be commenced before the minor attains 25, after which it is too late to seek restitution. See INFANT.

QUADRI'GA. See CHARIOT.

QUADRILA'TERAL, in Military Language, is an expression designating a combination of four fortresses, not necessarily connected together, but mutually supporting each other; and from the fact that if one be attacked, the garrisons of the others, unless carefully observed, will harass the besiegers, rendering it necessary that a very large army should be employed to turn the combined position. As a remarkable instance, and a very powerful one, may be cited the Venetian Quadrilateral (Austrian till 1866), comprising the four strong posts of Mantua, Verona, Peschiera, and Legnago. These form a sort of outwork to the bastion which the southern mountains of the Tyrol constitute, and divide the north plain of the Po into two sections by a most powerful barrier. Napoleon III., in 1859, even after the victories of Magenta and Solferino, hesitated to attack this quadrilateral.

QUADRI'LLE, a dance of French origin, consisting of consecutive dance movements, generally five in number, danced by couples, or sets of couples, opposite to, and at right angles to each other. The name seems to be derived from its having been originally danced by four couples.

QUADRILLE is a card game, which, as its name denotes, is played by four persons. The number of cards employed is forty, the tens, nines, and eights being discarded from the pack. The rank and order of the cards in each suit vary according as they are or are not trumps, and are different in the black and red suits.

The ace of spades, whatever suit be trumps, is always the highest trump, and is called *spadille;* the ace of clubs is always the third highest trump, and is known as *basto;* while the second highest trump, or *manille*, is the deuce of spades or clubs, or the seven of hearts or diamonds, according to the suit which is trumps, it being always of the trump suit. When the black suits are not trumps, the black cards rank as in whist; and when they are trumps, the order is the same, with the exception, as above mentioned, of the deuce, which then (in the trump suit only) becomes manille, the deuce of the black suit which is not trumps retaining its position as the lowest card. When the red suits are not trumps, the order of rank is as follows: King, queen, knave, ace, deuce, three, four, five, six, seven; but when they are trumps, the ace (of the trump suit only) is raised to the position of the fourth highest trump, under the name of *ponto* or *punto*, and the seven (of the trump suit only) becomes, as previously stated, manille. A little consideration will show, that when the black suits are trumps, the number of trump cards is eleven, and twelve when a red suit is trumps.

The three highest trumps, spadille, manille, and basto, are called *matadores*, and the player who possesses one of them can, if he have no other trumps in his hand, decline to follow suit if trumps are led, provided the trump led is not a matadore of value superior to his own. After the cards have been shuffled, cut and dealt, the elder hand, on looking at his cards, may, if his hand be weak, decline to play (or *pass*); the next player may do the same, and so on all round; in which case the elder hand must commence, naming the suit which he wishes to be trumps, and the cards are laid, and tricks taken, as in ordinary card games. If a player does not pass, but commences the game by naming trumps and playing a card, he must himself make six tricks to win; and if he succeeds he obtains the whole of the winnings; but if he loses, he pays the whole of the losses. If he commences the game by 'asking leave'—i. e., to have a partner—which is done by calling a king, the player who holds the king of the suit led must play it when his turn arrives; and he who asked leave, or *l'hombre* (in England generally called *ombre*), along with him who had the king called, or the *friend*, are from this time partners in the game, and divide either the gains or the losses, as the case may be. The ombre and the friend win the game if they make six tricks between them. This game is complicated by a number of conditions, which, under certain circumstances, modify the ordinary mode of playing.

A modification of this game, under the name of *preference*, is much in vogue in Lancashire; and in this country, in the beginning of last century, and on the continent—especially in France—the game of *l'hombre*, which is nothing more than quadrille played by three persons, was exceedingly fashionable. L'hombre is now quite obsolete, but a most accurate description of the mode in which it was played will be found in Pope's *Rape of the Lock*. L'hombre was the immediate predecessor of quadrille in popular favor.

QUADRI'VIUM (Lat. *quatuor*, four, and *via*, a road), the name given, in the language of the schools of the West, to the higher course of the medieval studies, from its consisting of four branches, as the lower course for an analogous reason was called TRIVIUM (q. v.), or 'Three Roads.' The quadrivium consisted of arithmetic, music, geometry, and astronomy. It would carry us beyond our limits to detail the nature and extent of each of these branches as pursued in the medieval schools. The reader will find much curious and new matter on all questions of this nature in the volumes of the works of Roger Bacon, lately edited in the series issued under authority of the Master of the Rolls, as also in the Introduction prefixed to the volumes.

QUADRU'MANA (Lat. four-handed), in the zoological system of Cuvier an order of *Mammalia*, which he places next after *Bimana* (q. v.)., and which contains the animals most nearly resembling man in their form and anatomical characters—viz., the monkey and lemur families. The order Q., with the limits assigned to it by Cuvier, is very generally received by naturalists. The name is derived from a character, in which one most obvious difference from man is, that the extremities of all the four limbs are *hands*, or formed for grasping, and not merely those of the anterior ones; these, indeed, being in many of the monkeys less perfect hands than the hinder ones, through the want or rudimentary character of the thumb. None of the Q. are naturally adapted for an erect posture. The differences between man and the apes which most nearly approach him in form, are pointed out in the articles MONKEY, CHIMPANZEE, GORILLA, and ORANG. The Q. resemble man in their dentition more than any other animals. Their other digestive organs also exhibit a general similarity to those of man. The similarity is further apparent in the brain and in the reproductive organs; but in the *Lemuridæ*, a gradual departure from the human form and characters is manifested, with an approach to the ordinary quadruped type.

QUA'DRUPEDS (Lat. four-footed), a term employed both popularly and by scientific writers to designate *four-footed animals*. It is not, however, the name of a class or order in systems of zoology. Popularly, it is almost always limited to those *Mammalia* which have four limbs well developed and formed for walking, and is scarcely ever applied to the *Cetacea*, and rarely even to Seals or to the *Quadrumana* (q. v.). The full development of the limbs, with their termination in *feet* properly so called, thus appears to be by no means one of the most important characters by which groups of animals are distinguished; and this further appears when the same character is found again in great perfection, in a lower class of vertebrate animals—in Chelonian and Saurian Reptiles, as tortoises and lizards. But the *four-limbed* type prevails among vertebrate animals, from man downwards; so that even in serpents, in which it is least notable, traces of it appear on anatomical examination, as in the case of that class of large serpents named Boas (see BOA); and there are many other creatures which form connecting links as to this character between serpents and those reptiles—as crocodiles and lizards—which possess it in greatest perfection. The homology of certain fins of fishes with the limbs of quadrupeds is noticed in the article FISHES. No approach to the four-limbed type is to be found among Invertebrate animals.

QUÆ'STOR (Lat. contr. from *quæsitor*, a searcher or investigator, from *quæro*, to seek or search into) was anciently the title of a class of Roman magistrates, reaching as far back, according to all accounts, as the period of the kings. The oldest quæstors were the *quæstores parricidii* ('trackers of murder,' ultimately public accusers), who were two in number. Their office was to conduct the prosecution of persons accused of murder, and to execute the sentence that might be pronounced. They ceased to exist as early as 366 B.C., when their functions were transferred to the *Triumviri Capitales*. But a far more important though later magistracy was the *quæstores classici*, to whom was intrusted the charge of the public treasury. The exact date of their institution cannot be ascertained, but it was subsequent to the expulsion of the kings. They appear to have derived the epithet of *classici* from their having been originally elected by the centuries. At first they were only two in number, but in 421 B.C, two more were added. Shortly after the breaking out of the first Punic War, the number was increased to eight; and as province after province was added to the Roman Republic, they amounted, in the time of Sulla, to twenty, and in the time of Cæsar to forty. On its first institution the quæstorship (*quæstura*) was open only to patricians; but after 421 B.C., plebeians also became eligible.

QUA'GGA (*Equus*—or *Asinus*—*Quagga*), an animal of the family *Equidæ* (q. v.), a native of the southern parts of Africa, rather smaller than the Zebra (q. v.), with the hinder parts higher, and the ears shorter; the head, mane, neck, and shoulders blackish-brown, banded with white; similar bands towards the rump, gradually becoming less distinct; a black line running along the spine. The Q. receives its name from its voice, which somewhat resembles the barking of a dog. It is more easily domesticated than the zebra, and a curricle drawn by quaggas has been seen in Hyde Park. In its wild state it does not associate with the zebra, although inhabiting the same plains. Hybrids, or mules, have been produced between the horse and quagga.

QUAIL (*Coturnix*), a genus of gallinaceous birds of the family *Tetraonidæ*, nearly allied to partridges, but having a more slender bill, a shorter tail, longer wings, no spur, and no red space above the eye. The first and second quills of the wing are about as long as the third, which is the longest in the more rounded wing of the partridges. Quails, therefore, far excel partridges in their power of flight. The tail is very short. They never perch on trees, but always alight on the ground. They are among the smallest of gallinaceous birds.

The COMMON Q. (*C. vulgaris* or *C. dactylisonans*) is found in most parts of Europe, Asia, and Africa. In India and other warm countries, it is a permanent resident; but in many countries it is a bird of passage; and thus it visits the north of Europe, and at certain seasons appears in vast multitudes on the coasts and islands of the Mediterranean, so that quails are there taken in hundreds of thousands in their northern and southern migrations. The Q. is not plentiful at any season in any part of Britain; but sometimes appears even in the northern parts of Scotland, and more frequently in the south of England, where it is sometimes seen even in winter. There is reason to believe that the food miraculously supplied to the Israelites in the wilderness was this very species of bird, to which the name *Selav*, used in the Mosaic narrative, seems to belong.—The Q. is fully 7 inches in entire length; of a brown color, streaked with different shades, and the wings mottled with light-brown; the throat white, with dark-brown bands in the male, and a black patch beneath the white, the lower parts yellowish-white. The Q. is polygamous. The nest is a mere hole in the ground, with 7 to 12 eggs. The Q. is highly esteemed for the table. Great numbers of quails are

brought from the continent to the London market.—Other species of Q. are found in different parts of Asia, although no other is so abundant as the Common Q., and none migrates as it does.—The Coromandel Q. (*C. textilis*) is a very pretty little bird, rather smaller than the Common Quail.—The Chinese Q. (*C. excalfactoria*), a very beautiful little species, only about 4 inches long, is abundant in China, and is there kept for fighting, the males being very pugnacious, like those of other polygamous birds, and much money is lost and won on the combats of these quails. It is also used for a singular purpose—the warming of the hands of its owner.

QUAKERS; the ordinary designation of the Society of Friends (q. v). In respect of law, Quakers differ from the rest of their fellow-citizens chiefly as regards their marriages and their taking of oaths. Thus, though the English marriage acts required all marriages to take place in a consecrated church of the establishment, before the dissenters obtained a relaxation of the law, the Quakers' marriages were excepted, and marriages between two Quakers were allowed to be solemnized according to the usage of their own sect. As regards Quakers in the matter of taking oaths it is expressly provided by several statutes, that instead of taking an oath in the usual way, they may make an affirmation instead, whether as witness in a court of justice, or as holding a civil office, the qualification for which office is the taking of an oath. The penalties of perjury, however, attach to a false affirmation in the same way as to a false oath. With regards to church-rates, it had been decided that Quakers stand on the same footing as other people in respect of their liability to pay church-rates; but compulsory church-rates are now for the most part abolished.

QUAKING-GRASS (*Briza*), a genus of grasses, having a loose panicle; drooping spikelets, generally remarkable for their broad and compressed form, suspended by most delicate footstalks, and tremulous in every breath of wind; the spikelets with two glumes and numerous florets, the florets having each two awnless paleæ, which become incorporated with the seed. The species are few,



Quaking Grass (*Breza media.*

and mostly European. They are all very beautiful. *B. maxima*, a native of the south of Europe, is often planted in flower-gardens. *B. media*, the only species common in Britain, growing in almost all kinds of poor soil, from the sea-coast to an elevation of 1500 feet, is of some value as pasture-grass, being very nutritious, although the quantity of herbage is scanty.

The value of many poor pastures very much depends on it; but when they are enriched by manures, it generally disappears. It is sometimes sown by farmers, but not nearly to such an extent as it would be if its seed did not lose vitality so quickly that only a small proportion grows, if it is not sown in autumn when newly ripened.

QUAMASH, or BISCUIT ROOT (*Camassia esculenta*), a plant of the natural order *Liliaceæ*, nearly allied to squills and hyacinths. It is a North American plant, abounding on the great prairies west of the Mississippi. The roasted bulbs are agreeable and nutritious, and are much used as an article of food.

QUANG-NAM, KUANG-NAM, or TURON, a town of Anam, about 75 miles south-east-by-east from Hué (q. v.), or Phu-thuan-thien, the capital of Anam. It is situated near the head of a beautiful gulf, and is a place of considerable trade.

QUANTIFICA'TION OF THE PREDICATE, a phrase belonging to Logic, and introduced by Sir W. Hamilton to express the characteristic feature of certain logical doctrines of his respecting the Proposition and the Syllogism.

According to the Aristotelian Logic, propositions are divided, according to their *quality*, into affirmative and negative ('The sun has set,' 'The sun has *not* set'); and, according to their QUANTITY, into universal and particular ('*All* men are mortal,' '*Some* men live eighty years'). If we combine the two divisions, we obtain four kinds of propositions—Affirmative Universal ('All men are mortal'), Affirmative Particular ('Some men live to eighty'), Negative Universal ('No men are omnipotent'), Negative Particular ('Some men are not wise').

Now, it is remarked by Sir W. Hamilton, that the statement of the QUANTITY of these various propositions is left incomplete; only the *subject* of each has its quantity expressed (*all* men, *some* men, *no* men); while there is implied or understood in every case a certain quantity of the *predicate*. Thus, 'All men are mortal,' is not fully stated; the meaning is, that all men are *a part* of mortal things, there being (possibly and probably) other mortal things besides men. Let this meaning be expressed, and we have a complete proposition to this effect: '*All* men are *some* (or part of) mortals,' where quantity is assigned, not only to the subject, but also to the predicate. It might be that the predicate contained under it only the subject, as in the proposition: 'All matter gravitates.' There is no other thing in the universe except matter that obeys the law of gravitation. Knowing this, we might quantify the predicate accordingly: '*All* matter is *all* gravitating things,' a kind of proposition not recognized in the old logic. Another original form of proposition, brought out by supplying the quantity of the predicate, is '*Some* A is *all* B;' '*Some* men are *all* Englishmen.' So that, instead of two kinds of propositions under affirmation, Sir W. Hamilton's system gives four. In the same way, he increases the number of negative propositions. 1. For 'No man is omnipotent,' he writes, quantifying the predicate, '*Any* man is not *any* omnipotent;' or, '*All* men are out of *all* omnipotent things.' 2. 'Some men are not young' is fully quantified; 'Some men are not *any* young things;' 'Some men are out of *all* young things.' These two (in their unquantified shape) are the ordinarily recognized propositions of the negative class. To them Sir W. Hamilton adds—3. '*All* men are not *some* animals,' 'All men are excluded from a certain division of the class animal;' and 4. '*Some* animals are not *some* men;' 'A portion of the animals is not included in a portion of men.'

The first result, therefore, of completing the statement of a proposition by inserting what Hamilton considers as implied in the thought—namely, the quantity of the predicate—is to give eight kinds of propositions instead of four. The next result is to modify the process called the Conversion of Propositions. See CONVERSE. The kind of conversion called *limitation* (All A is B, *some* B is A) is resolved into simple conversion, or mere transposition of premises without further change. 'All A is *some* B;' 'Some B is all A.'

The multiplication of varieties of propositions is attended with the further consequence of greatly increasing the number of *syllogisms*, or forms of deductive reasoning. See SYLLOGISM. In the scholastic logic, as usually expounded, there are nineteen such forms, distributed under four figures (four in the first, four in the second, six in the third, five in the fourth). By ringing the changes on eight sorts of propositions, instead of the old number, four, *thirty-six* valid syllogisms can be formed in the first figure. Whether the increase serves any practical object, is another question.

Sir W. Hamilton also considers that he has been led, by the new system, to a simplification of the fundamental laws of the syllogism, or, as he expresses it, 'the reduction of all the *General Laws of Categorical Syllogisms* to a *Single Canon*.'

Professor De Morgan, in his elaborate system of *Formal Logic*, has also invented and carried out into great detail a plan of expressing the quantity of the predicate; but he does not admit the whole of Hamilton's eight propositional forms, rejecting in particular the last mentioned in the above enumeration. He also increases the number of valid syllogisms as compared with the old logic. Not content with indicating that the predicate has quantity as well as the subject, he supposes the possibility of a *numerical estimate* of quantity in both terms of the proposition, and from this draws a new set of inferences. Thus, if 60 per cent. of B are included in C, and 70 per cent. in A, 30 per cent. at least of B must be found both in A and in C.—See Sir W. Hamilton's *Discussions;* Spencer Baynes's *New Analytic of Logical Forms;* De Morgan's *Formal Logic;* Mill's *Logic*, under the Syllogism; and his *Examination of Sir W. Hamilton's Philosophy.*

QUAQUAVE'RSAL (Lat. turning every way), a term applied in Geology to the dip of the Stratified rocks when arranged in dome-shaped elevations, or basin-shaped depressions, whereby the beds have an inclination on all sides to one point, that point

being the summit of the dome in the one case, and the lowest level of the basin in the other.

QUA'RANTINE (from the Fr. *quarantaine*, a period of 40 days) is a forced abstinence from communication with the shore, which ships are compelled to undergo when they are last from some port or country where certain diseases held to be infectious, as yellow fever, plague, or cholera, are or have been raging. Where a quarantine is established, it is a high misdemeanor for any person in the suspected ship to come on shore, or for any one to disembark any merchandise or goods from her. The countries on the eastern and southern shores of the Mediterranean are those most commonly held to be infectious, and, as a regular arrangement, ships from them have to pass quarantine at Malta, or some French, Italian, or Spanish port. In England, the quarantine laws were, until about 20 years ago, enforced with severity; but now a quarantine is an unusual occurrence, although the power to enact it rests with the crown, and it is occasionally imposed by an order in Council. In Mediterranean ports, quarantine ordinarily lasts from 6 to 15 days, though it sometimes extends to a much longer period, during which the passengers are imprisoned in a sort of barrack called a 'lazaretto,' and the contents of the ship—animals, goods, and letters—are fumigated, punctured, sometimes immersed in water, or even acid, and all possible means are adopted to destroy infection.

Quarantine is not of necessity limited to a sea-frontier; and it is enforced—often with absurd rigor—at the frontiers between contiguous states, especially in Eastern Europe, to the annoyance of travelers, and to the serious detriment of commerce.

History declares quarantine regulations for maritime intercourse to have been first established by the Venetians in 1127 A.D.; but the practice must have been greatly older on land-frontiers; and the precautions of the Jews against leprosy indicate that a species of quarantine was enforced by them. The law for regulating quarantine, when imposed in England, is 6 Geo. IV. c. 78.

QUA'RÉ I'MPEDIT is the title of an English action, whereby a person who has purchased an advowson, or right of presentation to an ecclesiastical benefice, sues any one who disturbs or hinders him in the exercise of his legal right.

QUA'RREL, or QUARRY, a pane of glass of a lozenge or diamond shape. The name is also applied to a perforation or window of this form, and to square or diamond-shaped paving-stones or tiles.

QUA'RRY (Fr. *carrière*). When any useful rock is worked in an open manner at the surface of the earth, the excavation is called a quarry. Quarrying differs little from mining in principle, except that the latter is essentially an underground operation.

From a very remote period, famous granite quarries have been worked at Syene, and others of sandstone and limestone, along the banks of the Nile, for the temples and monuments of ancient Egypt. Greece found the materials for her white marble temples in the quarries of Mount Pentelicus, near Athens, and in those of the islands of the Archipelago. It was from the quarries of Travertine (a kind of limestone), at Tibur, that ancient Rome was chiefly built. Italy has long been celebrated for her marble quarries, those of Tuscany yielding the most esteemed kinds. The fine saccharoid marbles for statuary and other fine-art purposes, are exclusively obtained from the Apuan Alps, which rise around Carrara, Massa, and Seravezza. Those of Carrara, especially, are highly prized all over the world. From the quarries at Seravezza, marble to the value of £150,000 has been taken for the splendid cathedral of St. Isaac at St. Petersburg alone.

Of the more celebrated quarries of the British Islands, we may mention those of Cornwall, Aberdeen, and Wicklow for granite; those in the neighborhood of Edinburgh, Glasgow, and Newcastle, for sandstone; those near Bristol and Doncaster, and in the Isle of Portland, for limestone; those of Derbyshire, Devonshire, Kilkenny, and Galway, for marbles; and those of North Wales and Argyleshire for slates.

To understand the operations of the quarryman, it is necessary to bear in mind that all rocks belong to one or other of two great classes, namely, the stratified and the unstratified. The former are sedimentary rocks, occurring in parallel beds or strata, and consist chiefly, in so far as we are at present concerned, of sandstone and limestone. Unstratified or igneous rocks, which include greenstone or whinstone, granite, porphyry, &c., have no distinct bedding, that is, they do not lie in separate layers. Roofing-slate is a stratified rock, but it splits into thinner laminæ in the direction of its *cleavage* than in the direction of its bedding, the former being often at right angles to the latter. Granite and other igneous rocks have also a natural jointage or cleavage, although they are not stratified. Advantage is taken of these peculiarities in quarrying the different rocks, but in the main the systems adopted do not greatly differ.

Stones are most frequently separated from their native rock by blasting with gunpowder. This operation is described in detail under BLASTING; see also GALVANISM and SAFETY-FUSE. Of late the practice of boring jumper-holes with engine-power has been introduced, and wherever it can be conveniently applied, must be a great improvement on the slow and tedious process of boring by hand. See TUNNEL.

With some stratified rocks, such as sandstone, a good many of the best stones are procured without the aid of gunpowder. Hand-tools are alone used, because blasting is apt to cause rents, and otherwise shatter portions which it is desirable to keep solid. By this method, the quarryman makes a number of small holes with a pick, along a certain length of rock, into which steel wedges are inserted. After a succession of blows with heavy hammers, the wedges at length cut through the stratum. Blocks for columns, obelisks, tombstones, &c., are best procured in this way. It may also be stated that these are obtained from those more valuable parts of sandstone deposits technically termed 'liver rock,' which consist of the thicker and more consolidated strata. Flagstones and other pieces of limited thickness are quarried from the thinner beds termed 'bed rock.'

When stones are removed in masses by blasting or otherwise they have still to be quarried into shape, according to the purpose for which the various pieces are best suited. Thus in an ordinary building-stone quarry, the larger stones (after those of unusual size and quality are selected for the purposes named above) are roughly formed into ashlar, window-sills, lintels, rybats, corners, steps, and the like, by means of such tools as picks, hammers of various kinds, and wedges. The small irregular-shaped pieces are called *rubble*, and are used for the commonest kind of building. Slates are split up into the thickness used for roofing, by means of a mallet and broad chisel. In granite quarries worked for paving-stones, as has been incidentally alluded to above, the loss of material in reducing the blocks to the size and shape required, is enormous, as much as four-fifths of the whole being commonly wasted.

Besides the tools already mentioned, long iron bars called *pinches*, and powerful cranes for turning and lifting the larger stones, are nearly all the implements required by the quarry-master.

In quarrying, as well as in mining, much of the cost is incurred for the pumping of water from the workings. A good steam-engine and set of pumps are therefore indispensable for every quarry of any extent. Much expense is also every now and then incurred in clearing away sand, gravel, and other loose débris from the upper bed of the rock. This, which is called 'drift' by geologists, and 'tirring' in some localities by quarrymen, often becomes suddenly very deep, especially where the beds dip at a high angle, and is an obstacle by which many quarries of stratified rock are sooner or later arrested.

QUARRIES, in point of law, belong to the person who is owner of the freehold or inheritance of the land, the maxim being, that the owner is entitled to the soil down to the center of the earth. No person, therefore, is entitled to work a quarry or carry away the materials unless he derives his right from the owner by lease or other legal title, for the stones and materials are part of the soil, and belong to the freeholder.

QUART, a measure of capacity, and the fourth part of a Gallon (q. v.). The word is nothing more than the common word 'quarter,' a fourth part. The ordinary *quart-bottle* is a deception, containing only the sixth part of a gallon, and often less.

QUA'RTAN FEVER. See AGUE.

QUARTER, the name of two measures in use throughout the United Kingdom, one of them a measure of weight, and the other of capacity. The former is denominated a quarter from its being the fourth part of a hundredweight, and contains 28 lbs. avoirdupois; the capacity measure of the same name is said by some to have been so called from its being the fourth part of a 'chaldron,' but, as it happens, the quarter does not always bear this relation to the chaldron. As the porphyry coffer in the King's Chamber of the Great Pyramid (see PYRAMID) is said to be almost accurately the quadruple of the English quarter, the bold theory has been advanced that this is the origin of the measure and the name (see *Our Inheritance in the Great Pyramid*, by Piazzi Smyth). The quarter contains 8 bushels, or 4 pecks each. See BUSHEL.

QUARTER, in Heraldry, a subordinary consisting of the upper dexter fourth part of the shield, cut off by a vertical and a horizontal line meeting in the center of the shield. When two or more coats are marshalled together on a shield divided into squares for their reception, such divisions are also called quarters. See QUARTERING.

QUARTER, in War, signifies the sparing of the life of a vanquished enemy, which by the laws of war is forfeit to the victor. The expression seems to be derived from the use of the word 'quarter' to designate the lodging of the particular warrior; to *give quarter* to a prisoner being to send him to his captor's quarter for liberation, ransom, or slavery. The refusal of quarter is a

terrible aggravation of the horrors of war, and is only at all justifiable towards an enemy who has been guilty of atrocious cruelty himself or of some flagrant breach of faith.

On shipboard, a quarter is the stern portion of each of the ship's sides. The extent of the quarter is arbitrary, but it is generally held to comprise about one-fifth of the ship's length.

QUARTER-DAYS are the days adopted between landlord and tenant for entering or quitting lands or houses and for paying rent. The origin of these periods is no doubt due entirely to convenience, and though in England they are unknown to the common law, yet now they are almost part and parcel of every agreement made between parties as to the letting of houses and land. In England, if nothing is said as to the time of payment of rent, it is due only once a year, and the first payment is due at the end of a year from the time of entry. But owing to the convenience of the usual quarter-days, they are commonly referred to, and thereby imported into the contract. Thus, it is usual to enter and leave houses either at one of the four ordinary quarter-days, or where it is so arranged at half-quarter-days, and these points of time are fixed upon for the convenience of calculating rent. Rent of houses is generally made payable quarterly on the usual quarter-days. These are, in England and Ireland, Lady Day, March 25; Midsummer Day, June 24; Michaelmas Day, September 29; and Christmas Day, December 25.

In Scotland, there are what are called two legal terms in each year, and two conventional terms, the latter being only adopted when expressly so agreed. The legal terms are Whitsunday, May 15, and Martinmas, November 11; and the conventional terms are Candlemas, February 2, and Lammas, August 1. (Since 1881, the *removal* terms for houses in burghs in Scotland are fixed for the 28th May and 28th November.) In Scotland, if nothing is said between the parties on letting houses and lands, these legal terms are implied in the agreement, both as regards time of entry and payment of rent. Thus, as to houses and grass-lands, the legal term of entry is Whitsunday, and that of entry to arable land is Martinmas. So the rent is presumed to be payable twice a year at those legal terms.

QUARTER-DECK of a ship is an upper deck extending from the main-mast to the poop, or, when there is no poop, from the main-mast to the stern. It is used as a promenade by the officers only, and, in a ship-of-war, no person—officer or otherwise—enters upon it without touching his hat in token of salute. When the captain addresses his men, or confers public distinction on any individual, the crew are summoned aft on the quarter-deck.

QUA'RTERING, in Heraldry, is the bearing of two or more coats on a shield divided by horizontal and perpendicular lines, a practice not to be found in the earlier heraldry, and little in use till the 15th century. Arms may be quartered for various reasons. 1. To indicate dominion. A sovereign quarters the ensigns of his different states. The earliest instance of quartering in England is found in the paternal arms of Eleanor, daughter of Frederick III., king of Castile and Leon, and first wife of Edward I., as represented on her tomb in Westminster Abbey—the castle of Castile occupying the first and fourth quarters, and the lion of Leon the second and third. The arms of England and Ponthieu are similarly quartered on the same monument, and on the crosses erected to Queen Eleanor's memory. The received rule regarding the quartering of the ensigns of different states is, that precedence is given to the most ancient, unless it be inferior in importance. Feudal arms are sometimes quartered in the same way by subjects. 2. Arms of augmentation or special concession accorded to a subject by his sovereign, by way of honor, are sometimes granted to be borne quarterly with the paternal arms. These generally contain a portion of the royal insignia, and have precedence of the paternal coat. 3. The most usual reason for quartering is to indicate descent from an heiress who has intermarried into the family. Where there is but one heiress, her coat occupies the second and third quarter of the shield, and the paternal arms the first and fourth. Where there are more than one, they are marshalled in the successive quarters in the order of the intermarriages. Where more than four coats have to be marshalled, the number of vertical lines is increased, and the divisions, though more than four, are still called quarters. Where there is an odd number of coats, the last quarter is usually filled up by repeating the first.

One of the quarters may itself be quartered, when the heiress was entitled to bear a quartered coat; the shield is then said to be counter-quartered, and its primary quarters are called *grand quarters*. Quarterings are not allowed to be added to the paternal coat without the sanction of the heraldic authorities.

The expression 'quarterings' is often loosely used for *descents* in cases where there is no right to quarter from representation. The eight or sixteen quarterings which are sometimes ranged round the Scottish funeral escutcheon, and which are still important for many purposes in Germany, have no reference to representation, but imply purity of blood for four or five generations; i. e., that the father and mother, the two grandmothers, and four great-grandmothers, as also in the case of sixteen quarterings, the eight great-great-grandmothers, have all been entitled to coat-armor.

QUA'RTERMASTER. In the Army, the *quartermaster-general* is a staff-officer of high rank, whose duty it is to arrange the marches, quarters, and internal arrangements of the army to which he belongs. Every army has some officer of this department; from a brigade with a deputy-assistant-quartermaster-general, receiving £173, 7*s*. 6*d*. a year besides regimental pay, up to a complete army under a commander-in-chief, with a quartermaster-general, who is usually a general officer, and receives £691, 19*s*. 7*d*. per annum, besides his other pay. At headquarters, there is a permanent quartermaster-general, responsible for all the movements of the army, the organization of expeditions, camps of instruction, &c. He receives £1500, besides his pay as a general officer, and has a sub-department at the War-office, with clerks, &c. He is under the officer commanding in chief, and the adjutant-general.

The *quartermaster* is an officer on the staff of each regiment, in which he holds the relative rank of lieutenant. His duties are to superintend, assign to their respective occupants, and have charge of, quarters, barracks, tents, clothing, &c., used by the regiment. He is also regimental storekeeper. He rises, with scarcely an exception, from the ranks, the experience of an old sergeant being considered highly useful in the office. The quartermaster has no further promotion to look forward to; but after 30 years' service in all—including 10 as an officer—he may retire with the honorary rank of captain. He receives 10*s*. 2*d*. a day in the cavalry, and 8*s*. 2*d*. in the infantry, rising by length of service to 15*s*. 2*d*. and 13*s*. 2*d*.; with slightly different rates in the Guards, Engineers, &c. He is not required to join the mess. The *quartermaster-sergeant* is a non-commissioned officer appointed to assist the quartermaster in his various duties. He receives daily 4*s*. 5*d*. in the cavalry, 4*s*. in the artillery, 2*s*. 11*d*. in the infantry of the line.

In the Navy, the *quartermasters* are certain petty officers appointed in each ship by the captain to have charge of the stowage of ballast and provisions, of coiling ropes, attending to the steering, keeping time by the sand-glasses, &c. The principal of these men is called the ship's quartermaster, and receives £41, 1*s*. 3*d*. per annum, if engaged for continuous service; £36, 10*s*., if otherwise.

QUA'TERN is a term frequently employed in some parts of Great Britain to designate the fourth part of a peck; and in liquid measure, it is the fourth part of a pint, and is synonymous with the imperial gill.

QUARTERS, in Naval and Military affairs, are, generally, the positions assigned to persons or bodies of men. In a more special sense, the quarters in the army are the places of lodging assigned to officers or men, when not actually on duty. *Head-quarters* is the quarter of the commanding officer of a force, or of a section of a force. The head-quarters of the whole British army is at the Horse Guards, where the commander-in-chief has his permanent offices.

In the *Navy*, quarters has the special meaning of the positions to be taken by every man in actual combat.

QUARTERS, the upright posts of timber-partitions, &c., used for lathing upon. They do not exceed 4 inches square, and are generally about 4½ inches by 2 inches, and are placed from 12 to 14 inches apart.

QUARTER SESSIONS, in England, is a court or meeting of justices of the peace, who assemble every quarter of the year, for judicial as well as miscellaneous business. The meetings are fixed by statute to be held in the first full week after December 28, March 31, June 24, and October 11, respectively; often otherwise called the Epiphany, Easter, Trinity, and Michaelmas Sessions. The chief officer of the Court of Quarter Sessions is the *custos rotulorum*, so called because he is intrusted with the custody of the records and rolls. He is always one of the justices of the peace of the county or riding, nominated by the crown, and appointed by the commission. His deputy is the clerk of the peace, who acts also as clerk to the Court of Quarter Sessions.

The jurisdiction or the Court of Quarter Sessions is confined to criminal business, and is very important. It includes all criminal offences whatever, except the highest classes; thus, it has no jurisdiction to try for treason, murder, or capital felony, or blasphemy, perjury, forgery, arson, bigamy, abduction of women or girls, concealment of birth, offences against the Queen's title or the bankrupt laws, bribery, blasphemous, seditious, or defamatory libels, unlawful combinations or conspiracies, stealing or destroying wills or records. Besides its jurisdiction in criminal offences, there are numerous miscellaneous matters of which the Court has cognizance, including appeals from petty sessions, and from justices in special sessions, on a great variety of subjects, as to convictions of vagrants, stopping up highways, removal of

paupers, &c. The justices who do the work of Quarter Sessions are all unpaid, and thus save the country much expense. They generally choose a chairman of their own body to preside regularly at these courts, which office is considered a great honor, and is generally given to an able practical man, well versed in business.

This plan, however, of unpaid judges has been found inexpedient in boroughs and large towns, where the justices of the peace, being appointed chiefly from successful tradesmen, are not possessed of the necessary education to secure the efficient performance of like duties. There is therefore appointed for every borough in England a Recorder, who is a barrister, appointed by the Home Secretary, and is paid by salary out of the borough fund—a salary, however, very trifling in amount. His duty is confined to trying prisoners and other judicial business, and he is in fact, in his own person, the Court of Quarter Sessions for boroughs. There is also an exception to unpaid judges of Quarter Sessions in the county of Middlesex, where a barrister is appointed to act in the trial of prisoners, and called the assistant judge, being the official chairman of the Middlesex Sessions. The routine of business at Quarter Sessions consists of the trial of offenders, the trial of appeals, and the hearing of motions upon different subjects. Sometimes a second court sits, consisting of some of the justices appointed by the whole court, whenever the business is unusually heavy. In Scotland, there is also a Court of Quarter Sessions of the peace, held four times a year at the county town—viz., on the first Tuesdays in May, August, and March, and the last Tuesday in October. At these courts, the justices have power to review the sentences of special and petty sessions. But these courts are of a trifling description compared to the courts of the same name in England. In Scotland, the judicial business which in England devolves on Courts of Quarter Sessions, is chiefly disposed of by the sheriff of the county.

QUARTER-STAFF, formerly a favorite weapon with the English for hand-to-hand encounters, was a stout pole of heavy wood, about 6½ feet long, shod with iron at both ends. It was grasped in the middle by one hand, and the attack was made by giving it a rapid circular motion, which brought the loaded ends on the adversary at unexpected points.

QUA'RTETT, a piece of music arranged for four voices or instruments, in which all the parts are *obligati*, i. e., no one can be omitted without injuring the proper effect of the composition. Vocal quartetts are generally accompanied by instruments to sustain the voices. A mere interchange of melody, by which the parts become in turn principal and subordinate, without any interweaving of them, does not constitute a quartett. Quartetts for stringed instruments are generally arranged for two violins, a tenor violin, and violoncello. The most important quartetts have been composed by Haydn, Mozart, Beethoven, Spohr, and Onslow.

QUA'RTILE. See ASPECTS.

QUA'RTO-DE'CIMANS, those who, after the final decision of the Council of Nicæa, continued to hold that it was obligatory on Christians to celebrate Easter on the 14th day of the first lunar month near the vernal equinox, *whether that 14th day fell on Sunday or not*, or who, even before the Council of Nicæa, held the observance of the Jewish Passover to be of obligation. The controversies as to the celebration of Easter have been briefly described under the head EASTER (q. v.).

QUARTZ, a mineral, which is essentially *Silicic Acid*, or *Oxide of Silicon* (see SILICON), although it is often combined or mixed with other substances. It is a very abundant and widely-diffused mineral. It is almost the sole constituent of quartz rock, in which gold is far more frequently found than in any other matrix; and it is a principal constituent of granite, syenite, protogine, eurite, pegmatite, granulite, elvanite, all the different kinds of sandstone, and many other rocks. It is also a common mineral in trap-rocks, limestone, &c., and the sands of the sea-shore and of deserts are chiefly formed of it. It is found both massive and crystallized; the primary form of the crystals is a rhomboid, but it far more frequently occurs in six-sided prisms, terminated by six-sided pyramids; or in six-sided pyramids; or sometimes in dodecahedrons, formed by six-sided pyramids base to base. It is hard enough to scratch glass easily, and it gives fire with steel. It becomes positively electrical by friction; and two pieces, rubbed together, give light in the dark. When pure, it is quite colorless; but, owing to the presence of foreign substances, it often exhibits great variety of colors; and many minerals, known by different names, and consisting chiefly of quartz, have little or nothing to distinguish them but their color. Thus Rock Crystal, Chalcedony, Carnelian, Cairngorm, Agate, Amethyst, Prase, Chrysoprase, Jasper, &c., are mere varieties of quartz. Opal (q. v.) is very nearly allied to it.

Quartz Rock, or Quartzite, is a sedimentary sandstone, converted into a very hard, compact rock by metamorphic action. It is distinctly granular; the grains, however, seem to melt into each other, or to be enveloped in a homogeneous silicious paste. It is frequently brittle, and in weathering, it breaks up into small irregular cubes.

Quartz veins, occur in metamorphic rocks. The structure of the veins is compact and homogeneous, and very different from that of quartzite. Veins not only differ in width, but the same vein is very variable throughout its course, sometimes thinning to a very fine film, and then swelling out to great thicknesses. Quartz veins are more metalliferous than the mass of the rocks in which they occur. They are the principal natural repositories of gold, for though the precious metal is chiefly obtained from alluvial sands and gravels, these are the weathered and abraded fragments of the under-lying, or neighboring Palæozoic rocks. Small quantities of gold have been found in the quarts veins traversing the Silurian and Cambrian rocks of Wales and Scotland; and in Victoria, the great veins are so highly auriferous, that they are mined for the precious metal. Wherever the Lower Silurian rocks make their appearance on the surface throughout the colony, they are everywhere intersected by enormous numbers of quartz veins, which often reach a thickness of 10 to 15 feet. As yet, only a very small proportion of those have been explored; but the results have been so remunerative, that mining in the solid rock for gold is extensively pursued. One mine has been driven to a depth of 400 feet, and, contrary to the generally-received opinion, the vein at this depth continued to be auriferous.

QUASIMODO SUNDAY, called also DOMINICA IN ALBIS, the first Sunday after Easter. The name Q. S. is taken from the first words of the Introit (1 Peter, ii. 2) of the mass of the day. The name *Dominica in Albis* is derived from the custom which was formerly observed of the neophytes who had been baptized at Easter appearing in white garments in the church.

QUASS, a sort of weak beer produced in Russia by fermenting rye-meal in warm water. It is usually bottled in stone bottles, and is a favorite beverage with the people generally. When it becomes too sour, it is used as vinegar.

QUA'SSIA, a genus of trees and shrubs of the natural order *Simarubaceæ* (q. v.); having hermaphrodite flowers, with five petals combined into a tube, and much longer than the small calyx, ten stamens, five germens, and only one style; the fruit composed of five drupes. *Q. amara* is a native of the tropical parts of America, and of some of the West India Islands. It is a shrub of 10—15 feet high, with racemes of bright-red flowers, and large pinnate leaves, the stalks of which are remarkably winged and jointed. The wood, and particularly that of the root, has a very strong bitter taste, and was at one time much used in medicine under the names of *Q.-wood*, *Bitterwood*, &c. The flowers were valued in Surinam for their stomachic properties, as early as the beginning of the 18th c.; the wood of the root began to be known in Europe before the middle of that century, and was more fully brought into notice about 1756, by Rolander, a Swede, who had visited Surinam, and had learned its value from a negro, called Quassi, or Quasha. This negro had employed it with great success as a remedy for fevers, and although, as Rolander says, a very simple man, had acquired a great reputation by his use of it.

Linnæus published a dissertation on it in 1763, and it was he who gave to the genus the name Quassia, from the name of the slave by whom its medicinal qualities had been made known. The true Q. is now, however, little used; its name having been transferred to the Bitterwood (q. v.) of the West Indies *Picræna* (or *Simaruba*) *excelsa*, a lofty tree, the wood of which possesses the same properties, although in an inferior degree; but this inferiority is compensated by the greater facility with which any requisite supply is obtained. It is the wood of this tree which is now sold as *Q.-wood*, or *Q.-chips*, in the shops. It is used to a considerable extent instead of hops for making beer, although the use of it is illegal in Britain, and beer made with it is said to become muddy and flat, and not to keep. Q.-wood is narcotic, and a decoction of it is used for killing flies. Cabinet-work made of it is safe from all attacks of insects. In medicine, it is a valuable tonic; but in fevers, it is not to be compared with Peruvian bark and its alkaloids. Its properties depend chiefly on a bitter principle, called *Quassite* or *Quassin*.

QUATE'RNARY, a term employed by some French and English geologists to characterize the Post-tertiary strata, which they group together into an epoch of equal value with the three great divisions of Primary, Secondary, and Tertiary. The deposits included under the name will be found described under the Pleistocene and Recent strata, to which we refer the reader.

QUATE'RNIONS, the name given by its inventor, Sir W. R. Hamilton (q. v.), to one of the most remarkable of the mathematical methods or calculi, which have so enormously extended the range of analysis, while simplifying its application to the most formidable problems in geometry and physics.

It would be inconsistent with our plan to give even a complete

though elementary analytical view of this calculus; but it is possible, by means of elementary geometry and algebra alone, to give the reader a notion of its nature and value.

For this purpose, it will be necessary to consider some very simple, but important, ideas with reference to the *relative position* of points in space. Suppose A and B to be any two stations, one, for instance, at the top of a mountain, the other at the bottom of a coal-pit. *Upon how many distinct numbers does their relative position depend?* This can be easily answered thus: B is so many degrees of longitude to the east or west of A, so many degrees of latitude to the north or south of A, and so many feet above or below the level of A. THREE numbers suffice, according to this mode of viewing the question, to determine the position of B when that of A is given. Looking at it from another point of view, suppose A to be the earth, B a fixed star. To point a telescope at B, we require to know its altitude and azimuth, its latitude and longitude, or its right ascension and declination. Any of these pairs of numbers will give us the *direction* of the line AB, but to determine absolutely the position of B, we require a *third* number—viz., the length of AB. Hence, it appears that any given line AB, of definite length and direction, is completely determined by *three* numbers. Also, if the line *ab* be parallel and equal to AB, it evidently depends on the same three numbers. Hence, if we take the expression (AB) to denote (*not* as in geometry, the length of AB merely, but) the length and direction of AB; we see that there will be no error introduced, if we use it in the following sense:

$$A + (AB) = B;$$

i. e., if, beginning with A, we take the step represented by (AB), we shall find ourselves at B. From this it follows at once that, if C be any third point,

$$A + (AB) + (BC) = C;$$

i. e., beginning at A, and taking the successive steps (AB) and (BC), we are finally brought to C. But we have also

$$A + (AC) = C,$$

by taking the step from A to C at once. Hence, with the present signification of (AB) &c., we see that

$$(AB) + (BC) = (AC),$$

which shows that lines, *when their length and direction are both considered*, are to be added or compounded according to the same law as velocities or forces. See COMPOSITION OF FORCES. In this sense, a line is called by Sir W. R. Hamilton a *Vector*.

Again, we have evidently

$$A + (AB) + (BC) + (CA) = A,$$

because the three successive steps bring us back to the starting-point. Hence

$$(AB) + (BC) = -(CA),$$

and therefore $(AC) = -(CA)$, or the sign (only) of a vector is changed if its direction be reversed.

The rules for the addition, and therefore for the subtraction of vectors are thus extremely simple; and without any further preface, we are in a position to solve a great many geometrical problems, some of which are of no common difficulty. A comparatively simple one must suffice; let us prove Euclid I., 33; i. e., if AB be parallel and equal to CD, AC is parallel and equal to BD. In vectors, given $(AB) = (CD)$, prove $(AC) = (BD)$. We have at once, by going directly from A to C, and then by the course A, B, D, C,

$$(AC) = (AB) + (BD) + (DC).$$

But $(AB) = (CD) = -(DC)$ by what we have just proved. Hence the first and third terms of the expression for (AC) are equal and of opposite signs, and therefore

$$(AC) = (BD).$$

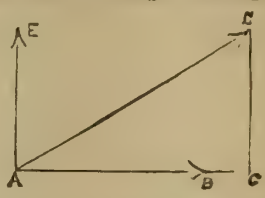
This example has been chosen from its simplicity, and gives an extremely inadequate idea of the grasp which vectors take in common geometry.

So far, we have not advanced much beyond common geometrical methods; but we *now* come to the step in which quaternions proper are introduced, a vector being merely a degraded species of quaternion. This new step contains Hamilton's answer to the question, answered over and over again during the last fifty years in forms of the most uncouth complexity, '*How to express the product, or the quotient of two vectors, or directed lines.*' In other words, keeping to one part of the question only, what is the nature of the factor q in the equation

$$(AC) = q(AB),$$

where A, B, C are any three points?

Let us first consider *on how many independent numbers does it depend?* It might at first sight appear to depend on *six*, for (AB) and (AC), as we have already seen, each contain *three*. But let us analyze the process of passing from the one vector to the other, much as we have already analyzed the vector step of passing from one point to another. To simplify the idea of the process, let us suppose it to be effected by a species of rotation. First, then, in order that (AB) may be turned so as to coincide in *direction* with (AC), it must be turned about an axis perpendicular to the plane of the triangle ABC, and through an angle BAC. Now, the



direction of a line depends on *two* numbers, as we have seen above; hence we have *two* for the direction of the axis, and *one* for the angle through which AB is turned. But AB and AC are not, in general, of equal length; hence, after their directions have by turning been made coincident, AB must be compressed or stretched till its *length* is the same as that of AC. Thus, a *fourth* number is required for the complete description of the process, and therefore q depends upon *four independent numerical quantities;* hence its name, quaternion. A similar investigation, but somewhat less elementary, shows that the *product* of two vectors also depends on four distinct numbers. This will be proved analytically further on in the article.

Now, suppose AB and AC to be *equal* to each other, and at right angles; and suppose

$$q(AB) = (AC);$$

i. e., suppose that q turns AB through a right angle in a given plane, without altering its length. Apply the operation, denoted by q, a second time, and we have

$$q \cdot q \cdot (AB) = q(AC).$$

Now $q(AC)$ must represent a vector equal to AC in length, but turned through a right angle in the plane BAC. It must therefore be in the direction of BA produced through A, and equal in length to AB. Hence, by a previous remark, it may be expressed by

$$-(AB), \text{ or by } (BA).$$

Hence, $q \cdot q(AB) = -(AB)$, or $q \cdot q = -1$.

The particular quaternion, therefore, which turns a vector through 90° without altering its length, has its square equal to -1. Though, of course, they are essentially a real geometrical conception, this result shows how closely quaternions are connected with what are called Imaginary Quantities (q. v.) in analytical geometry and algebra.

Now, it is found, by a careful examination of all the consequences involved, that we are at liberty to represent by a vector of unit length, perpendicular to the plane of two equal lines at right angles to each other, the quaternion which, employed as a multiplier, changes one of these lines into the other. This result we must assume; as its proof, though not in any sense difficult, would require the free use of analytical symbols to condense it within our assigned limits. Hence, three vectors, each of unit length, and each perpendicular to the other two, have the property that the product of any two, taken in the proper order, is the third. For illustration, suppose these to be drawn eastwards, northwards, and upwards, and let them be represented (according to Hamilton's notation) by i, j, k respectively; we have the following equations among them:

$$i \cdot j = k, \quad j \cdot k = i, \quad k \cdot i = j;$$

where it is to be observed that the *order* of the alphabet is maintained throughout. Also, as before, we see that $i^2 = j^2 = k^2 = -1$.

Considering them, for a moment, as handles to be laid hold of to turn the whole system about one of them, we see that i turns j into the position of k; that is, the operation i may be effected by a left-handed quadrantal rotation about the eastward line i. What, then, is the result, upon the vector i, of the rotation symbolized by j? Laying hold of the northward line j, use it as an axis of left-handed quadrantal rotation, and the effect on the system will be not only (as above, $jk = i$) to make the upward line an eastward one, but to make the eastward line a *downward* one; in symbols,

$$j \cdot i = -k.$$

Comparing this with

$$i \cdot j = k,$$

we see that in quaternions, *the Commutative Law of Multiplication does not hold;* i. e., that the product depends not only on the factors, as in arithmetic and algebra, but upon the *order* in which the multiplication is effected. This is, of course, a little perplex-

ing to the beginner, but is easily got over; and the mere consideration of this fact is often sufficient for the proof of theorems regarded in general as of no ordinary difficulty.

For further information, we must refer the reader to Sir W. R. Hamilton's *Lectures on Quaternions*, and to his *Elements of Quaternions*. Some elementary information may also be derived from papers by Kelland and Tait in the *Quarterly Messenger of Mathematics*, and the *Quarterly Mathematical Journal*. The subject is yet in its infancy, but even now its power is herculean; and its extreme simplicity and generality recommend it to all who are desirous of extending the effective range of mathematical analysis.

QUA'TRAIN (Fr. *quatre*, four) is the name given (originally by the French) to a little poem of four verses (lines) rhyming alternately, or even sometimes to four verses of a longer poem, such as a sonnet, if they form a complete idea within themselves. Epigrams, epitaphs, proverbs, &c., are often expressed in quatrains.

QUATRE-BRAS (Four Arms), a village of Belgium, province of South Brabant, about ten miles south-south-east of Waterloo. It is situated at the intersection of the great roads from Brussels to Charleroi, and from Nivelles to Namur, whence its name. On the 16th June 1815—two days before the battle of Waterloo, Q. was the scene of a desperate and sanguinary battle between the English under Wellington and the French under Ney. The honors of the field remained with the former; but the severe defeat of Blücher the same day at Ligny, rendered Wellington's hard-won victory almost valueless; and foreseeing that it would be impossible for him to maintain his position, the English commander retired next morning through Jemappes to Waterloo, in order to keep up his communication with the Prussian army. The loss of the English and their allies at Q. was in all 5200; that of the French, though beaten, amounted only to 4140. This is to be accounted for by the fact that, during the greater part of the engagement, the English had no cavalry (for the Belgian horse galloped off the field without striking a blow) and no artillery.

QUATREFOIL, an opening in tracery, a panel, &c., divided by cusps or featherings into four leaves. This form is much used as an ornament in Gothic architecture.

QUATREFOIL, a heraldic bearing meant to represent a flower with four leaves. It is not represented with a stalk unless blazoned as *slipped*, in which case the stalk joins the lower leaf.

QUATREMÈRE, ETIENNE MARC, a learned French orientalist, was born in Paris 12th July 1782, and from his earliest childhood to his latest years, was literally immersed in abstruse studies, and lived more after the fashion of a medieval recluse than a modern scholar. His public life was almost eventless. Employed in 1807 in the manuscript department of the *Bibliothèque Impériale*, he was promoted in 1809 to the Greek Chair in the College of Rouen, and in 1819 to the chair of Ancient Oriental Languages in the Collége de France. In 1827 he became Professor of Persian in the School for Modern Oriental Languages. He died 18th September 1857. Q.'s erudition was something enormous, as might have been expected from his uninterrupted life-long devotion to study, but according to M. Ernest Renan (himself one of the first living orientalists), he was strikingly deficient in critical insight, and a genius for sagacious and luminous generalization. He would never believe in the hieroglyphic discoveries of Champollion; he despised comparative philology, and thought the labors of men like F. Schlegel, Bopp, Burnouf, &c. were wasted. But in less delicate fields of exploration he is safe. His historical and geographical memoirs, for example, are of incalculable value. Q.'s principal works are—*Recherches sur la Langue et la Littérature de l'Egypte* (Par. 1808), in which it is shown, in the clearest manner, that the language of ancient Egypt is to be sought for in the modern Coptic; *Mémoires Géographiques et Historiques sur l'Egypte* (Par. 1810); *Histoire des Sultans Mamelouks* (Par. 1837); from the Arabic of Makrizi; *Histoire des Mongols de la Perse* (Par. 1836), from the Persian of Rashid-Eddin; and his edition of the Arabic text of the Prolegomena of Ibn-Khaldun, one of the most curious monuments of Arabic literature.

Besides these, a multitude of most valuable articles are scattered through the pages of the *Journal Asiatique* and the *Journal des Savants*. It is deeply to be regretted that circumstances interfered to prevent his executing certain great lexicographical works —Arabic, Coptic, Syriac, Turkish, Persian, and Armenian dictionaries—which he had planned, and for which he had gathered ample materials. His old master, Silvestre de Sacy, pronounced him 'the only man capable of making an Arabic dictionary.'

QUA'VER, in Music, a note whose measure is equal to half a crotchet, one-fourth of a minim, or one eighth of a semibreve.

QUAY (Fr. *quai*), an artificial landing-place or wharf, consists usually of a platform on piles, or of masonry, surmounted with cranes, tramways, and other appliances for lading and discharging cargoes for shipping.

QUEBE'C, the most important military position in the Dominion of Canada, is situated on a steep promontory at the junction of the rivers St. Lawrence and St. Charles, in lat. 46° 48′ N., long 71° 12′ W. It is distant from Liverpool about 2070 miles, is 180 miles north-east of Montreal, 503 miles east-north-east of Toronto, and 430 miles north-north-east of New York. It is connected with all the cities in America by means of the Grand Trunk Railway. The site of Q., originally occupied by an Indian village named Stadacona, was discovered by Jacques Cartier in 1535; but the city was founded by Champlain in 1608. It continued to be the center of French trade and civilization as well as of Roman Catholic missions in North America till 1759, when it fell into the hands of Britain by the memorable victory of Wolfe on the heights of Abraham above the city. Q. remained the chief city of Canada till the British settlements in the West were erected into a separate province, when it became the capital of Canada East, now forming the province of Q. in the Dominion of Canada. The citadel of Q. is the most impregnable fortress on the continent of America. The view which it commands is one of the most magnificent in the world, and the scenery in its neighborhood, amid which are the Falls of Montmorenci, imparts an additional attraction to the city. A seminary for the education of Roman Catholic clergymen was established in the city in 1636 by M. de Laval de Montmorenci, and was raised by the queen in 1854 into a university bearing Laval's name. A Presbyterian college named after its founder, Dr. Morrin, was instituted in 1862, and affiliated in the following year to the M'Gill University of Montreal.

Q. is the seat of a Roman Catholic archbishop and an Anglican bishop, whose respective cathedrals are among the finest specimens of Canadian church architecture. The Church of Scotland and the principal denominations of dissenters are also represented in the city. From the building yards of Q. there are annually launched between 30 and 40 vessels of various tonnage. From 1400 to 2000 vessels enter the port every year from the ocean, principally to export the produce of the country. The chief export trade is in timber. The principal imports are woollen, cotton, and silk goods; iron, coal, hardware, and salt. In the three years 1879–81, the total exports of Q. rose from $4,665,000 to $12,200,000, and the imports from $2,890,000, to $4,500,000. Q. has extensive harbor works, and steam communication with Liverpool, London, Glasgow, &c. Pop. (1871) 59.699; (1881) 62,446. The city returns three members to the Dominion parliament, and three to the provincial legislature. For the province, see CANADA.

QUE'DAH, KEDAH, KEDDAH, KEEDAH, or KIDAH, a half independent state, on the west coast of the Malay Peninsula, on the Strait of Malacca. It extends from about latitude 5° north, to latitude 7° north, and its average breadth is about 50 miles. The British province Wellesley, which lies between it and the sea-coast opposite to Penang, was separated from it and ceded to the British in 1800, by a treaty in which the British agreed to pay the rajah 10,000 dollars a year. Q. nominally owes a kind of feudal subjection to Siam, but is in reality much more subject to the sway of Britain.—The capital, from which the state takes its name, stands at the mouth of a river also of the same name, in lat. 6° 6′ N., and long. 100° 20′ E. Its pop. is estimated at about 21,000.

QUE'DLINBURG, a town of Prussian Saxony, at the northern base of the Harz Mountains, on the river Bode, and 35 miles south-west of Magdeburg. Founded by Henry the Fowler in 920, it consists of an old town, a new town, and several suburbs, and is surrounded by a wall flanked with towers. On an eminence overlooking the town stands the castle, which, prior to the Reformation, was the residence of the abbesses of Q., who were independent princesses of the empire, and had a vote in the diet, and other privileges. This town was a favorite residence of the German emperors of the Saxon line. Here Klopstock was born. It is now the center of considerable industry. Cloth is manufactured, and there is a good trade in corn and cattle. Pop. (1880) 18,437.

QUEEN (Sax. *cwen*, woman; Gr. *gyne*, woman; Sansc. *goni*, mother, from *gan*, to generate), in its primary signification, the king's consort, who has in all countries been invested with privileges not belonging to other married women. The English queen, unlike other wives, can make a grant to her husband, and receive one from him. She can sue and be sued alone, and purchase land without the king's concurrence. The Statute of Treasons makes it treason to compass her death, or to violate her chastity, even with her consent, and the queen consenting is herself guilty of treason. If accused of treason, the queen is tried by the peers of the realm. A duty, amounting to one-tenth of the value of fines on grants by the crown, was in former times due to the queen, under the name of Queen-gold. Charles I. purchased it from his consort, Henrietta Maria, in 1635, for £10,000, but it was not renewed at the Restoration.

The queen-consort is exempt from paying toll, and from amercements in any court. She has a household of her own, consisting of six Ladies of the Bedchamber, a Lord Chamberlain, Vice-chamberlain, Mistress of the Robes, Master of the Horse, and three Equerries, as also her Attorney-general and Solicitor-general, distinct from those of the king, who are entitled to take a place within the bar along with the King's Counsel, and prosecute suits in law and equity for the queen. It has been the usual practice to crown the queen-consort with solemnities similar to those used in the coronation of the king. In the case of Queen Caroline, consort of George IV., who was living apart from her husband, this was not done, though her right to coronation was argued by Mr. Brougham before the Privy Council. Certain rents or revenues were anciently appropriated to the income of the queen, but no separate revenues seem ever to have been settled on any queen-consort by parliament. Her personal expenses are defrayed from the king's privy purse.

The *Queen-dowager* is the widow of the deceased king. She retains most of the privileges which she enjoyed as queen-consort, nor does she lose her dignity by re-marriage; but it has been held that no one can marry the queen-dowager without permission from the king, on pain of forfeiture of lands and goods. On the marriage of a king, or accession of an unmarried prince, parliament makes provision for the queen's maintenance, in case of her survivance. An income of £100,000 a year, with two residences, was settled on the queen of George III.; and the same provision was made for the late Dowager Queen Adelaide, at the commencement of the reign of William IV. The queen-dowager, when mother of the reigning sovereign, is styled the Queen-mother. Until the time of George II., queens-consort bore the arms of the king impaled with their paternal coat, with the king's dexter and their paternal sinister supporter; since that period, they have used both royal supporters. It is not usual to place the arms of the queen-consort within the Garter.

The *Queen-regnant* is a sovereign princess who has succeeded to the kingly power. In modern times, in those countries where the Salic law does not prevail, on failure of males, a female succeeds to the throne. By an act of Queen Mary, the first queen-regnant in England, it was declared 'that the regall power of this realme is in the queene's majestie as fully and absolutely as ever it was in any of her most noble progenitours kinges of this realme;' and it has since been held, that the powers, prerogatives, and dignities of the queen-regnant differ in no respect from those of the king. The husband of the queen-regnant is her subject; but in the matter of conjugal infidelity, he is not subjected to the same penal restrictions as the queen-consort. He is not endowed by the constitution with any political rights or privileges, and his honors and precedence must be derived from the queen. The late Prince Consort was naturalized by 3 and 4 Vict. c. 1, 2, words being used which enabled him to be a privy-councillor, and sit in parliament; and by 3 and 4 Vict. c. 3, Queen Victoria was empowered to grant him an annuity of £30,000; but it was provided that His Royal Highness was not, by virtue of his marriage, to acquire any interest in the property of her Majesty. By a decree of the Queen, Prince Albert enjoyed place, pre-eminence, and precedence next to her Majesty.

A queen-regnant is the only woman who is in her own right entitled to bear her arms in a shield and not in a lozenge. She is also entitled to the exterior ornaments of helmets, mantling, crest, and motto, and may surround her shield with the Garter, and the collars and ribbons of all other orders of knighthood of which she is sovereign.

QUEEN ANNE'S BOUNTY, the name given to a fund appropriated to increase the incomes of the poorer clergy of England, created out of the first-fruits and tenths, which before the Reformation formed part of the papal exactions from the clergy. The first-fruits are the first whole year's profit of all spiritual preferments, and the tenths are one-tenth of their annual profits, both chargeable according to the ancient declared value of the benefice; but the poorer livings are now exempted from the tax. Henry VIII., on abolishing the papal authority, annexed both first-fruits and tenths to the crown; and statute 2 and 3 Anne, c. 11, first formed them into a perpetual fund for the augmentation of poor livings, and advancing money to incumbents for rebuilding parsonages. The Archbishops, Bishops, Deans, Speaker of the House of Commons, Master of the Rolls, Privy Councillors, Lieutenants, and *custodes rotulorum* of the counties, the Judges, Queen's Serjeants-at-law, Attorney and Solicitor-general, Advocate-general, Chancellors and Vice-chancellors of the two Universities, Lord Mayor and Aldermen of London, and mayors of the several cities; and by supplemental charter the officers of the Board of Green Cloth, the Queen's Council, and the four Clerks of the Privy Council, were made a corporation by the name of 'The Governors of the Bounty of Queen Anne, for the augmentation of the Maintenance of the Poor Clergy;' and to this corporation was granted the revenue of first-fruits and tenths. Queen Anne's charter has been regulated and supplemented by a number of statutes, the latest being 33 and 34 Vict. c. 89. According to the rules established by the trustees, the sum allowed for each augmentation is £200, to be laid out in land to be annexed to the living: this donation to be made: 1. To all livings below £10 a year; 2. To all livings below £20; and so in order, while any remain under £50. But when any private benefactor advances £200 for the augmentation of any living not above £45 a year, the trustees give another £200, though it may not belong to the class of livings which they are then augmenting.

QUEEN ANNE'S FARTHINGS. The farthings of Queen Anne have attained a celebrity from the large prices sometimes given for them by collectors. Their rarity, however, has been much overrated; it was, indeed, long a popular notion that only three farthings were struck in her reign, of which two were in



Queen Anne's Farthing.

public keeping—a third was still going about, and, if recovered, would bring a prodigious price. The Queen Anne farthings were designed by a German of the name of Crocker or Croker, principal engraver to the Mint; and were only patterns of an intended coin, having never been put into circulation; but they are by no means exceedingly scarce. A few of them were struck in gold.

QUEENBOROUGH, a village in the Sheppey district of Kent, about 2 miles south of Sheerness. It was founded by Edward III. and named after his Queen, Philippa. A line of steamers recently established between Q. and Flushing affords a direct and rapid passage from England to the continent.

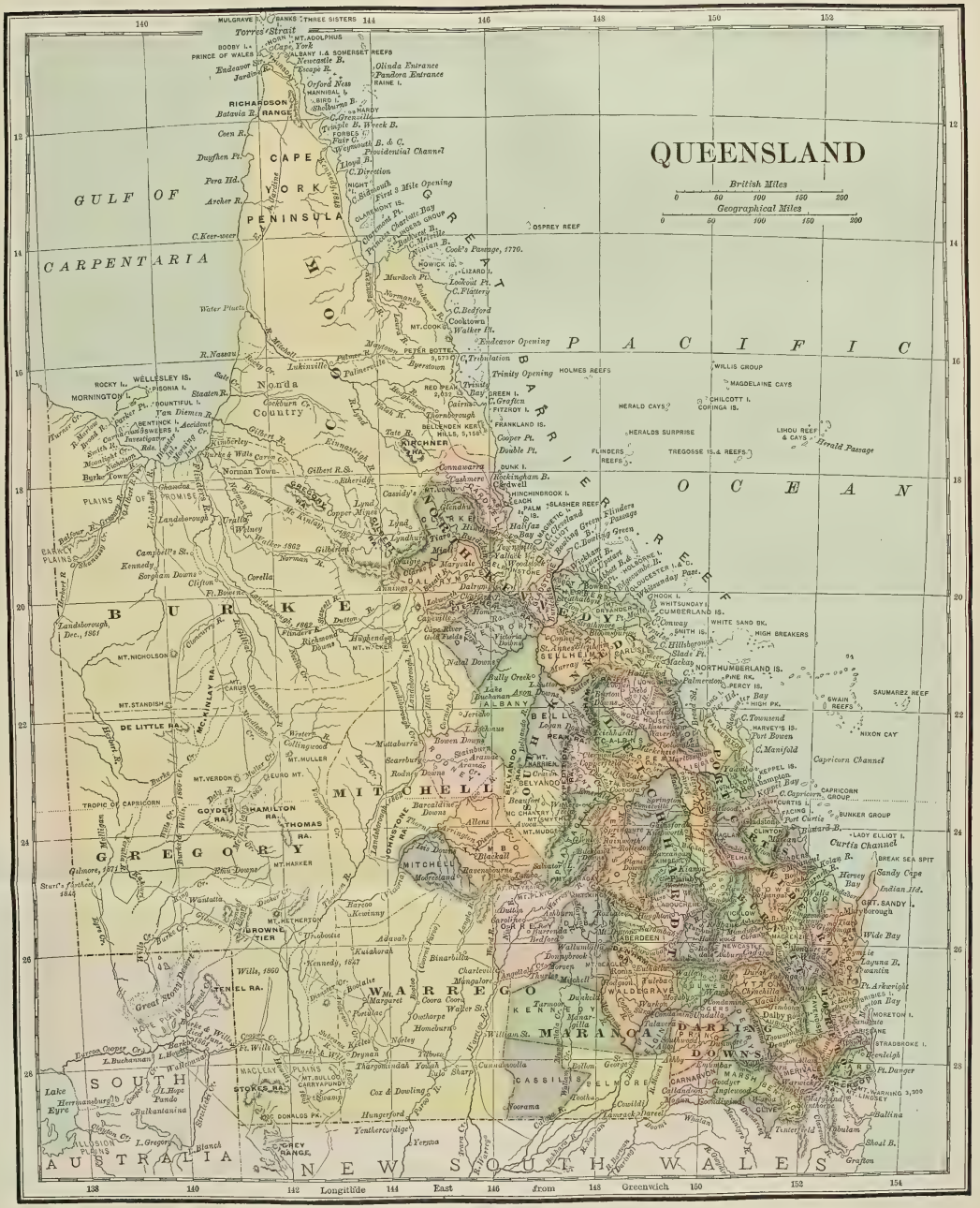
QUEEN CHARLOTTE ISLAND AND QUEEN CHARLOTTE SOUND. See VANCOUVER ISLAND.

QUEEN OF THE MEADOW. See SPIRÆA.

QUEEN-POST, the side or secondary upright ties in a trussed-roof. See ROOF.

QUEEN'S BENCH, or KING'S BENCH, one division of the High Court of Justice, which was a separate court until the changes introduced by the Judicature Act of 1873, and subsequent acts. The King's Bench was so called from its origin, the king being wont to sit there in person. In Cromwell's time, it was called the Upper Bench. The court consists of five judges, a President (who is called the Chief-justice of England, and is the highest of all the judges next to the Lord Chancellor), and four puisne judges called justices. In 1874, the old courts were reconstituted, and all were merged in the High Court of Justice, which consists of four divisions, each of which, however, retains nearly the same jurisdiction as before such change, and the only appeal from each is to the High Court of Appeal, which exercises the functions formerly vested in, and from remote antiquity exercised by, the House of Lords. The ancient jurisdiction of the court, and the history of its modifications, are too technical to be stated in this place, but the outline of the leading points of jurisdiction may be shortly stated. The Q. B. is the highest court which has a criminal jurisdiction, and such jurisdiction is unlimited. But practically, this jurisdiction is seldom exercised originally, for it is only when an indictment is removed from an inferior court into the Q. B. that a criminal trial takes place there, and this is only the case when there is some peculiar difficulty or importance attending the trial, which renders it expedient to remove it from the sessions or assizes. But though criminal trials in the Q. B. are exceptional, there are certain criminal matters which are part of its ordinary administration. A criminal information, for example, when filed by the Attorney-general, or the master of the Crown-office, charging a person with a criminal offence, is tried in the Q. B. as a matter of course, and can be tried in no other court.

The Q. B exercises a superintending control over all interior tribunals, and also over public bodies, by commanding them to do a specific duty, the writ being called a writ of Mandamus; or by prohibiting them from going on with some matter over which they have no jurisdiction, by a writ called a writ of Prohibition. The Q. B. also entertains appeals from justices of the peace on a vast variety of matters. Besides the criminal jurisdiction, and the prerogative writs of Mandamus, Prohibition, and Quo Warranto, there is a civil jurisdiction belonging to the Q. B. of the most extensive kind; indeed, any civil action to recover debts and


QUEENSLAND
British Miles
0 50 100 150 200
Geographical Miles
0 50 100 150 200
GULF OF CARPENTARIA
CAPE YORK PENINSULA
GREAT BARRIER REEF
PACIFIC OCEAN
Torres Strait
MULGRAVE
BANKS
THREE SISTERS
MT. ADOLPHUS
Cape York
BOOBY I.
PRINCE OF WALES
ALBANY I.
SOMERSET
REEFS
Endeavour R.
Jardine R.
Newcastle R.
Escape R.
Olinda Entrance
Pandora Entrance
RAINE I.
Orford Ness
MANNIKAL I.
BIRD I.
RICHARDSON RANGE
Batavia R.
Shelburne B.
HARDY
C. Grenville
Triggle R.
Wreck B.
FORBES
Flat C.
Weymouth B.
B. & C.
Providential Channel
Coen R.
Dougfhen Pt.
Lloyd B.
C. Direction
Pera Hd.
Archer R.
NIGHT I.
C. Grafton
Five 3 Mile Opening
CLARENCE IS.
OSPREY REEF
C. Keer-weer
Cook's Passage, 1770.
MOWICK IS.
LIZARD I.
Murdoch Pt.
Lookout Pt.
C. Flattery
Water Pools
C. Bedford
Cooktown
Walker Pt.
MT. COOK
Endeavor Opening
R. Mitchell
R. Nassau
PETER BOTTE
C. Tribulation
Palmer R.
Maytown
Lukinville
Palmerville
Byerstown
Trinity Opening
HOLMES REEFS
WILLIS GROUP
ROCKY I.
WELLESLEY IS.
MORNINGTON I.
PISONIA I.
Staaten R.
Batt C.
Norda Country
REG PEAK 2,035
Trinity Bay
GREEN I.
Cairns
Grafton
FITZROY I.
MAGDELAINE CAYS
CHILCOTT I.
CORINGA IS.
HERALD CAYS
BOUNTIFUL I.
Van Diemen R.
Cockburn C.
Hann R.
Tate R.
Thornborough
BELLENDEN KER HILLS, 5,158
FRANKLAND IS.
HERALDS SURPRISE
LIHOU REEF & CAYS
Herald Passage
KIRCHNER
Cooper Pt.
Double Pt.
FLINDERS REEFS
TREGOSSE IS. & REEFS
Connawarra
DUNK I.
Rockingham B.
Cardwell
HINCHINBROOK I.
PALM I.
LEACH
SLASHER REEF
Halifax B.
Flinders Passage
Hinchinbrook Chan.
Bowling Green
Gilbert R.S.
Normanton
Gilbert R.
Einasleigh R.
Burke & Wills Camp
Burke Town
Ghoondoo
PROMISE
Landsborough
Trafalgar
Whitney
Lynd
Copper Mines
Lynd Junction
Lyndhurst
Mt. Windsor
Walker 1862
Gilberton
Campbell's St.
Kennedy
Sorgham Downs
Clifton
Corella
Fl. Bowen
Annings
Dalrymple
Townsville
Cape River Gold Fields
Cape River
Port Denison
Bowen
Whitsunday I.
Cumberland Is.
White Sand Bk.
High Breakers
Smith Is.
Hillsborough
Slade Pt.
Mackay
Northumberland Is.
Pine Pk.
Percy Is.
Saumarez Reef
Swain Reefs
Nixon Cay
Capricorn Channel
Keppel Is.
Capricorn Group
Curtis I.
Facing I.
Port Curtis
Bunker Group
Lady Elliot I.
Curtis Channel
Break Sea Spit
Sandy Cape
Indian Hd.
Port Sandy
Wide Bay
Laguna B.
Fraser I.
Moreton I.
Stradbroke I.
Pt. Danger
Mt. Warning 3,300
Lindsey
Ballina
Shoal B.
Grafton
Tweed
Richmond
Clarence
Logan
Brisbane
Moreton B.
Stanley
Wivenhoe
Esk
Ipswich
Warrego
Darling Downs
Maranoa
Balonne
Condamine
Nogoa
Comet
Fitzroy
Dawson
Mackenzie
Isaac
Burdekin
Belyando
Suttor
Bowen
Proserpine
Whitsunday
Broadsound
Peak Downs
Clermont
Sapphire
Rockhampton
Yeppoon
Keppel Bay
Port Curtis
Gladstone
Calliope
Boyne
Auckland Pt.
Hervey Bay
Maryborough
Gympie
Noosa
Caloundra
Pine R.
Redcliffe
Bribie I.
Pumicestone Pass
Caboolture
Sandgate
Brisbane
Ipswich
Logan
Beaudesert
Nerang
Southport
Coomera
Tweed
Richmond
Clarence
Burke
Landsborough, Dec., 1861
Mt. Nicholson
Mt. Standish
De Little Ra.
Mt. Carlo
Mt. Muller
Euro Mt.
Mt. Verdon
Tropic of Capricorn
Goyder
Hamilton Ra.
Thomas Ra.
Mt. Harker
Gilmore, 1871
Stuart, 1st Trav. 1845
Mt. Ketherton
Browne Tier
Wills, 1860
Kennedy, 1847
Denison Ra.
Great Stony Desert
Wills
Burke
Cooper
Eyre Creek
Diamantina
Lake Eyre
Herrensburg L.
Pando
Lake Hope
Bulkatanana
Macumba
Mt. Bulloo
Carrapundy
Stokes Ra.
Donalds Pk.
Grey Range
Yeathercoridge
Yerrina
Hungerford
Cox & Dowling
Thargomindah
Yowah
Cunnamoolla
Cassini
Noorama
Tambo
Augustus
Barcoo
Kewinny
Aquah
Ketabarah
Binarulla
Charleville
Mungalora
Coora
Walter Sir
Southorpe
Homebush
Nokey
Tibbuta
Drynan
Pt. Wills
Burt
Mt. Drynan
Thylungra
Eyre Creek
Cooper Creek
L. Buchannan
L. Hope
Wallumbilla
Roma
Mitchell
Warroo
Mungallala
Tarroom
Dirranbandi
Surat
Yuleba
Wandoan
Taroom
Dawson R.
Callide
Theodore
Banana
Moura
Duaringa
Rockhampton
Yeppoon
Emerald
Clermont
Sapphire
Peak Downs
Broadsound
Nebo
Mackay
Proserpine
Bowen
Whitsunday
Charters Towers
Ravenswood
Townsville
Ingham
Herbert R.
Cardwell
Hinchinbrook I.
Palm I.
Lucinda
Halifax B.
Flinders Passage
Bowling Green
Burdekin R.
Belyando R.
Suttor R.
Nogoa R.
Comet R.
Dawson R.
Mackenzie R.
Isaac R.
Fitzroy R.
Condamine R.
Balonne R.
Maranoa R.
Darling Downs
Warrego
Paroo
Bulloo
Cooper Creek
Diamantina R.
Georgina R.
Eyre Creek
Lake Eyre
Lake Frome
Lake Callabonna
Lake Blanche
Lake Gregory
Lake Torrens
Lake Hope
Lake Herrensburg
Lake Pando
Lake Macumba
Lake Yowah
Lake Wallumbilla
Lake Broadwater
Lake Murray
Lake Dunn
Lake Galilee
Lake Buchanan
Lake Elphinstone
Lake Lindeman
Lake Proserpine
Lake Cootharaba
Lake Weyba
Lake Wivenhoe
Lake Somerset
Lake Moogerah
Lake Maroon
Lake Perseverance
Lake Broadwater
Lake Murray
Lake Dunn
Lake Galilee
Lake Buchanan
Lake Elphinstone
Lake Lindeman
Lake Proserpine
Lake Cootharaba
Lake Weyba
Lake Wivenhoe
Lake Somerset
Lake Moogerah
Lake Maroon
Lake Perseverance
Longitude East from Greenwich
138
140
142
144
146
148
150
152
154

damages may be brought there. The civil jurisdiction is mostly shared in common with the other two common-law divisions. The judges of the Q. B. are often called the Queen's Coroners, having a universal jurisdiction of that kind throughout England, though seldom acting in that capacity. The Chief-justice has latterly been usually made a peer, or has the option of becoming one if he pleases. The officers of the court are the Master of the Crown-office, and several masters of the court. [Further consolidation of the common law courts took place in 1881, and the High Court of Justice is now divided into the three divisions of Chancery; Common Law; Probate, Divorce, and Admiralty.]

QUEEN'S COLLEGE, Oxford. In 1340 Robert de Eglesfield, chaplain or confessor to Queen Philippa, founded, by license of Edward III., a collegiate hall in Oxford, under the name of the Hall of the Queen's Scholars. In his statutes, he sets forth his motives and objects with unusual minuteness. Theological study was the main object of the foundation. Residence was rigidly enforced, and poverty enjoined with peculiar force. The original number of the provost and fellows was to be 13, in memory of our Lord and the 12 apostles; and the ultimate number of poor boys to be educated on the foundation was 72, in memory of the 70 disciples. Few colleges, however, have disregarded more directly the wishes of their founders. When the Commissioners under 17 and 18 Vict. c. 81 began their work, they found the poverty required changed into a provostship of £1000 a year, and fellowships of £300, the conditional preference to north-countrymen converted into an absolute exclusion of all others; and the 72 poor children represented by 8 'taberdars', as they are called, who were alone eligible to fellowships. A separate foundation had been given to Queen's by John Michel, Esq., in 1736, consisting of 8 open fellowships, and 4 open scholarships. The Commissioners introduced great changes, The foundations are consolidated, and the college now consists of a provost, 19 fellows, 15 scholars or taberdars, 2 Bible-clerks, and 4 Eglesfield exhibitioners. There are also upwards of 20 exhibitions in this college, some of which are confined to natives of the northern counties. There are 30 benefices in the gift of the college, also the principalship of St. Edmund Hall.

QUEENS' COLLEGE, Cambridge, was founded in 1446 by Margaret of Anjou, consort of Henry VI., and refounded in 1465 by Elizabeth Woodville, consort of Edward IV. The college consists of a President and 14 foundation Fellows; the fellowships being tenable for 10 years from M.A. without being subject to any restrictions whatsoever; while any Fellow who takes holy orders, and has not a benefice of the net annual value of £300, may hold his fellowship for life. The new statutes provides that there shall be at least 14 scholarships, tenable till B.A., ranging between £30 and £50; the number and value of the scholarships to be augmented at the discretion of the President and Fellows. Besides these, there are five exhibitions, ranging from £12 to £20; and there are funds to the amount of £130 per annum at the disposal of the President, for the behoof of deserving students of limited means. There are likewise a number of prizes, ranging from £5 to £30. The College holds the patronage of ten benefices in the counties of Bucks, Cambridge, Essex, Leicester, Norfolk, Notts, and Wilts.

QUEEN'S COUNSEL are certain barristers who receive from her Majesty a patent giving them preaudience over their brethren, and but for which they would rank only according to seniority of their standing as barristers. The advantage of appointing Queen's Counsel is this, that it enables the most able or successful counsel to take precedence of those of the same or longer standing, and to take the chief conduct of causes. In practice, there are almost invariably two counsel engaged on each side, called a leader and a junior, and the leader is generally a Queen's Counsel, and the junior is not. The appointment is made by the crown, on the nomination of the Lord Chancellor. The practice of appointing crown counsel is adopted in Ireland, and also in Scotland. In the Courts of Chancery in England, it was usual for a Queen's Counsel to confine himself to a particular Vice-Chancellor's court, or to that of the Master of the Rolls, so that his clients might thus reckon on his attendance there; and when he went into another court, he required an addition to his fee. In the common-law courts, however, this arrangement was impracticable, and had never been adopted. It is sometimes popularly believed that the appointment of Queen's Counsel entitles the counsel to a salary from the crown; but this is a mistake, except as to the Attorney and Solicitor-general. When a Queen's Counsel is engaged in a criminal case againt the crown, as, for example, to defend a prisoner, he requires to get special license to do so from the crown, which is always given, as a matter of course, on payment of a small fee. In courts of law and equity, a Queen's Counsel is entitled to preaudience over all other counsel, except those who were appointed Queen's Counsel before him. A Queen's Counsel has preaudience over all Serjeants-at-law, though many of the latter obtain patents of precedence, which also make them in effect Queen's Counsel, as well as serjeants, and prevent them being displaced by those who come after them. The order of Serjeants-at-law is much more ancient than that of Queen's Counsel, though now it is in point of rank inferior. The practice of appointing Queen's Counsel is not older than the time of Sir Francis Bacon, who was the first appointed.

QUEEN'S COUNTY, an inland county of the province of Leinster, Ireland, is bounded N. by the King's County, E. by Kildare and Carlow, S. by Kilkenny, and W. by Tipperary and King's County. Area, 424,854 acres, of which 363,153 are arable. The population, in 1861, was 90,750; in 1871, 79,771; in 1881, 72,598, of whom 63,963 were Catholics, 7743 Protestant Episcopalians, and the rest Protestants of other denominations. The number of acres under crop in 1881 was 139,831; cattle, 74,277; sheep, 74,344; pigs, 28,021. Q. C., for the most part, is within the basin of the Barrow, which is the chief river, and is partly navigable for barges. On the north-western border lie the Slieve Bloom Mountains, and the Dysart Hills occupy the south-east; the rest of the surface being flat or gently undulating. In its geological structure, it belongs to the great limestone district; but the Slieve Bloom Mountains are sandstone, and the Dysart Hills include coal, but not in deep or profitably worked beds. Coarse linen and cotton cloths are manufactured in small quantities. The chief town is Maryborough; pop. (1881) 2872. The National schools in 1880 were 107; pupils, 13,274. Q. C. anciently formed part of the districts of Leix and Ossory; and on the submission of O'More to the English, the territory retained a qualified independence. Under Edward II., the O'Mores became so powerful, that a protracted contest was maintained by them with the English. In the reign of Edward VI., Bellingham, the lord-deputy, succeeded in re-annexing the territory of the O'Mores to the Pale (q. v.); and a new revolt in Mary's reign led to measures by which it was finally reduced to a shire, under the name Q. C., in honor of Mary, from whom also the chief town, Maryborough, was called. There are a few antiquities of interest—a perfect round tower, and two in a less perfect condition, and some ecclesiastical and feudal remains, the most important of the latter being a castle of Strongbow on the picturesque Rock of Dunamase. Q. C. is traversed by the Great Southern and Western, and by the Midland Great Western Railways, and also by a branch of the Grand Canal. It returns two members to parliament.

QUEEN'S EVIDENCE. See King's Evidence.

QUEE'NSFERRY, South and North.—South Q. is a royal and parliamentary burgh in Linlithgowshire, on the south shore of the Firth of Forth, about 9 miles west-north-west of Edinburgh. It was erected into a royal burgh in 1636, but was for centuries before a burgh of regality. The walks and scenery about South Q., with Hopetoun House and grounds on the west, and Dalmeny Park on the east, are very beautiful, and the town itself is a good deal resorted to for sea-bathing. The Forth—much wider both above and below the ferry—here narrows to a width of only about two miles. It receives historical mention as early as the middle of the 11th c., as the ferry between Edinburgh and Dunfermline. A railway bridge across the Firth here was begun in 1878, abandoned after the Tay Bridge disaster, and re-commenced on a new plan in 1881. Pop. (1881) 1966. South Q. is one of the Stirling district burghs.—*North Queensferry*, a small village in Fifeshire, on the north shore of the Firth of Forth, opposite South Q.; pop. (1881) 360.

QUEENS'LAND. This prosperous British colony occupies the whole of the north-eastern portion of Australia, commencing at a point of the east coast about 400 miles north of Sydney, called Point Danger, in lat. 28° 8′ S. The greater portion of the southern boundary-line is formed by the 29th parallel of south latitude. The eastern seaboard extends about 1300 miles to Cape York, the extreme northern point of the continent, in lat. 10° 40′. The mean breadth of the territory is 900 miles, from the eastern coast-line to the meridian of 138° E. long., which forms the western boundary-line. This includes the greater portion of the Gulf of Carpentaria, which has a seaboard of about 900 miles. The whole of Q. comprises 669,520 sq. m.—nearly twelve times the area of England and Wales.

The portion of the colony extending along the eastern coast, is indented with numerous bays, which are the outlets of many navigable rivers, having their sources in the cool gorges and deep recesses of a great mountain-range, running north and south, parallel with the sea-coast, at a distance of from 50 to 100 miles. The summits of this great 'dividing range' rise from 2000 to 6000 feet above the level of the sea. Numerous spurs are given off from the range in ridges sloping gradually towards the coast. These ridges are generally composed principally of quartz, and in many places form good natural roads for a considerable distance. The ridges are usually covered with a variety of fine and valuable timber. The iron-bark, blood-wood, box, and other descriptions of wood, very valuable to the farmer for fencing and building, are found here in great abundance.

Unlike almost every other portion of Australia, Q. is correctly

described as a 'land of rivers and streams.' These rivers find an outlet in the many large and beautiful bays and estuaries on the eastern seaboard. One of these, Moreton Bay (q. v.), receives the waters of five rivers, which are always navigable. The largest of these, the Brisbane, is navigated by good-sized steamers for 75 miles, and is nearly a quarter of a mile wide at a distance of 15 miles from its mouth. The principal rivers on the eastern seaboard are the Brisbane, the Burnett, the Mary, the Calliope, the Boyne, the Fitzroy, the Pioneer, and the Burdekin. The longest tidal river in Q. is the Fitzroy, which drains an area of not less than 50 millions of acres, and is navigable as far as Yaruba, 60 miles from its estuary in Keppel Bay. It receives, as its principal tributaries, the Dawson, Mackenzie, and Isaacs, large streams flowing for several hundred miles from the north-west, west, and south-western parts of the interior. The tide at Rockhampton (40 miles from the embouchure of the river) rises 14 feet, and the stream is thus rendered navigable for vessels of considerable burden.

The banks of the rivers are usually well elevated, and in many places consist of very rich alluvium, brought down from the great mountain-ranges. This alluvial soil is frequently of very great depth, and is marked everywhere by a magnificent growth of timber, very unlike the ordinary Australian wood. The enormous fig-trees and gigantic eucalyptæ tower aloft, and spread out their great arms, festooned with vines and flowering parasites, which throw themselves over every spreading branch, and deck it with their varied and brilliant colors; the tall pine-trees shoot up their straight stems to a great height; while the cedar, the myrtle, the rosewood, and tamarind trees, display their rich and green foliage in every variety of shade. A thick evergreen hedge of mangroves covers the banks, preserving them from the wash of the stream; and at certain seasons of the year, this is fringed with thousands of flowering lilies.

Ordinarily, the eastern sea-board part of the country assumes very much the appearance of park-scenery in Great Britain, the trees standing at some distance apart, and the ground between them being covered with grass, which is generally green and luxuriant throughout the whole year. The regularity of the showers which fall in the summer season keeps the grass growing with luxuriant verdure generally during the hot months. Exceptions to this sometimes occur, and a dry summer appears to have been experienced in this part of Australia about once in every six or seven years. The summer of 1863 formed one of these exceptional seasons. The frosts of winter being generally so slight as not to injure the vegetation, the country is almost always green from January to December.

Beyond the 'Andes,' or great dividing-range, the country presents features of still greater beauty and fertility. Vast plains—10, 15, or 20 miles across—stretch out their level surface unbroken by a single tree, but covered with luxuriant grass, and often purpled over with fragrant herbage. These great plains are composed of rich black soil. They are well watered with a network of streams, which trickle down from the gradual slopes of the mountain-range. The soil in this locality is admirably adapted for tillage; and within a certain distance of the mountain range, the rains fall with great regularity. The land here is lightly timbered, and is cleared with less labor than on the lower lands, and the soil is proved to be peculiarly adapted for the growth of wheat of the finest quality. The yield per acre in this locality has sometimes been as much as 50 and even 60 bushels to the acre, of 63 lbs. to the bushel. The average yield may be estimated at 30 bushels per acre. Indian corn and other cereals as well as all the European fruits, grow luxuriantly, and come to the greatest perfection in this highly-favored locality, which has been called the 'Garden of Queensland.'

'This country, west of the great dividing-range, stretches away in a series of fine plateaux for a distance of 400 or 500 miles westward, and, with the interruptions of other mountain-ranges crossing the main range at right angles, for upwards of 1000 miles towards the fertile plains bordering the shores of the Gulf of Carpentaria.

A third distinct portion of Q. is formed by the country which falls off in a succession of steep declivities, or more gradually descending terraces, from the table-land thus described, towards the lower land, which then intervenes between these terraces and the western boundary-line of the colony and of South Australia.

The 'settled districts,' by far the most important part of the colony, occupy the southern part of the strip watered by rivers discharging eastwards at the Pacific. This region, a comparatively small area in the south-east of Q., is not merely the most populous and rich, but is more suitable for agriculture, and contains the chief deposits of coal and gold. Sheep do not thrive here so well as further west. A second district is watered by rivers running north-west to the Gulf of Carpentaria; it is a partially settled pastoral country, with some mines. The great pastoral plains, already mentioned, form the third drainage area, the streams in it running partly into the marshes of South Australia, or into the Darling and Murray rivers.

Two-thirds of Q. lie within the tropics. The climate on the whole is hot, but varies much according to situation. At Brisbane, in the temperate part of the country, the average temperature in recent years was 78°; the absolute maximum 108°; the absolute minimum, 34°. The climate may fairly be compared with that of Madeira, which it is said to resemble. On the north coast the monsoons blow regularly, and the year is divided into seven dry and five wet months. November to April is the rainy season. On the downs and high lands the air is cool, and on the east coast the sea-breeze tempers the heat. The rainfall varies prodigiously both according to locality and from year to year. In the same year (1878) 56 inches fell at Brisbane in 124 days; at Mackay, the rainfall was 86 inches; at Toowoomba, on the Darling Downs, 100 miles from Brisbane, only 29 inches; and at other places, only 19, 16, and even 10. Again, in 1865, 24 inches fell at Brisbane; in 1870, 79. Long droughts and destructive floods are not unknown. In the north, especially in the low lands, the heat of the tropical sun is too great for Europeans, though gold-mining is pursued by Europeans within the tropical limits. Nevertheless, the climate of Q., is on the whole very healthy, the death-rate never having exceeded 24 per 1000, while in some places it is only 14. The birth-rate is very high.

The Alienation of Crown-lands Act, passed during the first session of the colonial parliament, revolutionized the old plan of selling land at a high upset price at auction, and the disposal of lands in Q. is now regulated by a series of acts passed since 1868 (including the Land Amendment Act of 1879).

Land is least for pastoral purposes, or purchased in fee simple. Leases of land in the not as yet settled districts may be had for 21 years, at a rent of 5*s*. a square mile for the first seven years, 10*s*. for the second, and 15*s*. for the third seven years. A condition of the lease is that the land must be stocked to the extent of one-fourth of its capacity—namely, 100 sheep or 10 cattle per square mile. The amount so leased must be not less than 28 square miles, or more than 100 square miles. The quantity of land that may be purchased by one person, and the price to be paid for it, vary according to the position of the land. The largest quantity anywhere sold by the system of 'conditional selection,' is 5120 acres; the lowest, 40 acres. The lowest price is 5*s*. an acre; the highest about 15*s*. Payment may be made in ten annual instalments. It is required that the purchaser or his bailiff should reside on the land, that certain improvements should be made, and part of the land be tilled. If at the end of three years all the conditions have been so far fulfilled, the purchaser may pay up the money and get a deed of the land. The Homestead Law encourages the settlement of industrious farmers. On condition of continuous residence for five years, and cultivation or improvement to the value of 10*s*. per acre, the homestead selector gets 160 acres of land or less at the nominal price of sixpence an acre per annum for five years.

Q. is a great pastoral country, the wool of its sheep being remarkable for fineness; and towards the north the fleeces, though they diminish in quantity, rather increase in fineness. Much of the soil is very fertile, and soil and climate are suited for the production of a great variety of crops, including wheat, barley, oats, maize, tobacco, coffee, rice, potatoes, arrowroot, sugar, and cotton. Semi-tropical fruits grow as well as English ones; and bananas, pine-apples, guavas, melons, citrons, oranges, yams, grow side by side with the fruits and flowers of Northern Europe. Still, agriculture is not a favorite calling in Q. Whereas in South Australia there are under tillage nearly seven acres of land per head of population; in Q. there is only one. In 1881 only about 11,000 acres were under wheat, while 44,000 were under maize. Sugar is now the favorite crop. During the American war, cotton was extensively grown: in 1871, 6000 bales were raised; in 1881, only 125,730 lbs. were produced. In the year 1880–81 the total area of land under cultivation was 120,881 acres (14,000 more than in preceding year). Besides the grain crops, potatoes, sugar, and cotton, the items sorghum, tobacco, bananas, pine-apples, oranges, and vines for wine-making, occupied most part of the tilled ground. The growth of cotton led to the introduction of South Sea Islanders as laborers, the employment of whom is regulated by special acts. It seems doubtful whether, for such crops as sugar, cotton, and tropical fruits, European labor can suffice, and whether the help of Chinese or coolies may not soon be required.

The mineral resources of Q. are very great. Gold has been plentifully found, especially since 1867; and in 1880 about twenty gold-fields were being wrought. There are both quartz and alluvial workings. Of late years there has been less decrease in the quantity of gold found than in any other Australian colony. Copper is extensively found; boundless stores of tin keep some twenty mines at work, though the output varies from year to year. Antimony is found. The coal-beds of Q. are very productive, and in some of them the coal is of very fine quality. It has been

estimated that the coal-beds underlie an area of near 24,000 sq. miles.

Pearl fishery is carried on with good results in the extreme north; those employed are chiefly South-Sea Islanders and Malays. Bêche de mer (trepang) occurs on the barrier reef and elsewhere, and the securing of it employs many hands and brings much profit. The dugong fishery is industriously plied; the oil of the dugong being valuable for various purposes.

There are several railways, of which a mileage of more than 600 miles are in operation. A scheme for a railway connecting Q. with New South Wales was being promoted in 1881; and a company has been formed to connect the settled districts by railway with the Gulf of Carpentaria.

At the census of 1871 the population of Q. was 120,306. At that of 1881 it was 213,525 (an increase of 23 per cent. on the population in 1876); of whom 11,229 were Chinese, and 6348 Polynesians. The government officials numbered 1426; professional persons, 2899; engaged in domestic duties, and children, 122,437; tradesmen, carriers, &c., 10,473; squatters, agriculturists, &c., 33,261; mechanics, manufacturers, 33,117; and miscellaneous workers, 5530.

The capital of Q., and the seat of the local government, is Brisbane (q. v.); pop. (1881) 30,955. Ipswich, Rockhampton, Cooktown, Maryborough, Gladstone, Toowoomba, Gayndah, Dalby, and Bowen are rising towns.

The revenue for the year 1880–81 was £1,771,251 (an increase on preceding years); the expenditure £1,757,653. The public debt was £13,250,000 (on which the interest is £599,000). The amount of revenue per inhabitant in 1881 was £8, 6*s*. (of which only about £3, 12*s*. is derived from taxation, the rest from crown-lands, &c.), and the debt was in the proportion of £62 in 1881. In 1880 the exports amounted in value to £3,216,999, and the imports to £2,881,555. The chief articles of export, the produce of the colony, were tin (ore and smelted), copper (ore and smelted), cotton, gold, rum, sugar, wood, tallow, hides, preserved meats, maize, green fruits, shell-fish, bêche de mer, pearl, shell, arrow-root, coal, cedar, sawn pine. The imports include most kinds of manufactured goods, the bulk being from the United Kingdom; but of late a brisk trade has arisen in American manufactures, especially agricultural implements and tools. (A table showing the development of the revenue, exports, &c. of Q. and the other Australian colonies in the ten years 1870–1880, will be found at the article AUSTRALIA.)

Amongst the mills and manufactories of Q. in 1880 were above 80 sugar-mills, 25 tanneries, 70 brick-works, also flour-mills, saw-mills, tobacco-factories, soap and candle works, breweries, foundries, confectionery works, agricultural implement works—the total number being upwards of 570.

In 1880, 1225 vessels, of 633,673 tons, entered the ports of Q., and 1221, of 621,903 tons, cleared. There were registered in the colony 26 ocean steamers (of 12,895 tons), 17 harbor steamers, and 35 river steamers. There are 20 lighthouses on the coasts of Q., besides lightships and 70 minor lights.

Q. was erected into a separate and independent colony in December 1859. The government is vested in a Governor (the Queen's representative), an Executive Council, and two Houses of Parliament. The Legislative Council consists of 30 members, nominated by the crown for life, under a president elected by themselves. The House of Assembly comprises 55 deputies elected for five years. The suffrage is not universal, but within the reach of every industrious man after a twelvemonth's residence. Voting is by ballot. State aid to religion was abolished by one of the first acts of the parliament. An excellent system of primary education, which, since 1870, has been made free, is in successful and vigorous operation throughout the colony. Other changes were introduced in 1876, the Department of Public Instruction being placed under a Minister for Education.

QUEEN'S METAL, an alloy formed by fusing 100 parts of tin with 8 parts of antimony, 4 parts of copper, and 1 part of bismuth. It is a kind of Britannia metal, and is used for teapots and similar articles of domestic utility.

QUEEN'S REGULATIONS, or KING'S REGULATIONS, are those collections of orders and regulations in force in the army and navy respectively, which serve to guide commanding and other officers in all matters of discipline and personal conduct. The queen's regulations for the navy also in a great degree regulate matters of finance; whereas, in the army, financial matters are left to the War-office Regulations (q. v.). The reason for this distinction is, that as regards the navy, the Admiralty are responsible both for discipline and finance; while in respect to the army, the officer commanding-in-chief controls the discipline, and the financial secretary the finance, both of course being responsible to the Secretary of State for War, and through him to parliament. The regulations for the army were first collected in 1788, since which several editions have been issued. The current regulations are supplemented, corrected, and cancelled by numerous circulars and addenda; so that they never represent the whole body of military or naval rules for many days together. Every officer must have a copy, and must thoroughly know the contents.

QUEEN'S TOBACCO-PIPE, the facetious designation of a peculiarly shaped kiln, which used to be situated at the corner of the Tobacco Warehouse belonging to the London Docks. The kiln consisted of a circular brick stalk, bulging out at the bottom to a width of five feet inside. In the interior were piled up damaged tobacco and cigars, and contraband goods, such as tobacco, cigars, tea, silk, &c., which had been smuggled, books which are attempted evasions of the Copyright Act, &c., till a sufficient quantity had accumulated, when the whole was set fire to and consumed. The total value of the goods thus destroyed was enormous; and though this wanton destruction was often censured, government continued till recent years periodically to fill and light the 'Queen's Pipe.' Seized goods are now sold at the periodical 'customs sales,' where unclaimed goods, samples, &c., are also disposed of.

QUEE'NSTOWN, called formerly COVE OF CORK, Ireland, a seaport town, on the south side of Great Island, in the harbor of Cork, is distant from Cork 14 miles east-south-east, and from Dublin 157 miles south-west-by-west. It rose into some importance during the French war, as the port of embarkation for troops going on foreign service, and is now an admiral's station. On the occasion of the Queen's visit in 1850, the name Q. was given to it in honor of her Majesty. The formation of the town is rather peculiar, as it occupies the sides of an amphitheater, around which it is built in parallel streets. It enjoys a high reputation for its mild and salubrious climate, and is much frequented by invalids during winter. A splendid Roman Catholic cathedral, estimated to cost £100,000, is a conspicuous building; it is 100 feet in height, and the plan includes a tower of 230 feet. Pop. (1871) 10,334; (1881) 9738.

QUEEN'S YELLOW. See YELLOW COLORS.

QUENTIN, ST., a thriving manufacturing town in the north of France, department of Aisne, is situated on the Somme, about 80 miles north-east of Paris. Its population has more than doubled in 25 years, and in 1881 was 45,021. Q. has a celebrated church —'one of the finest, boldest, and purest Gothic buildings in this part of Belgic Gaul.' Q. is the center of the manufacture of linen, muslin, lace, and gauze. The *Canal of St. Quentin*, connecting the basin of the Somme with that of the Scheldt, was finished by Napoleon in 1810. It is carried through the intervening hills by tunnels. At St. Q., a battle was fought, $\frac{\text{July 29,}}{\text{August 10,}}$ 1557, between the Spaniards, assisted by a body of English troops, and the French, in which the latter were defeated.

QUE'RCITRON, the name both of a dyestuff and of the species of oak of which it is the bark. This oak (*Quercus tinctoria*), also called *Dyer's Oak* and *Black Oak*, is a native of North America—one of the noblest forest trees of the United States, found in New England, and as far south as Georgia, although there only at a considerable elevation. The name Black Oak is given to it from the dark color of its outer bark, The leaves are obovate-oblong, dilated outwards, and widely sinuated; with short, obtuse, and bristle-pointed lobes. The wood is reddish, coarse-grained, and porous, but much esteemed for strength and durability, and is used in America for ship-building. The bark is used for tanning as well as for dying. It is the inner bark which is the quercitron of dyers. It yields a yellow crystallizable substance, *Quercitron* ($C_{36}H_{18}O_{20} + 2\,Aq$), which may be extracted by means of alcohol; the tanning acid, which is simultaneously taken up, must be precipitated by the addition of gelatine, after which the liquid will, on evaporation, yield crystals of quercitrin. On the addition of alum, its solution assumes a beautiful yellow color; and solutions of acetate of lead, acetate of copper, and chloride of tin precipitate it in yellow flakes. When boiled with dilute acids, it breaks up into glycose and *quercetin* ($C_{24}H_8O_{10}$)—a yellow crystalline substance, which is soluble in alkaline solutions, to which it communicates a golden-yellow color. The decomposition shows that quercitrin belongs to the glycosides, or compounds which, when broken up, yield sugar.

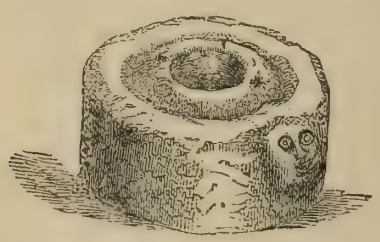
QUERETA'RO, an important town of Mexico, capital of a state of the same name, is charmingly situated on a hilly plateau, 6365 feet above sea-level, 110 miles north-west of Mexico. It is built on a regular plan, contains 11 convents, 3 great squares, many richly-decorated churches, &c. Water is supplied from an aqueduct ten miles long, and supported in part upon arches 90 feet high. Woollen and cotton goods and leather are the chief manufactures. Q. contains the largest cotton-spinning mill in the country; 3000 hands are employed in it. Here, when the town, after a long defence, fell into the hands of the Republicans, the Emperor Maximilian was shot by order of a court-martial, 19th June 1867. Pop. 48,000.

QUERN, a primitive mill for grinding corn, the stone of which was turned by the hand before the invention of windmills or water-mills. It is a contrivance of great antiquity, and so well adapted for the wants of a primitive people, that we find it perpetuated to the present day in remote districts of Ireland, and some parts of the Western Islands of Scotland. The remains of querns have been dug up in Britain, Ireland, and Continental Europe, wherever the traces of ancient population are found. They occur in the Scottish Earth-houses (q. v.), or cyclopean underground dwellings; in the Crannoges (q. v.), or lake-dwellings of Ireland and Scotland; and the very similar *Pfahlbauten* of Switzerland; and abundantly among the remains of the Roman period in Britain and Northern Europe.

The most usual form of quern consists of two circular flat stones, the upper one pierced in the center with a narrow funnel, and revolving on a wooden or metal pin inserted in the lower. The upper stone is occasionally ornamented with various devices; in the Roman period, it is sometimes funnel-shaped, with grooves radiating from the center. In using the quern, the grain was dropped with one hand into the central opening, while, with the other, the upper stone was revolved by means of a stick, inserted in a small opening near the edge. As early as 1284, an effort was made by the Scottish legislature to supersede the quern by the water-mill, the use of the former being prohibited except in case of storm, or where there was a lack of mills of the new species. Whoever used the quern was to 'gif the threttein measure as multer;' the contravener was to 'tine [lose] his hand-mylnes perpetuallie.' This enactment did not, however, prevent hand-mills from being largely used in Scotland down to the beginning of the present century.

Probably the oldest type of quern is that which was fashioned from a section of oak; one of this description was found in Scotland in 1831, in the course of removing Blair Drummond Moss. It is 19 inches in height by 14 in diameter, and the center is hollowed to a depth of about a foot, so as to form a mortar, in which the grain seems to have been pounded by a wooden or stone pestle.

A less simple variety of the hand quern, known as the Pot Quern, and also of great antiquity, consists of a circular stone basin, with a hole through which the meal or flour escapes, and a smaller circular stone fitting into it, perforated with an opening through which the grain was thrown into the mill. A number of querns of this description have been exhumed in Scotland, and still more in the bogs of Ireland, in which country the pot quern is believed not to be yet altogether disused. The subjoined woodcut represents one in the Museum of the Scottish Antiquaries; it



Quern.

is of unusually large size, 17 inches in diameter, and 8½ high, and was discovered in the parish of Gladsmur, in East Lothian. It is made of coarse pudding-stone, and is furnished with holes in the sides, to which handles were probably attached. The iron ring is a modern addition.—See Dr. Wilson's *Archæology and Prehistoric Annals of Scotland*, vol. i. p. 211, *et seq.*, 2d edition (London and Cambridge, 1863).

QUESALTENA'NGO, a town of Guatemala, Central America, the capital of a dep. of the same name. It is 66 miles west-by-north from Guatemala, and stands in an elevated table-land, on a river which flows into the Pacific Ocean. Pop. 30,000.

QUESNAY, FRANÇOIS, an eminent French economist and physician, was born at Mérey, near Montfort-l'Amaury, June 4, 1694, and studied at Paris, where, in 1718, he passed surgeon with a high reputation. He acquired a high reputation in his profession, and at his death, in 1774, was first physician to the king. But Q.'s fame depends almost wholly on his economistic speculations, which are to be found scattered through the pages of the famous *Encylopédie* (see, for example, the articles 'Fermiers' and 'Grain'), the *Journal d'Agriculture*, and the *Ephémérides du Citoyen*. He is the inventor of the term 'Political Economy,' and one of the earliest and most distinguished writers on the subject. His views were systematically set forth in a little treatise, entitled *Tableau Economique*, which was nicknamed by La Harpe, the *Alcoran des Economistes*. Only a few copies of this work were printed about the end of the year 1758, and these have now all disappeared. Nevertheless, the principles maintained by Q. are well known, partly from the sources above mentioned, but chiefly from other treatises that have met with a better fate than the *Tableau*, viz., his *Maximes Générales du Gouvernement Economique d'un Royaume Agricole*, the *notes* to which occupy more space than the text; *Le Droit Naturel; Analyse du Tableau Economique; Problèmes Economiques;* and *Dialogues sur le Commerce et sur les Travaux des Artisans*, all of which are to be found in Dupont's *Recueil* of Q.'s writings (Leyden and Paris, 1768).

QUESNEL, PASQUIER, a French theologian, was born at Paris, July 14, 1634, and having been educated in the Sorbonne, entered the Congregation of the Oratory in 1657. He obtained even early in his career the reputation of a profound familiarity with Scripture and the Fathers; and by several popular ascetical treatises which he published, he attracted so much notice, that, at the early age of 28, he was appointed director of the Paris house of his Congregation. It was for the use of the young men under his charge that he commenced the series of his afterwards celebrated *Reflexions Morales*. The first specimen of this work having been much admired, Q. continued to extend it to other portions of the New Testament. Soon afterwards, he published an edition of the works of St. Leo (2 vols. 4to, Paris 1675), which has been much criticised. His residence at Paris, however, was cut short by the disputes about Jansenism. Having refused to sign certain propositions, subscription to which was, by a decree of 1684, required of all members of the Oratory, Q. left the Congregation, and retired to the Low Countries, where he attached himself to the party of Arnauld, in which he speedily rose to the first position of influence and authority. He continued at Brussels his *Réflexions Morales;* and in 1693—1694, the Reflections on the New Testament were published in a complete form, with the approval of the Cardinal de Noailles, Bishop of Châlons, and ultimately Archbishop of Paris. The work, however, on examination, was found to contain all the most obnoxious doctrines of Jansenius; and Q., having been denounced to the authorities, was arrested, by order of Philip V., and put into prison. He escaped, and betook himself to concealment. But his book was condemned, first by the decree of an assembly of the bishops of France, and afterwards by a decision of Clement XI. in 1711, and finally by the celebrated bull *Unigenitus*. September 8, 1713.

With this condemnation, the formal dogmatic declarations of the Roman Church on this controversy may be said to have ceased. The controversy continued, but nothing, or very little, that was new was afterwards elicited. Q. withdrew to Amsterdam, where he lived to a great age, not having died till 1719, in his 85th year. Besides the *Reflexions Morales*, he left a vast number of treatises, chiefly ascetical. The few dogmatical essays which he published, as well as his critical editions of St. Leo, are all tinged with his peculiar opinions. The *Reflexions Morales* falling in, in the main, with the views of one of the religious parties in the Protestant Church, has been translated into German and English, and at one time enjoyed considerable popularity both in England and in Germany.

QUETELET, LAMBERT ADOLPHE JACQUE, a celebrated Belgian statistician and astronomer, was born at Ghent, 22d February 1796, and studied at the lyceum of his native city, where, in 1814, he became Professor of Mathematics. In 1819, he was appointed to the same chair at the Brussels Athenæum; and in 1826, was chosen by King William I. to superintend the construction of the Royal Observatory in the capital, of which he became director in 1828. In 1836, he was made Professor of Astronomy and Geodesy at the Brussels Military School. Elected a member of the Belgian Royal Academy in 1820, he became perpetual secretary in 1834. Q. was besides a corresponding member of the Institut de France and of the Royal Society of London. Among his numerous and valuable writings are—*Astronomie Elémentaire* (Par. 1826; 4th ed. Brux. 1848), *Recherches sur la Population, les Prisons, les Dépôts de Mendicité*, &c., *dans le Royaume des Pays-Bas* (Brux. 1827); *Recherches sur la Reproduction et la Mortalité et sur la Population de la Belgique* (Brux. 1832); *Statistique Criminelle de la Belgiqae* (Brux. 1832); *Sur l'Homme et le Développement de ses Facultés ou Essai de Physique Sociale* (Par. 1835); *Du Système Sociale et des Lois qui le régissent* (Par. 1848); and *Physique* (Brux. 1855). Q. was also one of the most efficient collaborateurs in drawing up the *Bulletin de la Commission Centrale de Statistique*, the *Annales des Mines*, the *Journal des Economistes*, the *Annales des Travaux Publics*, the *Trésor National*, &c. He also published numerous papers on meteorology, astronomy, terrestrial magnetism, &c., in the *Memoires* and *Bulletins* of the Belgian Royal Academy. He died in 1874.

QUETTA (so usually; but more accurately spelt *Kwatah*), a town in Beloochistan (q. v.), strategically important as being near the head of the Bolan Pass, and close to the Pishin Valley. By treaty in 1877, Q. has become a British military station, and commands the southern route from India into Afghanistan. It secures the Pishin Valley, and keeps several passes open. The

valley of Q. lies 5500 feet above the sea, and is surrounded by mountains 5000 or 6000 feet higher still.

QUEVEDO Y VILLEGAS, Don Francisco Gomez de, a Spanish classic, was born at Madrid, 26th September 1580, and studied at the university of Alcala de Henares, where he acquired a good knowledge not only of Latin and Greek, but also of Hebrew and Arabic, besides French and Italian. His career, which was chiefly that of a diplomatist, was marked by numerous vicissitudes. He died 8th September 1645, at Villa Nueva de los Infantes.

The prose works of Q. are divisible into two classes—the serious and the burlesque. Among the former are his *Vision of St. Paul*, *The Spanish Epictetus*, *Phocylides*, *Fortune become Reasonable*, and particularly *The Life of Marcus Brutus*, and *The Policy of God*—the last two of which are remarkable for the purity and elevation of their sentiments. Among his satirical and burlesque productions, in which his genius finds its happiest expression, the principal are—*The Dream of the Death's Heads*, *The Demon Alguazil*, *Pluto's Stables*, *The Side-scenes of the World*, *The Letters of the Knight of the Forceps*, *Recollections of Student Life*, and *The Grand Sharper, or the History of Don Pablo de Segovia*, a romance of rascaldom, a species of fiction much cultivated in Spain at that time, in which the hero is usually an adventurous scamp. The lively sallies, the piquant allusions, and the happy metaphors found in these books, have enriched Spanish literature with a crowd of proverbs and colloquial phrases. Q.'s poetry is also chiefly of a humorous character. His works have been often reprinted; the most complete edition is that by Sancho (Madrid, 11 vols. 1791—1794); a more recent collection is the one by M. Guerra y Orbe (Madrid, 1852). An English translation of Q.'s satirical works was published at Edinburgh in 1798; his *Sueños*, or Visions, among the most popular of all his productions, were also translated into English by Sir Roger l'Estrange (1708).

QUIBERON, a small fishing town of France, in the dep. of Morbihan, at the extremity of a long slender peninsula, 25 miles south-west of Vannes. Pop. (1876) 720. It is historically celebrated as the spot where a body of French emigrant royalists, under D'Hervilly and Puisaye, landed from an English fleet, on the 27th of June, 1795, and endeavored to rouse the people of Brittany and La Vendée against the Convention, but were defeated, and driven into the sea by General Hoche. All the prisoners taken were shot, by order of the Convention. At an earlier period, during the war of the Austrian Succession, an English force attempted a landing here (1746), but was severely repulsed. In 1759, Admiral Hawke completely defeated a French fleet under Admiral Conflans in Quiberon Bay.

QUI'CKENS. See Couch-grass.

QUICK-MATCH, a combustible match, made by dipping cotton-wick in a composition of vinegar, saltpetre, and sometimes an admixture of gunpowder; when lighted, it continues to burn to the end, and hence it is useful in exploding mines, &c. The rate at which it burns being known, it is only necessary, for insuring safety, to take the right length of quick-match.

QUI'CKSILVER. See Mercury.

QUI'ETISTS, the name of a somewhat numerous class of mystical sects, who, in different ages, have held that the most perfect state of the soul is a state of quiet, in which the soul ceases to reason, to reflect, whether upon itself or on God, and, in a word, to exercise any of its faculties, its sole function being passively to receive the infused heavenly light, which, according to their view, accompanies this state of inactive contemplation. Under the various heads, Fenelon, Hesychasts, Brethren of the Free Spirit, Molinos, Mysticism, most of the details of the doctrines of the Q. have been explained. Some of these are of a purely speculative character, and involving but little of practical consequence, whether for good or for evil. But there is one most pernicious class of errors, which, however, eschewed by the leaders of the various schools, has seldom failed to characterize the practical working of the system among the vulgar crowd of its followers. From the belief of the lofty and perfect nature of the purely passive state of contemplation, there is but a single step to the fatal principle in morals, that in this sublime state of contemplation all external things become indifferent to the soul, which is thus absorbed in God; that good works, the sacraments, prayer, are not necessary, and hardly even compatible with the repose of the soul; nay, that so complete is the self-absorption, so independent is the soul of corporeal sense, that the most criminal representations and movements of the sensitive part of the soul, and even the external actions of the body, fail to affect the contemplating soul, or to impress it with their debasing influence. These results will be found detailed under some of the heads named above. The chief Quietist sects have been the Messalians or Euchites, in the 4th c.; the Bogomili, in the 11th c.; the Beghards and Beguines, in the 13th c.; the Hesychasts, in the East, about the same period; the Brethren of the Free Spirit, in the 14th c.; Michael Molinos, in the 17th c.; and others of less note.

QUILIMA'NE, a seaport of Eastern Africa, in the Portuguese territory of Mozambique, stands about 15 miles from the mouth of the river of the same name. The town itself, or village, stands on a large, moist mudbank (in any part of which water can be found by digging two feet deep), surrounded by mango-bush and marsh. The climate is unhealthy in an eminent degree. The bar at the harbor is extremely dangerous, and the volume of water is so small, that the bed of the small stream which communicates between the Quilimane and the Zambesi (q. v.) is dry for at least nine months in the year. During the dry season, trade is carried on by land-carriage. Pop. about 15,000, including the inhabitants of the country in the immediate vicinity of the town.

QUILLA'IA, a genus of plants of the natural order *Rosaceæ*, the type of a tribe called *Quillaieæ* with herbaceous calyx-tube, capsular fruit, and seeds winged at the apex. The sub-order is remarkable for saponaceous secretions. The barks of some species of *Quillaia*, as *Q. saponaria*, and *Q. Brasiliensis*, are used in South America under the name of *Quillai*, as a substitute for soap. They contain a substance closely allied to *Saponine*.

QUILLED, in Heraldry, a term used in describing a feather, to indicate that the quill differs in tincture from the rest.

QUILLO'TA, a town of Chili, 22 miles north-east from Valparaiso. The richest copper-mines of Chili are in its vicinity. Pop. 12,000.

QUILLS, the large feathers of the wings of birds, the hollow tubes of which, being properly cleaned of all oily or fatty matter, and dried, are used for making pens to write with. The exact time of their introduction to use for this purpose is not known. Those plucked from geese are most generally used, but swan and turkey-quills are not uncommon; and for very fine writing, and for pen-and-ink drawing, crow-quills are preferred to all others. At one time, the collection and preparation of quills formed a very large and important branch of commerce; but the introduction of metallic pens has reduced it to very small limits. The following are the chief kinds sold by the dealers, and the list gives a correct indication of the sources of supply: Swan-quills, Iceland, &c.; English goose-quills, Irish goose-quills, Hudson's Bay goose-quills, Dutch goose-quills, St. Petersburg goose-quills, Riga goose-quills, Turkey goose-quills, British crow-quills, duck-quills for tooth-picks. Our imports amount to nearly 300,000,000 per annum, the value of which is about £250,000. Those of the swan fetch the highest price, or about four guineas per thousand; whilst the best goose-quills rarely exceed 20 shillings. After they have been carefully scraped and cleaned, the drying is effected by gentle heat in ovens, by which they acquire a necessary brittleness in a longitudinal direction. This is important, as, without this property, we could not make the fine slit, upon which the whole working character of the pen depends.

QUILO'N (*Kayan Kulan*), a town of India, in the state Travancore, 35 miles north-west from Trivanderam. It is situated on the sea-coast, in a bight where ships may anchor and have shelter. Q. has a barrack for European troops, a hospital, a jail, &c. There is a considerable export trade in timber, cocoa-nuts, ginger, pepper, &c. The communication with Trivanderam is almost entirely by canals, connecting the lagoons of the *back-water*. There is similar water-communications with towns further northward on the coast. Pop. estimated about 20,000.

QUI'LTOR, a fistulous wound about the top of the horse's foot, results from treads, pricks, or neglected corns, which lead to the formation of matter underneath the hoof. Any dead horn, matter, or other cause of irritation must be sought for by cutting away the hoof. A free opening must be provided for the egress of any pent-up matter. Poulticing for a few days is often useful; whilst healing may afterwards be expedited by the injection of any mild astringent lotion. The powerful caustics so frequently used, cause much unnecessary pain, and often aggravate the evil.

QUIMPER, an old town of France, capital of the department of Finistère, is prettily situated on the Odet, about 9 miles from its mouth, and about 35 miles south-east of Brest. Its cathedral, a stately and richly-carved and ornamented edifice, commenced in 1424, is the principal building. Potteries are in operation, as well as tanyards, breweries, &c.; and sardine-fishing is actively carried on. Pop. (1876) 13,879.

QUIN, James, a celebrated actor of Irish descent, was born in London, 24th February 1693, and made his first appearance on the stage in 1714 at Dublin as Abel in *The Committee*. Shortly after, he proceeded to London, where he was engaged at Drury Lane, but for quite inferior parts. In 1716, however, the sudden illness of a leading actor led to Q.'s being called on to sustain the character of Bajazet in the once famous play of *Tamerlane*. His success was marked. Next year, he exchanged Drury Lane for Mr. Rich's theater at Lincoln's Inn Fields, where he remained as a

principal actor 17 years. Not long after leaving the former place, he had the misfortune to kill a brother-actor, Mr. Bowen, in a duel—a circumstance which clouded his reputation for a while. The only really fine parts which he seems to have played were Captain Macheath in the *Beggar's Opera*, and Falstaff in the *Merry Wives of Windsor*. In 1734—1735, he returned to Drury Lane Theater, 'on such terms,' says Cibber, 'as no hired actor had before received;' and from this date until the appearance of Garrick in 1741, he was, by universal consent, the first actor in England. Q. was by no means pleased at the rising fame of Garrick, and sarcastically expressed his chagrin by declaring that 'Garrick' was a new religion, and that Whitefield was followed for a time; but they would all come to church again.' In this, however, he was mistaken. In 1751, he withdrew from the stage as a hired actor, though he continued at intervals to give his services for benevolent purposes, and fixed his residence at Bath, where he died January 21, 1766. In after-dinner conversation, he was a coarse but capital story-teller, and many of his jests are still in vogue.

QUINCE, (*Cydonia*), a genus of trees and shrubs of the natural order *Rosaceæ*, sub-order *Pomeæ*, nearly allied to *Pyrus*, with which many botanists have united it, but distinguished by having many instead of two seeds in each cell, and by their very mucilaginous nature. The COMMON Q. (*C. vulgaris*), a native of the south of Europe and temperate parts of Asia, is a low tree, with generally tortuous branches; ovate, entire, deciduous leaves, which are downy on the under side; and rather large, whitish flowers, which are solitary at the extremity of young branches. The fruit is in some varieties globose; in others, pear-shaped, of a rich yellow or orange color, with a strong smell. It is hard and austere, but when stewed with sugar, becomes extremely pleasant, and is much used in this way either by itself, or to impart a flavor to apple-pies. It is also much used for making a preserve called *Quince Marmalade*. A delicious beverage, somewhat resembling cider, is made from it. The seeds readily give out their mucilage to water, so that they turn 40 or 50 times their weight of water into a substance as thick as syrup. Q. mucilage, or Q. gum, *Cydonin*, is allied to Bassorin, but differs from it in being readily soluble in water, whilst it differs also in some particulars from Arabin. See GUM.—The Q. was cultivated by the ancient Greeks and Romans, and is at the present day cultivated in the south of Europe, in England, and generally in temperate climates. In Scotland, the fruit seldom ripens except on a wall.— The JAPANESE Q. (*C. Japonica*, better known by its older name, *Pyrus Japonica*), a low bush, a native of Japan, but perfectly hardy in Britain, is often to be seen trained against walls, being very ornamental from the profusion of its beautiful flowers.

QUI'NCY, a city of Illinois, U.S., on the east bank of the Mississippi River, 160 miles north of St. Louis, is handsomely built on a high bluff, and has a large trade by the river, railway connections with Chicago, Toledo, &c., extensive manufactures, seven banks, eight newspapers, and thirty churches. Pop. (1870) 24,052; (1880) 27,275.

QUINCY, JOSIAH, an American lawyer, orator, and man of letters, and son of Josiah Quincy, a distinguished orator of the Revolution, was born at Boston, February 4, 1772; graduated at Harvard College, 1790; studied the profession of law; took an active interest in politics as a leading member of the Federal party in New England; entered Congress in 1805, where he became distinguished as a ready, earnest, and fervent orator, in opposition to the policy of Jefferson and Madison. He was one of the earliest to denounce slavery in Congress, and declared that the purchase of Louisiana was a sufficient cause for the dissolution of the union. Disgusted with the triumph of the democratic party and the war of 1812, he declined a re-election to Congress, and devoted his attention to scientific agriculture. He became, however, a member of the senate of Massachusetts, and in 1822, judge of the Municipal Court of Boston. In 1823, he was elected Mayor of Boston; and in 1829 accepted the post of President of Harvard College, which he held until 1845. Among his published works are a Memoir of his father, 1825; *History of Harvard University*, 1840; *History of the Boston Athenæum*, 1851; *The Municipal History of the Town and City of Boston*, 1852; *Life of John Quincy Adams*, 1858; *Essays on the Soiling of Cattle*, 1859. Born before the American Revolution, in which his father took an active and distinguished part, he lived to denounce the secession of the Confederate States in 1860, and urged on the war for their subjugation. He died at Boston, July 1, 1864.—His son, EDMUND QUINCY, is a distinguished author and orator, and was an active member of the Abolitionist party.

QUINET, EDGAR, a French author, was born at Bourg, in the department of Ain, 17th February 1803, and studied at Lyon and Paris. He made his literary *début* at the age of 20 by his *Tablettes du Juif Errant*, after which his love of philosophy and mystic reverie led him to Germany. He studied at Heidelberg, and on his return to France published a translation of Herder's *Ideen zur Philosophe der Geschichte der Menschheit*, so well executed, that Cousin signalized it as *le début d'un grand écrivain*. From this early period dates his intimate friendship with Michelet (q. v.), the result of a community of feeling and belief. Q. was a member of the scientific commission sent to the Morea in 1828, and while there, gathered materials for his *Grèce Moderne et ses Rapports avec l'Antiquité* (Par. 1830). Although his political enthusiasm was extremely ardent, he continued unabated his literary labors, and became a contributor to the *Revue des Deux Mondes*, in which *Ahasuerus*, perhaps his finest work, first appeared. From 1839 to 1842, he held the chair of Foreign Literature at Lyon, where his lectures on the ancient civilizations excited a profound interest. From this situation he passed to the chair of *Littératures Méridionales* at the College of France, expressly instituted for him by M. Villemain; and here, in company with Michelet, he assailed the Jesuits with a keen, earnest, epigrammatic eloquence that startled the chiefs of that body, and made even the government nervous, who knew the peril of being exposed to their secret hostility. In 1846, Q. was silenced. He threw himself eagerly into the Reform agitation that brought about the revolution of 1848, and was elected a member of the Constituent and Legislative assemblies, where he always voted with the Extreme Left; but was expelled from France after the 2d of December. On the fall of the empire, Q. returned to France, and was reinstalled in his chair at the College of France, November 1870. In 1871 he was elected a member of the Assembly. He died in 1875. Among his chief works are (*Allemagne et Italie* 1839); *Histoire de la Poésie Epique* (1836—1837); *Le Génie des Religions* (1842); *Les Jesuites*, along with Michelet (1843); *Les Révolutions d' Italie* (1848); *Merlin l' Enchanteur* (1860); *La Campagne de* 1815 (1862). An edition of Q.'s *Œuvres Complétes* appeared in 1878.

QUI'NIA, or QUININE, and the other CINCHONA ALKALOIDS. In the barks of the different varieties of *Cinchona* which are employed in the treatment of disease, several alkaloids or organic bases occur in combination with quinic and quinotannic acids. Of these bases, the most important are quinia and cinchonia, each of which is accompanied by (or connected with) two isomeric bases, termed respectively *Quinidine* and *Quinicine*, and *Cinchonidine* and *Cinchonicine;* and besides these, a base termed *Aricine* or *Cinchovatine* occurs in the bark of *Cinchona ovata*. We shall describe (1) the *chemical characters*, and (2) the *therapeutic action* of these alkaloids.

1. *Quinia* ($C_{40}H_{24}N_2O_4$) is characterized by the following properties. It crystallizes with six atoms of water, in the form of silky needles, from an ethereal or alcoholic solution allowed to evaporate spontaneously in a cool place; but when thrown down from acid solutions, it forms a white curdy precipitate. It is comparatively insoluble in water, requiring about 200 parts of boiling water for its solution, but dissolves readily in alcohol and in ether, and in water acidulated with a mineral acid. It has an intensely bitter taste, which is chiefly perceived at the back of the mouth; it has a well-marked alkaline reaction. It combines with acids, and forms both neutral and acid salts, most of which are capable of crystallization, and all of which possess its own bitter taste. Of these salts, the acid ones are far the most soluble.

The most important of its salts is the *neutral sulphate*, represented by the formula $C_{40}H_{24}N_2O_4$, $HO,SO_3 + 7Aq$. (It was formerly termed the disulphate, till Strecker showed that the correct formula for quinia was $C_{40}H_{24}N_2O_4$, and not $C_{20}H_{12}NO_2$.) It crystallizes in long snow-white silky needles, sparingly soluble in water (yet imparting to it a peculiar bluish tint), but dissolving freely in diluted sulphuric acid and in alcohol. The *acid sulphate*, $C_{40}H_{24}N_2O_4$, $2(HO,SO_3)$, is also crystallizable, and the crystals, when dried for some time at a temperature of 212°, are phosphorescent. Its solution, or an acidulated solution of the former salt, exhibits the phenomena of *Fluorescence* (q. v.) in a striking manner. On heating a solution of sulphate of quinia with strong acetic acid, and adding, drop by drop, an alcoholic solution of iodine to the hot solution, we obtain crystals of a compound represented by the formula $C_{40}H_{24}N_2O_4I,2(HO,SO_3) + 10$ Aq. These crystals, which are formed in large flat rectangular plates, present very remarkable optical properties, polarizing light as perfectly as plates of tourmaline.

This alkaloid may be obtained from several species of cinchona, but is most abundant in the yellow bark (*C. Cardifolia*). The pulverized bark is boiled with water containing 1 per cent. of oil of vitriol, which dissolves the bases that are present; the solution is precipitated by carbonate of soda, and the quinia (with the other alkaloids) extracted from the precipitate by ether. For various methods of obtaining the sulphate of quinia on a large scale for medicinal purposes, we must refer the reader to Pereira's *Materia Medica*, 4th edition, vol. 2, part 2, pp. 147—149, and the *British Pharmacopœia*, p. 315. The mother liquid from which sulphate of quinia has been obtained, contains a considerable quantity of a resinous amorphous substance

known as *Quinoidine*, which, when treated with ether, yields crystals of *Quinidine* ($C_{40}H_{24}N_2O_4 + 4Aq$), a base isomeric with quinia, from which again is derived another isomeric base, *Quinicine*.

Cinchonia ($C_{40}H_{24}N_2O_2$) crystallizes in comparatively large quadrilateral prisms, which are anhydrous. It is less soluble in alcohol than quinia, and is insoluble in ether, and this difference of solubility affords the means of separating these two alkaloids. With acids it forms two series of salts similar to, but more soluble than, those of quinia. These salts are intensely bitter, and possess (although in a less powerful degree) the same therapeutic properties as those of quinia. In certain varieties of cinchona bark, a crystalline alkaloid named *Cinchonidine*, isomeric with cinchonia, occurs. On exposing its salts, or those of cinchonia, to a high temperature, corresponding salts of *Cinchonicine* are formed. The last-named substance has the same composition as the two preceding ones, and is precipitated from its salts in the form of a resinous mass. Cinchonia and its isomeric allies are most abundant in the pale Peruvian Bark (*Cinchona condaminia*). The method of obtaining cinchonia is precisely the same as that for obtaining quinia. When both bases are present, they may be separated by converting them into sulphates; the salt of quinia is the least soluble, and crystallizes first.

The relations of the above-described alkaloids to polarized light have been carefully studied by Pasteur, and are very remarkable. Their respective effects on the plane of polarization are as follow: Quinia produces a powerful left-handed rotation; quinidine produces a powerful right-handed rotation; quinicine produces a feeble right-handed rotation; cinchonia produces a powerful right-handed rotation; cinchonidine produces a powerful left-handed rotation; cinchonicine produces a feeble right-handed rotation. The action of these alkaloids thus affords an excellent illustration of the importance of circular polarization as an aid to chemical analysis.*

2. The only preparations of the above-described alkaloids included in the *British Pharmacopœia* are the *Sulphate of Quinia*, the *Compound Tincture of Quinia* (which is merely a solution of the sulphate in tincture of orange-peel in the proportion of one grain to a fluid drachm), and the *Citrate of Iron and Quinia*. Sulphate of quinia is a preparation which, from its expense (about 12 shillings an ounce), is always liable to adulteration; and specimens containing gypsum, chalk, magnesia, gum, starch, boracic and stearic acids, sugar, salcine, and sulphate of cinchonia, are not unfrequently met with. The first five may be detected by their insolubility in alcohol; boracic acid by the green tinge which it gives to the alcoholic flame; stearic acid by its insolubility in dilute acids; sugar by its solubility in cold weather; salcine by the addition of oil of vitriol, which turns it red; and the sulphate of cinchonia by precipitating the suspected specimens by liquor ammoniæ, and then adding ether, when the quinia will be dissolved, but the cinchonia will float between the two liquids. (This test for cinchonia is recommended by the French government, who refuse to allow the sale of sulphate of quinia containing more than three per cent. of cinchonia.) The most important use of sulphate of quinia is in the treatment of intermittent fever, for which it may be regarded as a specific. Various nervous affections, especially if they assume a periodical character, are successfully treated by it—as, for example, neuralgia, chorea, certain forms of headache, &c. In numerous forms of dyspepsia, debility, and cachexia, there is no single remedy more effectual than the citrate of iron and quinia.

The ordinary dose of the sulphate is from one to three grains, but in ague it may be given in far larger doses.† It may be prescribed in the form of pills made with conserve of roses, or as mixture, in which case a little sulphuric acid should be added to render it soluble. In large doses, as from 10 to 20 grains or more, it excites the nervous system, giving rise to headache, buzzing of the ears, blindness, giddiness—a group of symptoms collectively known as *Quininism;* and several deaths are recorded as arising from its administration in excessive doses. The average dose of the citrate of iron and quinia is 5 grains, which may be given in a glass of sherry. *Quinoidine* (also termed *Amorphous Quinine*) seems to be as efficient a tonic as sulphate of quinia, but not to have so great an anti-periodic power, and hence not to be so serviceable in intermittent fever, &c. *Quinidine* possesses the medicinal properties of quinia. Pereira and other physicians have found that its sulphate is equally serviceable with that of quinia, both as a tonic and a febrifuge; and the action of *Quinicine* is similar to that of quinoidine. *Cinchonia* appears to act precisely the same as quinia, while *Cinchonidine* and *Cinchonicine* are of little therapeutic value.

Quinia is employed not merely in the cure of disease, but for the preservation of the health, when the system is exposed to certain noxious influences. Its value as a means of guarding the system from the attack of intermittent fever is so generally recognized, that our Admiralty regulations require that every man should take quinia when the ship is within a certain distance of the east and west coast of Africa, and that it should be regularly continued in eight-grain doses every morning to those engaged in boat-cruising along the coasts or on the rivers or creeks. The author of 'A Visit to the Cities and Camps of the Confederate States,' in *Blackwood's Magaziue* for January 1865, observes, that formerly it was considered certain death to sleep out for one night on James's Island, opposite Charleston, during the malaria season; when he wrote, thousands of men were quartered on it. In 1863, when the taking of quinia was optional, there was a great deal of fever; in 1864, all were compelled to take their dose regularly every morning, and they were very healthy. It would appear, however, that quinia is not equally efficacious in guarding the system against all forms of intermittent fever, for Mr. Meller, surgeon-naturalist in medical charge of Dr. Livingstone's Zambesi expedition, found a glass of rum given at sunrise to be 'a far better prophylactic' than quinia in the fever of East Central Africa.

QUI'NISEXT (Lat. *quinque*, five, and *sex*, six), the name given to a council which, being regarded as a sort of supplement of the fifth and six generals, is called by a title which appears to combine both. In the same view, it is called by the Greeks *penthekte* (from *pente*, five, and *hecte*, sixth). The fifth general council, held in 553, on the subject of the Three Chapters (q. v.), enacted no canons of discipline. In like manner, the sixth, held against the Monothelites in 660, was confined almost entirely to doctrinal decisions. In order to supply the want, a numerous body of bishops, 211 in number, assembled in 692, in a hall of the imperial palace at Constantinople, called the Trullus. It was a purely oriental council, and not only was not approved by the Western Church and the pope, but was almost immediately reprobated. Its decrees are purely disciplinary; and it is chiefly important as being the council in which was laid down the broad distinction between the legislation of the East and that of the West, on the subject of clerical celibacy. The Q. council, while prohibiting the marriage of any one who is in priest's orders, permits a married man to receive after marriage the order of subdeacon, deacon, or priest, but not of bishop. Against this, the Roman pontiffs vigorously protested. Another peculiar canon of this synod (57th) prohibits fasting on Saturday, even though in Lent. On these and other points of difference in discipline, no agreement has taken place between the churches down to the present time.

QUINOA (*Chenopodium Quinoa*), an annual plant, a native of Chili and the high table-land of Mexico. It much resembles some of the British species of *Chenopodium* (q. v.), has an erect stem, with ovate, angulate-toothed leaves, the younger ones pulverulent, and panicles much crowded and branched. In the countries in which it is indigenous, it is much cultivated for its seeds, which form the principal food of the inhabitants. The meal made from some varieties of the seed has a somewhat peculiar flavor, but it is very nutritious. Q. meal resembles that of oats in not becoming elastic and tenacious when mixed with water, and like oatmeal, can only be made into cakes, not into leavened bread. The plant is sometimes cultivated in our gardens for it leaves, which are a good substitute for spinach.

QUINQUAGE'SIMA SUNDAY (Lat. fiftieth), the Sunday immediately preceding Ash-Wednesday.

QUINQUE'NNIAL PRESCRIPTION, a period of five years allowed by the law of Scotland within which payment of sums on all bargains concerning movables, arears of rent in some leases, multures, ministers' stipends, arrestments, must be enforced.

QUI'NQUEREMES, vessels with five banks of oars, however arranged (see TRIREME), may be regarded as the first-rates of the ancient navies. The Greek states used them after the death of Alexander, and the Carthaginians a little later. A Carthaginian vessel of this class served during the first Punic War as a model to the Romans, who built 100 on the coast of Bruttii in the year 266 B.C., and thenceforward maintained fleets of such ships. According to Polybius, a quinquereme carried 300 seamen and 120 soldiers.

QUI'NSY, or COMMON INFLAMMATORY SORE THROAT, known also as CYNANCHE TONSILLARIS and TONSILLITIS, is an inflammatory affection of the substance of the Tonsils (q. v.). The inflammation is, however, seldom limited to these glands, but extends to the uvula, the soft palate, the pharynx, and not unfrequently the salivary glands. The disease usually manifests itself by difficulty in swallowing, and a sense of heat and discom-

* MM. de Vry and Alluard published some time ago a *Report*, in which they state that the polaroscope reveals the presence of impurities in quinia when too small to be detected by any chemical process.

† Mr. Desvignes (in a *Memoir* communicated on January 10, 1865, to the Royal Medical and Chirurgical Society) advocates the administration of solutions of quinia by subcutaneous injection. The solution he employed was a grain and a half in 15 drops of water, acidulated with a drop of dilute nitric acid. With this he successfully treated several hundred cases of intermittent fever in the district of Tuscany, known as the 'Maremma,' in many of which the use of quinia and arsenic) administered in the ordinary way, had failed to effect a cure.

fort in the throat, often amounting to considerable pain. On examination, the throat at first exhibits unnatural redness, with enlargement of one or both tonsils. The uvula is enlarged and elongated; its end either dropping down into the pharynx, and by exciting the sensation of a foreign body, giving rise to much irritation, or else adhering to one of the tonsils. The tongue is usually furred, and the pulse rapid, and there are the ordinary symptoms of that form of constitutional disturbance known as inflammatory fever. The inflammation terminates either in resolution (if the attack is not severe, and yields readily to treatment) or in suppuration, which may be detected by the occurrence of slight rigors, and by the increased softness of the enlarged tonsil. The matter which is discharged has a very fetid smell, and the fetor is often the first indication of the rupture. The pain almost entirely ceases with the discharge of matter, and recovery is then rapid. The disease is usually at its height in about a week after the manifestation of the first symptoms, and it almost invariably terminates favorably. The ordinary exciting cause of this disease is exposure to cold, especially when the body is warm and perspiring; and certain persons (or even families) are so subject to it that slight exposure is almost sure to induce it.

The disease may sometimes be cut short if, at its very commencement, a sharp purgative (as, for example, compound infusion of senna with Epsom salts) be administered followed up almost immediately by an emetic of a scruple of ipecacuanha with a grain of tartar emetic. The patient should remain in the house (or in cold weather, even in bed), and should be kept on low non-stimulating diet. A stimulating liniment, such as the compound camphor liniment, should be applied to the outside of the throat, and the neck should be surrounded with a piece of flannel. In mild cases, the above described treatment is sufficient. In more severe cases, the patient may gargle frequently with hot water, or milk and water, or, which is better, may inhale the vapor of boiling water. Blistering and leeching will sometimes give relief, but if suppuration is once established, they do harm rather than good. If the tonsils are very much enlarged, they should be pricked with a lancet made expressly for the purpose.

Dr. Trench, in his *English Past and Present*, gives quinsy (or quinsey, as he spells it) as an example of the gradual recasting of a foreign word into a new English mould. The Greek word *cynanche* was the origin of the French *esquinancie*, which entered the English language as *squinancy*, became *squinzey* in the time of Jeremy Taylor, and has now softened down to *quinsy* or *quinsey*.

QUI'NTAL, a French weight corresponding to the Eng. 'hundredweight,' was equal to 100 pounds (livres); on the introduction of the metrical system, the same name was employed to designate a weight of 100 kilogrammes (see GRAMME). The metrical quintal is thus more than twice as heavy as the old one, and is equivalent to 220 lbs. avoirdupois.

QUINTANA, MANUEL JOSÉ, surnamed the 'Spanish Tyrtæus,' was born at Madrid, 11th April 1772, studied at Salamanca, and established himself as an advocate in his native city, where his house became a resort of the advanced liberals of the time. Among his earliest productions were his *Odes*, which gave him a place in the first rank of Spanish poets. On the outbreak of the War of Independence, he made good use of his lyric gift to stimulate the patriotism of his countrymen, and otherwise distinguished himself as editor of the *Semenario Patriotico*, and author of the manifestoes of the insurrectionary juntos, and of most of the official statements of the first Cortes. Meanwhile, he did not abandon literature, properly so called. Besides his Spanish Plutarch (*Vidas de los Españoles Celebres*, Madr. 1807—1834), a work which is reckoned one of the finest Spanish classics, he published one or two tragedies, and an excellent selection of Castilian poetry (*Poesias Selectas Castillanas*, 3 vols. Madr. 1808). On the restoration of Ferdinand VII. in 1814, Q.'s liberalism caused his imprisonment for six years. On his release in 1820, he was received in Madrid with acclamations, and appointed President of Public Instruction. But his enthusiasm in the cause of liberty was now considerably quenched, and in its place appeared a spirit of subservience to royalty which greatly detracted from his previously patriotic character. In 1835 he was reappointed Director-general of Public Instruction, an office which he held till 1851. He was also made a peer and a senator, and acted as tutor to the young queen Isabella from 1840 to 1843. On the 25th of March 1855, Q. was honored with a public ovation in Madrid, had a speech made to him by the Cortes, and a crown of golden laurel placed on his brows by the hand of Isabella herself. He died 11th March 1857. Q.'s works are to be found collected in the *Biblioteca de Autores Espanoles* of Rivadeneyra (Madr. 1852).—See Kennedy's *Modern Poets of Spain*, and Ticknor's *History of Spanish Literature*.

QUINTE'SSENCE (Lat. *quinta*, fifth, *essentia*, essence) signifies literally the fifth essence. The word is of ancient origin, and dates from the time when it was generally believed that the simple elements or constituents of bodies were *four* in number, viz., fire, air, earth, and water, and that earth was the lowest element, being grosser than water, water than air, and air than fire. Some Pythagorian philosophers, not satisfied that these four elements or essences sufficed for the composition of all substances in nature, added to them a fifth element or essence, *ether*, which was supposed to be more subtle and pure than fire (the highest of the four), and was therefore located in the uppermost regions of the sky. The word 'quintessence' has thus come down to us in the signification of the most subtle ingredient or extract of any body, though in ordinary language it is employed in a figurative sense. See ALCHEMY.

QUI'NTETT, a musical composition for five voices, or for five instruments, each of which is *obligato*. The most remarkable quintetts for stringed instruments are those of Boccherini, Mozart, Beethoven, and Onslow; and for wind instruments (the flute, oboe, clarionet, horn, and bassoon), those of Reicha.

QUINTI'LIAN (QUINTILIANUS, M. FABIUS) was born 40 A.D., at Calagurris (the modern Calahorra) in Spain, and attended in Rome the prelections of Domitius Afer, who died in 59. After this date, however, he revisited Spain, whence he returned in 68 to Rome, in the train of Galba, and began to practise as an advocate, in which capacity his reputation became considerable. He was more distinguished, however, as a teacher than as a practitioner of the oratorical art, and his instructions came to be the most eagerly sought after among all his contemporaries, while among his pupils he numbered Pliny the Younger and the two grand-nephews of Domitian. As a mark of the emperor's favor he was invested with the insignia and title of consul; while he also holds the distinction of being the first public teacher who benefited by the endowment of Vespasian, and received a fixed salary from the imperial exchequer. His professional career as a teacher of eloquence, commencing probably with 69, extended over a period of 20 years, after which he retired into private life, and died probably about 118. The reputation of Q. in modern times is based on his great work entitled *De Institutione Oratoria Libri XII.*, a complete system of rhetoric, which he dedicates to his friend Marcellus Victorius, himself a court favorite and orator of distinction. It was written (as he tells us in his preface to his bookseller Trypho) after he had ceased to be a public teacher; and was the fruit of two years' labor. During its composition, however, he was still acting, in the lifetime of Domitian, as tutor to the grand-nephews of that emperor.

In the first book he discusses the preliminary training through which a youth must pass before he can begin these studies which are requisite for the orator, and he gives us an elaborate outline of the mode in which children should be educated in the interval between the nursery and the final instructions of the grammarian. The second book treats of the first principles of rhetoric, and contains an inquiry into the essential nature of the art. The subjects of the five following books are invention and arrangement; while those of the eighth, ninth, tenth, and eleventh are composition (embracing the proper use of figures of speech) and delivery. The last, and, in the author's view, the most important, book is devoted to the various requisites for the formation of a finished orator, such as his manners, his moral character, his mode of undertaking, preparing, and conducting causes, the style of eloquence most advantageous to adopt, the age at which pleading should be begun, and at which it should be left off, and other allied topics. The entire work is remarkable for its sound critical judgments, its purity of taste, and the perfect familiarity it exhibits with the literature of oratory. The condensed survey of Greek and Roman literature with which the tenth book commences, has always been admired for its correctness and animation. The declamations, amounting to 164, which have been ascribed to him, are now believed to be spurious, as they evidently belong to different authors, and even different epochs. There is better ground, however for ascribing to him the anonymous *Dialogus de Oratoribus*, often included in editions of Tacitus. The best editions of Q. are those of Burmann (Leyden, 1720); and of Spalding and Zumpt (Leip. 1798—1829).

QUINTIN MATSYS, a celebrated painter of the early Flemish school. He was born at Antwerp about 1460, and is generally known by the name of the Blacksmith of Antwerp, from having followed that trade in early life. The romantic story so long connected with this artist's name, of his having adopted the profession of painting in order to obtain the hand of a painter's daughter, is founded on nothing more authentic than the verses of Lampsonius, affixed to his portrait by Jerome Cock (1510—1570), and the inscription on his monument in the cathedral at Antwerp, 'Connubialis Amor de Mulcibere fecit Apellem.' The fact of his admission into the painters' fraternity of St. Luke in 1491—1492, is proved by an entry in the register of that body. It appears from two authentic documents that he was alive on 8th July 1530, but had died previous to 12th October 1531. In the works of this distinguished painter, art is exhibited as transitionary between the

style of Van Eyck and Rubens—his aim being, without neglecting the accessory details, to give more importance to the human figure, and more unity and effect to the general composition of his picture. Albert Dürer and Holbein thought highly of his works; among them, the best is an altar-piece with two folding-doors or wings, at one time in the cathedral, now in the picture-gallery at Antwerp, and one of the *chefs-d'œuvre* of that collection. It is specially referred to by Sir Joshua Reynolds in his Notes on his Tour through Flanders and Holland. Q. M. was on intimate terms with Erasmus, Sir Thomas More, and Petrus Ægidius. Many elaborate specimens of ornamental iron-work are attributed to this artist; but from the facts connected with his career as a painter, it may be inferred that he merely furnished designs for the works in iron referred to.

QUI'NTIN, or QUINTAINE, was an instrument used in the ancient practice of tilting on horseback with the lance. It consisted of an upright post, surmounted by a cross-bar turning on a pivot, which had at one end a flat board, at the other a bag of sand. The object of the tilter was to strike the board at such speed that the rider was past before the bag of sand, as it whirled round, could hit him on the back.

QUI'NTUPLET, in Music, a rhythmical group of five notes, formed of a note divided into five instead of its proper complement of four parts; the five notes having collectively the value usually expressed by four such notes. Thus, the five semiquavers of the group are equivalent in value to one crotchet, or four ordinary semiquavers.

QUI'NTUS CU'RTIUS RU'FUS, the Roman historian, flourished probably in the time of Vespasian; while a less plausible conjecture represents him as having lived in the reign of Constantine. Nothing further is known, or can even be fairly surmised regarding his life. His work entitled *De Rebus Gestis Alexandri Magni Regis Macedonum*, consisted of ten books; but of these the first two are lost, and the other eight are occasionally imperfect. Its style is flowing and ornate, but it wants the pure Latinity of Cicero, and the simplicity of Cæsar. Along with the Greek history of Arrian, it forms our most valuable source of information respecting the military career of Alexander the Great, although it is not entirely free from geographical, chronological, and strategical blunders. The best edition is that of Zumpt (Brunswick, 1849).

QUIRE (Fr. *cahier*), of paper, consists of twenty-four sheets, each doubled once, and one placed within the other.

QUIRI'NUS was, among the Sabines (and according to Mommsen, among the Latins also), a surname of Mars, and is probably derived from the Latin word *quiris*, a spear. It is therefore equivalent to the 'Spear-bearer.' According to the ancient legend, the name was first given to Romulus (q. v.), as the son of Mars, after his apotheosis, and the festival instituted in his honor was called the *Quirinalia*.—The QUIRINAL (Lat. *Collis Quirinalis*), is one of the seven hills on which ancient Rome stood, and, next to the Palatine and Capitoline, the oldest and most famous quarter of the city. It lies due north of the Palatine, and its western slope looks down on the Campus Martius, which stretches from its base to the banks of the Tiber. According to the ancient legend, it was the seat of the Sabine portion of the mixed population of early Rome; but this idea is strongly combated by Mommsen, who rejects as a 'baseless speculation' the 'etymologico-historical hypothesis started by Varro, and, as usual, unanimously echoed by Latin writers, that the Latin *quiris* and *Quirinus* are akin to the Sabine town *Cures*, and that the Quirinal Hill accordingly had been peopled from Cures' (*History of Rome*, vol. i.). The most notable structures on the Quirinal were *The Temple of Quirinus*, said to have been built by Numa in honor of Romulus, *The Temples of Flora, Salus, Fortuna, and Sol*. Here, also, were the famous Gardens of Sallust (*Horti Sallustiani*), the *Circus Floræ*, the *Circus Sallustii*, the Baths of Diocletian, and the Prætorian Camp.

QUIRK, a small angle or recess between mouldings. It is much used in Greek and Gothic architecture, and sometimes in Roman.

QUI'SCALUS, a genius of birds of the family *Sturnidæ*, having the tail longer than in the starlings (*Sturnus*), and *graduated*—the middle feathers longest—its sides turned up. From this last character, some of the species are often called BOAT-TAIL. The Great Boat-tail, or Great Crow Blackbird (*Q. major*), a bird about 16 or 17 inches long, is common in the southern parts of North America.—More common, and indeed abundant in all parts of the United States, is the PURPLE GRAKLE, or CROW BLACKBIRD (*Q. versicolor*), a bird about twelve inches in length, tail included; black, with reflections of blue, violet, &c. Vast flocks of this species are to be seen at the seasons of migration in some parts of North America. Its migrations extend to very northern regions in summer. It is to be found in Louisiana at all seasons. Its depredations in fields of maize and other kinds of grain, make it an object of special dislike to North American farmers. Its flesh is dry and coarse, although often used for food; but its eggs are esteemed a delicacy.

QUITCH. See COUCH GRASS.

QUI TAM actions are actions so called in the law of England from the first words of the old form of declaration by which informers sue for penalties, the plaintiff describing himself as suing as well for the crown as for himself, the penalty being divided between himself and the crown.

QUI'TO, the capital of Ecuador (q. v.), and of the province of Pichincha, stands between two parallel ranges of the Andes, on the east side of the volcano of Pichincha (q. v.), at an elevation of 9492 feet above the sea, and in lat. 0° 15′ S., long. 78° 45′ W. Its site, in the midst of mountains, is very uneven; its appearance, however, is picturesque, and its beautiful environment of mountains, together with its clear, healthy, and temperate climate, averaging 60° Fahr., and described as an eternal spring, make it one of the most charming cities of South America. From the hills in the vicinity, a beautiful panoramic view, embracing eight icy peaks of the Andes, may be obtained; and to the south of the city extends the lovely valley of Chillo, laid out in gardens. The chief edifices are built of stone, the others of adobes, or sun-dried bricks, covered with tiles. Q. contains many churches, monasteries, convents, two hospitals, two colleges, and several plazas or squares. By the earthquake of March 1859, most of the then existing churches, convents, and government buildings, as well as many private residences, were thrown down, property to the value of 3,000,000 dollars was destroyed, and many lives lost. From this calamity, the city has in great part recovered. Q. is the seat of the only archbishop in the country, and of the government. Coarse cotton and woollen goods and jewelry are manufactured, and the trade in grain, indigo, metals, and liquors is extensive. Pop. 76,000.

The most important events in the history of Q. are mentioned in the articles ECUADOR and PERU (q. v.).

QUIT RENT is the small rent which is payable by the tenants of old manors, by which they go *quiet* and free. In old records, it is called *white* rent, because it was paid in silver money, as distinguished from corn rents.

QUOIN (Fr. *coigne*, from Lat. *cuneus* = Gr. *gonia*) is generally a wedge or an angle. In artillery, the quoin is a wedge inserted beneath the breech of a gun, for raising or depressing the muzzle. The Armstrong gun is elevated by a screw instead of a quoin; but considering the rough service of actual warfare, it is doubtful whether the clumsier quoin is not more to be depended on. Quoins on shipboard are wedges used to prevent casks from damaging each other.

QUOIN, in Architecture, is one of the stones forming the solid corner of a building. Where the work is of brick or small materials, the quoins are usually of ashlar. They sometimes project, and are moulded, when they are called 'Rustic Quoins.' See RUSTICATION.

QUOITS, a game much practised by the working classes in the mining districts of Great Britain, seems to have been derived from the ancient game of 'throwing the *discus*,' which was such a favorite amusement of the Greeks and Romans. The discus was a circular plate of stone or metal, 10—12 inches in diameter, and was held by its further edge with the right hand, so as to lean upon the fore-arm, and was cast with a swing of the arm, aided by a twist of the whole body. It was generally thrown edge foremost, and upwards at an angle of 45°, so as to give it as great a range as possible, and the player who threw it furthest was the winner. Similar to this game was the 'throwing of the *solos*,' a heavy spherical mass of stone or iron, perforated through the center, to admit a rope or thong, by the aid of which it was thrown. In this game also, the furthest throw was the successful one. It is still practised by the mountainers of the Appenzell, in Switzerland. The game of quoits differs very considerably from both of these.

A quoit is a flattish ring of iron, generally from 8¼ to 9½ inches in external diameter, and between 1 and 2 inches in breadth. It is convex on the upper side, and slightly concave on the under, so that the outer edge curves downwards, and is sharp enough to stick into the ground. The mode of playing is as follows: Two pins, called 'hobs,' are driven into the ground from 18 to 24 yards apart; and the players, who are divided into two parties, stand at one hob, and in regular succession throw their quoits (of which each player has two) as near to the other hob as they can. The points are counted as in bowls or in curling. To facilitate the sticking of the quoits at the point where they strike the ground, a 'clay end'—that is, a flat circle of clay, about 1 or 2 inches in thickness, and 1½ feet in radius—is placed round each hob. This requires to be kept moist, and should have sawdust strewed over it. The quoit, when to be thrown, is grasped with the right hand by one side, and pitched with an upward and forward jerk of the

hand and arm, which give it a whirling motion, and cause it to strike the ground with its edge. Professional players acquire such dexterity in this game, that they can very frequently 'ring' their quoit—that is, land it so that the quoit surrounds the hob.

QUO'RRA. See NIGER.

QUO'RUM (Lat. *quorum*, of whom) is a legal term, denoting a certain specified number out of a larger number as entitled or bound to act for certain purposes. Thus, in statutes appointing commissioners or trustees of a public work, it was usual to name a certain number of the whole body as sufficient to discharge the business, when it may be inconvenient for all to attend. In Scotland, the word is commonly used in reference to trustees appointed under trust settlements, when one or two individuals, either in point of number, or for some personal reason, must concur in formal acts. In England the word is now seldom used except in regard to justices of the peace. It was an ancient practice of the crown to select a few of the justices, generally the most skilled in the law, and designate them as 'of the quorum,' so as to secure their presence on certain occasions when peculiar business requiring skill was to be done. This selection, however, by degrees came to be considered invidious; and by statutes of George II. and George III., it was expressly enacted that things which formerly required to be done only by justices of the quorum, might be done by ordinary justices. And latterly, the crown has made all the justices justices of the quorum, so as to put them all on the same footing.

QUOTI'DIAN FEVER. See AGUE.

QUO' WA'RRANTO is a writ or information issued from the Court of Queen's Bench in Westminster, calling upon a person or body of persons to show by what warrant they exercise a public office or privilege. It is the legal mode of remedying any usurpation of privilege or of office.

R.



THE eighteenth letter in the English and other Western alphabets, is one of the group of liquids. See LETTERS. Its name in Hebrew was Resh, meaning forehead, and the rude outline of a head is thought to be yet recognizable in the Phœnician form of the letter. Of all the consonants, R. approaches most nearly to the vowels. In Sanscrit, there is an R-vowel distinguished from the R-consonant by a different character. The Greek also had two varieties of R, one with the 'spiritus asper' (ῥ), or rough breathing, at the beginning of words, and when following another R; and another with the weaker breathing (ῤ) in other positions. The Romans in spelling Greek words represented the former by *rh*, and hence we still write *Rhodes, rheumatism, catarrh.* This *rh* was probably of the guttural kind commonly called a 'burr.' This pronunciation of *r* occurs as a peculiarity of individuals everywhere, but it is universal in Northumberland and Durham, and characterizes the pronunciation of the letter in certain positions throughout Germany and Scandinavia. The normal pronunciation of R in English and in the Romanic tongues (and it appears to have been the same in Latin) is a vibratory sound produced by applying the tip of the tongue near the roots of the upper fore-teeth. From the resemblance to the growl of an angry dog, R was called by the ancients the dog's letter.

In modern English, there is an increasing tendency to smooth down the roughness of the vibration, until, in such words as *far, serf, world*, the *r* has dwindled to a kind of nondescript vowel, modifying the preceding vowel. This emasculating process—for such it undoubtedly is—is in so far only the operation of the universal law of phonetic decay, arising from the natural tendency to spend as little energy as possible; but it has been accelerated in this case by a fashion which is apt to mistake languor and indifferene for refinement. This affectation goes so far as to turn words like *very, rare*, into *vewy, waaw.* R is one of the most difficult articulations; children are long in learning it, and some individuals never can pronounce it. Whole nations (e. g., the Chinese and some Polynesian tribes) have no such consonant in their language, using *l* instead. The interchanges of *r* with *l* are noticed under L. A more remarkable substitution is that of *r* for *d*, which was very prevalent in early Latin, as we learn from Priscian and from inscriptions. Ex. *arvocatos* for *advocatos.* The Latin of the literary period had returned from this corruption, except in *arbiter* (from an old verb, *adbitere*, to go to, to intervene). *arcesso*, and *meridies* (for *medidies*, from *medius*). The substitution is easily accounted for, when we consider that in both sounds the tongue is applied to the same part of the palate; only in the one it is applied firmly; in the other, loosely, so as to vibrate.

A very common phenomenon, especially in Latin, is the sinking or degradation of an original *s* between two vowels into *r*. On inscriptions, we find *Lases, asas, esum*, for what at a later period was written *Lares, aras, eram. Jus, mos*, became in the genitive *juris, moris*, instead of *jusis mosis.* Even final *s* was sometimes degraded to *r*, as in the double forms, *arbor* = *arbos, honor* = *honos.* Curiously, we know the date when the tendency to change *s* between the two vowels into *r* set in; for Cicero remarks that L. Papirius Crassus, who was consul in 336 B.C., was the first that was called Papirius, the ancestral name having been Papisius. The interchange in question occurs also to some extent in the Teutonic tongues. Compare Eng. *forlorn* with *lose* (Ger. *verlieren*), *was* with *were;* Ger. *wesen* (to be) with *war* (was); Goth. *hausjan* with Ger. *hören* (to hear); Eng. *hare* with Ger. *hase.* The unstable nature of this articulation is manifested in its frequently changing its place with regard to an adjoining vowel; compare *board* with *broad; bird* with old *brid; grass* with A.-S. *gærs.*

RA. See EGYPT.

RAAB (Hung. *Győr*) a town of Hungary, stands on an extensive plain at the confluence of the Raab and the Little Danube, a branch of the great river of that name, 67 miles west-north-west of Buda. It consists of an inner and outer town, is regularly built, and for the most part well paved, but suffers from an insufficient supply of drinking-water. It contains numerous religious edifices, among which is a beautiful cathedral. The manufactures are chiefly tobacco and cutlery; and the trade of the town, favored by its position on the highway between Vienna and Buda, is important both by land and by steamers on the river. Pop. (1880) 20,981.

RAA'LTE, a cantonal town of the Netherlands, in the province of Overyssel, 11 miles north-north-east of Deventer. Pop. (1875) 5512, of whom one-fourth belong to the Reformed Church, and the remainder, excepting 61 Jews, to the Roman Catholic. The trade is chiefly in agricultural produce, cattle, wool, wood, and bark for tanning. R. is one of the prettiest places in the province, having many beautiful houses, and in the neighborhood, seats of the nobility. Hans Willem, Baron van Bentinck, the founder of the ducal house of Portland, was born at R. in 1651.

RAA'SAY, one of the Western Isles, belongs to the group of the Inner Hebrides, and lies between the Isle of Skye and the mainland; the sound of Raasay separating it from the former, and Applecross Sound from the latter. It is 13 miles in length by 2½ miles in greatest breadth. Pop. was in 1871, 389; and in 1881, had risen to 478. The western side of the island is bare and uninteresting. On the eastern and more sheltered side, there are numerous farms, some patches of plantation, and bold and striking scenery. Brochel Castle, on the east shore—now a mere ruin—is the chief object of interest on the island. It is perched on the summit of a lofty cliff, which beetles over the sea, and is entirely inaccessible, save by a pathway winding around the cliff.

RABA'T, or RABATT, a seaport and manufacturing town in the kingdom of Fez, Morocco, stands at the mouth of the Bu-Regreb, 135 miles south-south-west of the entrance to the Strait of Gibraltar. It is surrounded by walls; protected by batteries, and by a citadel, called *El-Mansur;* and contains numerous mosques, minarets, bazaars, &c. Owing to the silting up of the mouth of the river, the commerce of R. has much declined. Manufactures, however, of carpets, bournus, woollen fabrics, waterproofs, mixed linen and silk goods, saddlery, &c., are actively carried on. R. was formerly the center of the European trade with Morocco, and it still exports olive oil, wool, grain, oranges, hides, flax, and dyestuffs, wax, &c. There is a small import of cotton-stuffs, linen, cutlery, glass, sugar and tea. Value of imports (1874) £11,000; of exports, £5400. Pop. 20,000, of whom 2000 are Jews.

RA'BRA, a flourishing town of Africa, in the kingdom of Gando, stands on the left bank of the Niger, 80 miles above Egga, in lat.

9° 16′. The district by which it is surrounded is beautiful and highly cultivated. R. carries on an extensive general trade, and is the most notorious slave-market in this part of Africa. Estimated pop., 40,000.

RA'BBI (Heb., *My Master*), an honorary title of the Jewish Masters of the Law, which is first found applied after the time of Herod, subsequently to the disputes between the two schools of Shammai (q. v.) and Hillel (q. v.). It was in common use at the time of Christ, who is addressed as such by his disciples and the common people. Other forms of the same title are Rab, Rabban, Rabbon, ('Rabbuni')—the first, like rabbi, being more a general term for a certain recognized authority, the latter applying more strictly to a head of an academy. The title Rabban, was first given to the grandson of Hillel, Gamaliel (q. v.), and was only borne by seven other exalted chiefs of schools. Properly speaking, the following dignities alone were of old considered 'official;' 1. *Sopher*, scribe, one who occupied himself with copying and commenting on the Scriptures, and who, when elected to the Sanhedrim (q. v.), received the title of Chacham (Sage); 2. *Rabban*, Nomodidaskalos, one who held popular orations, homiletically or otherwise treating of the Law. Out of the number of the regular disciples (Talmidim) were chosen the Chaberim (Colleagues), who, again, were elected to the dignity of a rabbi by the 'Semichah,' or imposition of hands by three members of the Sanhedrim. At present, nothing but the degree of 'Morenu,' our Teacher, bestowed upon a candidate who proves his erudition in the written and oral Law and all its bearings before a college of rabbis, is wanted to render him eligible for the post of a rabbi, which, however, carries no authority whatsoever with it, save on a very few ritual points.

We need hardly allude to the popular fallacy of the rabbi of our day being a kind of 'priest' in the sense of the Old Testament. He is simply the teacher of the young, delivers sermons, assists at marriages and divorces, and the like, and has to decide on some ritual questions. Up to the times of the removal of the 'Disabilities' in Europe, he had on some occasions also to give judgment in civil matters, in accordance with the 'Choshen Mishpat,' a legal text-book, derived from the Talmudical and post-talmudical authoritative decisions.

RABBIT (*Lepus cuniculus*), an animal of the same genus with the hare, but of smaller size, and with shorter limbs, the hind-legs shorter in proportion. It is not adapted, like hares, to seek safety by rapid and continuous running, but by retreating to burrows, which it excavates with great dexterity. Except in some varieties, which result from domestication, the ears are only about as long as the head. The wild R. is of a grayish-brown color, paler or whitish on the under parts; the ears not tipped with black, like those of the common hare; the tail rather larger and more conspicuous—brown above, white beneath. The R. exhibits a remarkable difference from the hare in its gregarious



Tame Rabbits.

habits; and another in the comparatively imperfect state of the young at their birth, which are blind for some days, and are almost destitute of hair. It delights in sandy heaths, dry grounds covered with scattered furze or juniper, and other such situations; to which, however, it is by no means restricted, and is often very troublesome by its depredations on crops in the finest fields, having its abode in some neighboring wood, but it never makes its burrow in a wet soil. Although now very abundant in most parts of Britain, and generally throughout Europe, the R. is said to have been introduced into Britain from Spain, and even to have been originally brought to Europe from the north of Africa.

In a wild state the R. is monogamous, and the attachment of a pair is said to continue during life; but in a state of domestication it ceases to pair. The fertility of rabbits is proverbial; they begin to breed when six months old, and are capable of producing several litters in a year, of 4 to 12 or more in a litter; so that, in favorable circumstances, they multiply with prodigious rapidity; and although they have many natural enemies, would in many places become an intolerable pest to farmers, were not means adopted to reduce their numbers. Rabbits often inflict great injury on plantations by barking young trees, seeming to take pleasure in tearing off far more than they can eat. An infusion of tobacco repels them from trees. The flesh of rabbits is in high esteem, and the fur being used for various purposes, rabbit-warrens are found profitable in lands not suited for agriculture. See RABBIT-SKINS.

Instances have occurred of the R. and hare breeding together, but they are very rare, and the creatures seem rather to regard one another with antipathy.

Tame rabbits exhibit great variety of colors—gray, brown, reddish-black, more or less mixed with white, and often white, with all the characters of albinism. Peculiarities of other kinds also appear in some of the varieties, among which excessively long and drooping ears are one of the most remarkable. *Fancy Rabbits* are prized and tended like *fancy pigeons*. But when rabbits are kept for economical purposes, those which differ less widely from the original type are preferred. Rabbits eat almost any kind of vegetable food; the coarser blades of cabbages, turnip-leaves, celery-tops, carrot-tops, and other produce of the garden, not suitable for human use, are readily consumed by them, as well as chickweed, sow-thistle, dandelion, and many other weeds. With very little trouble, and still less expense, a man can easily secure one or two rabbits a week for his family from the produce of his stock.

When the rabbit-enclosure contains a plot of grass and clover, it affords them an important part of their food. Great care is requisite to keep their boxes dry, neglect of which, and a too exclusive feeding with green and succulent food, cause diseases, often fatal, particularly to the young. Dry food, such as corn, ought to be frequently given; and aromatic herbs—such as parsley, thyme, milfoil, &c.—not only tend to preserve the health of rabbits, but to improve the flavor of their flesh. It is usual to give no water to tame rabbits; but it is better to supply them regularly with it, and the females particularly need it after producing young.

An old English name for the R. is *cony*, but the R. is not the Cony (q. v.) of Scripture. The R., introduced from England into the Australasian Colonies, has multiplied to such an extent, as to be a serious plague to sheep farmers and agriculturists in New Zealand and some parts of Australia. Of late, rabbits have been extensively tinned and sent to England as food.

The *Angora R.* is a remarkable variety, with very long silky hair, which is easily stripped off in summer. It is regularly reared in France.

The Gray R. (*Lepus sylvaticus*) of North America is the most plentiful species of the genus *Lepus* in New Jersey, Pennsylvania, and the more southern states; but although it somewhat resembles the common R. in color, and is rather inferior to it in size, its habits are intermediate between those of the R. and of the hare. It does not burrow, although, when hard pressed by a pursuer, it retreats into any accessible hole, and sometimes digs, in order to escape from or enter an enclosure.

RABBITS, in point of law, give rise to many nice questions, which in practical life are of no small importance, for they form a branch of the Game Laws (q. v.). In England and Ireland, the law till 1880 was, that whoever is owner of the soil is entitled to catch and kill all the rabbits he finds upon it, without any game license. As between landlord and tenant, the rule was, that unless the lease expressly said that the rabbits belonged to the landlord, they belonged to the tenant, who could kill and catch them at discretion. The Ground Game Act of 1880 largely altered the presumptions in law on this subject. Now the occupier of land has, as incident to and inseparable from his occupation, the right to kill and take ground game, that is, hares and rabbits, thereon, concurrently with any other person who may be entitled to kill and take ground game thereon. The occupier may authorize in writing one other person to kill ground game, being a member of his family dwelling on the land, a servant, or any one hired for reward. Such persons require no game license, but must have the gun license. No person qualified under this act shall use firearms to kill ground game between the hour after sunset and the hour before sunrise. If any one trespass on land to kill rabbits, he is liable to be fined £5; and he may be arrested, if caught in the act on the lands, and detained, provided he do not tell his name and address, and quit the land. The rabbits which he has poached cannot, however, be taken from him, except when he is on the highway, and then only by a constable.

In the latter case, viz., where the poacher is stopped on the highway by a constable, he cannot be taken into custody, but merely is liable to be summoned before justices, and fined. Poachers who take rabbits in the night-time now commit an indictable offence, and not merely an offence which justices can punish summarily. There is no close-time as to rabbits, and any person may buy and sell them without any license. In Scotland

also, the tenant was heretofore entitled to kill rabbits unless there was an express reservation of them to landlords; and the provisions of the Ground Game Act of 1880 apply to Scotland as to England. Poachers of rabbits are punished summarily in the same way; and constables on highways may stop poachers as in England. The only difference between the law of England and Ireland is, that in Ireland a game license is not required in any case for killing rabbits, whether the lands are the sportsman's own lands or not. See also GAME, POACHING.

RABBIT-SKINS have a regular commercial value in consequence of the hair being well adapted for felting purposes; hence they are collected in large numbers by the chiffoniers of this and other countries; and the hair itself is not unfrequently imported from Holland and Germany, under the erroneous name of 'cony-wool.' Its chief use is in making the bodies of felt hats; and this is now done by machinery of very ingenious construction. It consists of a hollow cone of copper, of the size of the felt cones required by the hatters. The cone is covered with perforations, and it fits on to a metal shaft of the diameter of its base, by means of a collar, which can be turned round by a band, so as to carry the perforated cone with it. At the bottom of the metal shaft is a fan, moved by machinery, which produces a strong downward draft, so that if the hairs are thrown against the cone, they are held tightly by the current of air through the perforations; and as the cone regularly revolves, its outer surface becomes entirely coated with the rabbit-hair. When a sufficient thickness is obtained, the smooth copper cone is easily drawn out, leaving a cone of wool, which is felted by the usual pocesses of wetting, beating, &c. Another ingenious contrivance in this machine is to make the draft of air caused by the fan blow the rabbit-fur forward to the cone, so as to distribute it with an evenness which could not otherwise be attained.

The skins, after the hair has been removed from them, are sold to the glue-makers, and are used—mixed with shreds of other skins—in the manufacture of glue and size. Besides these uses, the skins of rabbits are dressed as furs, in various ways, to supply the demand for cheap articles; and so skilfully is this branch of trade carried on, that admirable imitations of the rarer and more costly furs are made. Thus, ermine and miniver are made from white rabbit-skins, the black ones furnishing the spots; and the common variety is dressed and dyed various ways, to represent the furs of dark-colored animals. In the reign of Henry VIII., rabbit-fur was valued very highly, and was worn by the nobles of the realm; this is referred to in the charter of the Skinners' Company.

There has been a very large market in the United States for the imitation furs prepared from rabbit-skins, to which country British manufacturers have largely exported.

RABELAIS, FRANÇOIS, the greatest of French humorists, was born, according to the general statement of biographers, in 1483, but more probably towards 1495, at Chinon, a small town in Touraine. His father, Thomas Rabelais, was proprietor of a farm in the neighborhood, celebrated for the quality of its wine, the sale of which he perhaps combined with the business of an apothecary. His prosperous circumstances enabled him to give to his son every advantage of education, and at an early age, the boy was sent as a pupil to the neighboring Abbey of Seully. His progress in his studies being found by no means satisfactory, he was thence removed to the university of Angers. Here—though as a scholar he still remained quite undistinguished—he was fortunate enough to make the acquaintance of Jean (afterwards the celebrated Cardinal) Du Bellay, to whose study and helpful friendship he was subsequently much indebted.

At the desire of his father he consented to embrace the monastic state, and after passing through the preliminary novitiate, became a brother of the order of St. Francis, in the convent of Fontenay le Comte, according to the annalist, Pierre de St. Romuald, in 1511, but the discovery of a document by M. B. Fillon (*Poitou et Vendée*, Fontenay, 1861), renders the date 1519 more probable. R. now devoted himself with the utmost ardor and perseverance to the prosecution of his hitherto neglected studies. Aiming at the widest culture attainable, he ranged the whole circle of the sciences as then understood. To medicine, in particular, he seems to have been strongly attracted; and in the sphere of language, in addition to Latin and Greek, he is said to have attained a competent mastery of Italian, Spanish, German, English, Hebrew, and Arabic. Meantime, with his brother-monks, he was much the reverse of a favorite. They hated him for his devotion to the new learning, and suspected his Greek to be only a cover for heresy. About 1523, a search was made in his cell for suspicious books; the whole were confiscated, and to save himself from further and sharper persecution he fled. But though only a poor monk, the wit and learning of R. had gained him several influential friends, through whose exertions he obtained from Pope Clement VII. an indulgence to transfer himself from the order of St. Francis to that of St. Benedict, and became an inmate of the monastery of Maillezais. For the calumny afterwards circulated, that his removal was necessitated by the odium attached to a life of profligate indulgence, there seems no reason to suppose that there ever was the smallest ground.

We must infer that in his new abode he found himself not much more comfortable than before, as after a few years he quitted it abruptly, without the sanction of his ecclesiastical superiors, thereby incurring the severest censures of the church. But it was not persecution that induced this second flight from the monastic state. It was the incurable aversion of the grotesque humorist to the restraints of the 'regular' clergy. And nobody seems to have really blamed him for his professional apostacy—his own bishop, among others, receiving him at his table in the most friendly manner! During 1524—1530 he appears to have frequented the universities of Paris and Bourg; which may account for the intimate knowledge of university manners and opinions shown in his great work. In the year 1530, he settled at Montpellier, and taking a medical degree at the university, was appointed to the post of lecturer. In 1532 he went as hospital physician to Lyon, where he published several works on medical science, besides other miscellaneous matter bearing on archæology, jurisprudence, &c. In the beginning of 1534, his old friend, Jean Du Bellay, then Bishop of Paris, and shortly after to be Cardinal, passed through Lyon, on an embassy to Rome, whither, in the capacity of traveling physician, R. was delighted to accompany him, in fulfilment of a desire long cherished. While at Rome, he petitioned Paul III. for a remission of the penalties still attached to his misdemeanor before mentioned; and through the interest of Du Bellay and others, a bull was obtained, absolving him, and permitting his return to the order of St. Benedict. But he continued the exercise of his profession of medicine at Montpellier and other towns till 1538, when he withdrew as canon into Du Bellay's own abbey of St. Maur des Fosses, near Paris, and resumed his monastic habit.

The death of Francis I. in 1547, was followed by the fall of Cardinal du Bellay, the new monarch, Henry II., favoring the Cardinal de Lorraine. R. shared for a time in the disgrace of his old protector, whom he appears to have followed to Rome, but his tact and irresistible humor won him friends among the Lorraines, and in 1551 he obtained the curacy of Meudon, in the occupancy of which the remainder of his life was passed. So far as record remains of it, his life here was happy and blameless. He was exemplary in the fulfilment of duty, profuse of charity, sedulous in the relief of suffering, for which his medical knowledge afforded him unusual facilities; and always specially delighted to cultivate, as occasion served, the society of those any way noted as eminent in learning or science. He died at Paris, in 1553, in the Rue des Jardins, in the parish of St. Paul, in the cemetery of which he was buried.

The scientific treatises of R. are—almost in the nature of the case—long since utterly forgotten; but his romance, in which are narrated the wonderful adventures of Gargantua and Pantagruel, continues to take rank as one of the world's masterpieces of humor and grotesque invention. In the form of a sportive and extravagant fiction, it is, in fact, a satirical criticism of the corrupt society of the period, the prevalent follies and vices of which are parodied with surprising effect and ingenuity.

The difficulty of its allegorical form, however, and the quantity of recondite allusion it embodies, tend somewhat to impair the effect of the work for most modern readers. Also, it must be said, that in his attempt to

> Cleanse the foul body of the infected world,

it is the whim of the writer to infect himself with not a little of its foulness; and such is the riotous license of the buffoonery, from behind which, as a stalking-horse, he shoots the arrows of his wit, that few books are less fitted for general perusal in the present more decorous times. On the publication of his work, the charge of irreligion and atheism were freely preferred against R., and certain other scandals were circulated, for which there seems to have been in his life no foundation, except as the free tone assumed by the writer might suggest a precarious inference to defective morality in the man. The religious corruptions of the time, and the vices of the priestly class, had formed one favorite theme of his satire, and he simply paid the usual penalty in thus incurring the easy retort calumnious. See Delécluze *Rabelais*, (1841); Lacroix, *R. sa Vie et ses Ouvrages* (1859); Fleury, *R. et son Œuvre* (1876). The editions of R. are innumerable. Sir T. Urquhart's English translation (1653) is the basis of the more modern ones.

RA'BIES, the name given to a disease affecting the dog and other animals, was known to the ancients, and is spoken of by Aristotle, Pliny, and Horace; but it does not seem to have been then so virulent in its nature, or alarming in its consequences, and Aristotle, perhaps in ignorance, states that man was not subject to its attacks. It was very prevalent on the continent two or three centuries ago, but was comparatively rare in this country

until the last century. This malady stands almost alone in this, that all animals seem liable to its attacks.

It is a matter of dispute among some of our best authorities whether rabies be occasionally *spontaneous* in the carnivora—the only animals in which it is undoubtedly inherent—or communicated solely by *inoculation*.

Looking simply at the *history* of the disease, the facts would seem to be against the spontaneity theory. Rabies is not known in some countries, such as the Cape of Good Hope, South Africa, Egypt, Syria, the South Sea Islands, Lisbon, where dogs swarm; and in Constantinople, where they go at large, and support themselves on offals of all kinds and qualities, the disease is of very rare occurrence. John Hunter relates that it was not known in Jamaica for forty years previous to 1783, when it was introduced by an affected dog from America; and Dr. Hamilton says that curs of the most wretched description abound in the island of Madeira—that they are affected with almost every disease, tormented by flies, by heat, thirst, and famine, yet no rabid dog was ever seen there. There is often, no doubt, great difficulty in tracing the cause of rabies from inoculation. The owner may feel convinced that his diseased dog had almost never been out of his sight, or exposed to an affected animal; but when we consider the predatory habits of the dog, and his love of association, and how easily he can steal away unobserved by night or by day for a longer or shorter time, we can readily account for the most vigilant eye being occasionally off its guard. It has been asked, as an objection to the exclusiveness of contagion or inoculation, How was rabies at first originated? But the same difficulty attends the case of small-pox and other diseases which now arise only from contagion.

There is another important peculiarity in this disease on which medical men are divided—viz., whether the virus of a rabid animal, other than of the *carnivorous* species, can communicate the disease. Experiments to test this were made by some foreign surgeons of eminence, by Drs. Vaughan and Babington of London, and at the Royal Veterinary College; and it is reported that in every instance they failed in producing the disease. It is certain, however, that others have not so failed in their object. MM. Majendie and Brechet in 1823 inoculated two dogs with the saliva of a hydrophobic man, and it resulted in one of the dogs becoming rabid, which in turn communicated the disease to other dogs and some sheep. Mr. Earl, the well-known London surgeon, in administering medicine to a hydrophobic woman, was bitten by her, and he immediately excised the bitten part. Being accused of unnecessary fear and cowardice, he determined to justify his fears, and having inoculated several rabbits with the woman's saliva, some of them became rabid. Mr. King of Bath succeeded in producing the disease in a common hen by the virus of a cow. Several other cases could be related, but it may serve our purpose to quote the following remarks of Mr. Youatt: 'I can imagine that the disease shall not be readily communicated by the saliva of a graminivorous animal; but I have once produced it in the dog with the saliva of an ox, and twice with that of the horse, but I have failed to do it in very many cases. While on this point, it may be remarked, that the writer once saw a rabid horse bite a young man's hand rather severely, while incautiously giving it a ball of medicine, and he accompanied him to Sir Astley Cooper, who, according to his invariable practice, as he told us, applied nitrous acid to the injured part, and he assured us that no bad effects would accrue; and neither there did.'

We shall briefly notice some of the leading *symptoms* of rabies in the dog and horse. These may be exhibited in a dog in a few days, or it may be, and often is, weeks, and even months after he has been bitten. At first he loses his appetite, becomes sullen, fidgety, has a vacant gaze, licks or gnaws the injured part, laps any liquid that comes in his way—for he has, unlike man, no dislike for water, although he has a difficulty in swallowing it—eats wood, straw, hair, and other indigestible substances; and in a day or two he becomes quarrelsome, bent on mischief, bites at anything that comes in his way, and his bark is more like a howl; his lower jaw often becomes pendulous, and general paralysis sometimes precedes death; and as a rule, on the fifth or sixth day he dies. The principal post-mortem appearances are these—enlargement and increased vascularity of the salivary glands, inflamed condition of the base of the tongue and fauces, epiglottis, and stomach, which last organ almost invariably contains such indigestible substances as straw, hair, offal, &c. The symptoms in the horse, which becomes apparent in a few weeks, are those of extreme irritability. He trembles, heaves, and paws, staggers, and falls; and after a severe struggle he suddenly rises again, and appears settled and collected, when he will again exhibit the usual distressing symptoms. He is sometimes mischievous, bites, foams, and snorts; and generally in three days he dies paralyzed and exhausted.

The disease seems primarily to be one of *blood-poisoning*, and not, as some have represented it, an affection of the nervous system. We know that some instances of blood-poisoning terminate with coma, or convulsions, but are not, on that account, to be considered as proceeding from nervous disease. Whatever may be the precise nature of the disease, it is certain that no cure has been discovered for it. The writer has seen many dogs, some horses, and an ox in all the different stages of it, and many attempts at a cure tried, without producing even any palliative effects, and every one of the patients died in the ordinary course, whether anything or nothing was done. As the disease is so rare, and—contrary to popular belief—is not more prevalent at one period of the year than another, no anticipatory precautionary measures can be taken. Preventive measures, however, when it is known, or even suspected, that the disease has manifested itself, should not for an instant be neglected. All dogs known to have been bitten, or been in the company of the rabid animal, should be immediately destroyed, and every other dog in the town and district confined, or closely muzzled, for several weeks, or even months. As to the measures to be taken when a human being is bitten by a rabid animal, see HYDROPHOBIA.

RA'BINET, a small piece of ordnance formerly in use. It weighed but 300 pounds, and fired a small ball of 1⅝ inch diameter, with a very limited range.

RA'CAHOUT, a farinaceous food imported from the Barbary coast, and sometimes recommended, but with questionable judiciousness, to invalids. It is believed to consist of the meal of the acorns of the Barbary Oak (*Quercus Ballota*), flavored with some aromatic herb. It is sometimes sold under its French designation of *Racahout des Arabes*. It must not be confounded with Tacahout (q. v.).

RACALMU'TO, or RAGALMUTO, a town of Sicily, in the province of Girgenti, in an inland situation, on the crest of a hill 12 miles north-east from Girgenti. It is said to be of Saracenic origin. It has a castle, built by Frederick Chiaramonte in the 14th century. Pop. (1871) 11,012.

RACCONI'GI, a town in the west of Northern Italy, pleasantly situated on the Maira, 24 miles south of Turin by railway. Its palace, surrounded by a small but handsomely laid-out park, is one of the country residences of the royal family. Silk fabrics and twist, and woollen cloths, are manufactured. Pop. 8211.

RACCOO'N, or RACOON (*Procyon*), a genus of quadrupeds of the Bear family, *Ursidæ*, but differing widely from the typical members of that family, in being less perfectly plantigrade, the whole sole of the foot being indeed rested on the ground when the animal is still, but being partly raised when it walks, whilst when running it only touches the ground with the tips of its toes, and moves in a bounding manner. The dentition also differs from that of bears, there being, for one thing, only six instead of seven molars on each side in the lower jaw. The dentition indicates an aptitude both for animal and vegetable food. The general appearance may be described as intermediate between that of a fox and of a bear in miniature. The raccoons are exclusively American. The Common R. (*P. lotor*) is a native of North America, from Canada to the south of Mexico. It is about the size of a small fox, grayish-brown; the muzzle white. The hair, is of two kinds, an under-coat soft and woolly, of a uniform gray; and long and rather stiff hairs projecting through the wool, and alternately marked with black and grayish-white.

The R. frequents the seashore, and the margin of swamps and rivers. It commits great ravages on fields and Indian corn, plantations of sugar-cane, &c., and is not less destructive to poultry. It feeds much on oysters, particularly in the alluvial coast-lands of Carolina and neighboring regions where the American oyster abounds on the banks of rivers and creeks, and exhibits great dexterity in opening oysters. It is also very fond of crabs and



Raccoon (*Procyon lotor*).

other crustaceans. It has a curious habit of dipping or washing its food in water, whence its specific name *Lotor* (Lat. washer). When pursued, it often takes refuge in a tree, climbing with great agility, but its destruction is then considered sure, whence the American proverbial reference to a *tree'd 'coon*. The fur of the R. is used in the manufacture of hats, and is a considerable article of commerce.—Another species, the CRAB-EATING R. (*P. cancrivorus*), the Crab-dog of Guiana, is found in all parts of South

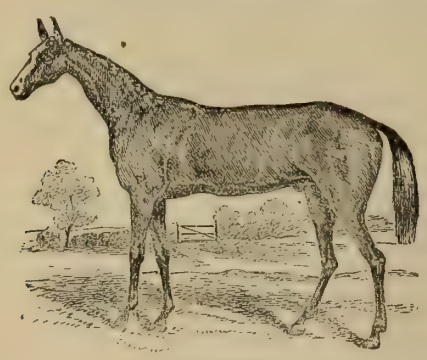
America east of the Andes. It is rather larger than the common R., although very similar to it.—Both species of R. display the same love of glittering things which is so remarkable in magpies, jackdaws, and others of the crow family. Mr. Wood mentions in his *Natural History* that a common R. did its best to get a ring off his finger by hitching one of its crooked claws into the ring, and pulling with all its strength; and a gentleman once resident in Guiana informed the writer of this article that a crab-eating R., which he caught young, and completely tamed, showed such a propensity to steal silver spoons, that he was obliged to send it away into the woods.

RACE. 'A *race* is a class of individuals concerning which there are doubts as to whether they constitute a separate species, or a variety of a recognized one. Hence the term is *subjective;* i. e., it applies to the *opinion of the investigator* rather than to the *object of the investigation;* so that its power is that of the symbol of the unknown quantity in algebra. The present writer having as yet found no tribe or family for which a sufficient reason for raising it to a new species has been adduced, has either not used the word *race* at all, or used it inadvertently. Its proper place is in *investigation*, not in exposition.'—Latham, *Natural History of the Varieties of Man.*

RACE, the portion of a loom from which the shuttle is projected through the shed, or separated threads of the warp.

RACE, a term employed in some cases, particularly in the English Channel, to designate the powerful current formed by a rushing tide. Thus, between the island of Alderney and Cape La Hogue, on the coast of France, is the *Race of Alderney;* and off the Isle of Portland, on the coast of Dorsetshire, England, is the *Race of Portland.*

RACEHORSE, a breed of horses distinguished for extreme fleetness. It owes its origin in great measure to Arabian, Barbary, and Turkish horses introduced into England. The great interest taken in Horse-racing (q. v.) since the time of James I., has led to the greatest care of the animals employed in it, and the



Racehorse.

utmost improvement of the breed. The racehorse is generally longer-bodied than the hunter, and the same power of leaping is not required. See HORSE-RACING.

RACE'ME (Lat. *racemus*, a bunch of grapes), in Botany, a form of Inflorescence (q. v.) which is *centripetal* (see CENTRIFUGAL AND CENTRIPETAL), and in which the flower-stalk throws off branchlets (*pedicels*) of nearly equal length, and each bearing a single flower. Familiar and very perfect examples of the R. may be seen in the Red or White Currant and in the Barberry. Notwithstanding the origin of the name, a bunch of grapes is not a true R., but a Panicle (q. v.).

RACE'MIC ACID. See TARTARIC ACID.

RACHEL, ELISA (properly ELISA RACHEL FELIX), a celebrated French *tragedienne*, was born at Munf, in Switzerland, of poor Jewish parents, on the 28th February 1820. The family removed to Lyon, in France; and in order to aid in its support, the child R. and her sister Sarah were in the habit of singing for chance gratuities in the streets and cafés of the place. In 1831, the household was transferred to Paris, and for R., lessons were procured in singing from an eminent teacher of the day. In music, she gave no promise of special excellence; and in 1833 she made her first appearance on the stage as an actress. Though her talent had previously been discerned by certain of the more judicious (among others, Jules Janin and the clebrated Mademoiselle Mars), it was only in 1838 that in the character of Camille, in Corneille's tragedy of *Les Horaces*, she first strongly attracted the attention of the public. The admiration excited by her performance rapidly grew into enthusiasm; and from this time forward, in the great parts supplied by the classic masterpieces of Corneille, Racine, and Voltaire, she shone without a rival. In 1843, her fame may be said to have culminated in her appearance as *Phèdre* in the tragedy of that name by Racine. In *Adrienne Lecouvreur*, a piece expressly written for her by MM. Legouvé and Scribe, she had also immense success, though in other more modern parts, her popularity was somewhat less. The *furor* excited in Paris in 1848 by her public recitation of the *Marseillaise Hymn*, in the interest of the revolutionary government, will continue to connect her name with the public history of the period. In 1849, she made the tour of the French provinces, and subsequently visited England and Russia, everywhere meeting with success and enthusiastic recognition. Her health, however, had begun to fail: in 1855, in the course of a professional visit to America, it altogether gave way, and she returned utterly prostrated. A residence at Cairo failed to restore her to strength; and on the 3d January 1858, she died at Cannet, near Toulon.

As an artist, within the limits prescribed by her genius, she has probably never been quite equalled. Of the burning intensity which characterized her rendering of passion in its fiercer concentrations, no words can give an adequate image. 'She does not act—she suffers,' some one very well said of her. Her *Phèdre*—by common consent her masterpiece—was an apocalypse of human agony, not to be forgotten by any one who ever witnessed it. In character, R. was neither exemplary nor amiable. Of the details of her private life it is as well nothing should be said. In her professional relations, she was notoriously grasping and avaricious. Her immense popularity enabled her, during much of her career, pretty much to dictate her own terms to her managers, and of this power, she has said to have availed herself without scruple or generosity. In this way she very rapidly amassed a large fortune. If little else of good is on record of her, she was constant in her home affections, and throughout she frankly made her whole family sharers of her prosperity.

RA'CHIS (Gr. the back-bone), in Botany, the *primary floral axis*, an elongation of the stem or of a branch, from which arise the flower-stalks (peduncles), or to which the flowers are immediately affixed.

RACINE, JEAN, the most admired of all the French dramatists, was born at Ferté-Milon, 21st December 1639, of a respectable family belonging to the *bourgeoisie*. At the age of four he lost both his parents, and then went to live with his maternal grandfather, by whom he was sent to the college of Beauvais. Here he remained till he was 16, at which time his grandfather died. He was then taken to Port-Royal (q. v.), where his grandmother and his aunt Agnes were leading a recluse life, and placed at the school which had been opened in that celebrated retreat by the pious scholars assembled there.

R. astonished his teachers by the rapidity of his progress in all his studies, especially in Greek; but he won their regards still more by the affectionate seriousness of his character, which gave a delicacy to his ardent sensibilities and vivid imagination. They loved him, yet they trembled for him. When they saw him wander—Sophocles or Euripides in his hand—among the shadows of the abbey, anxiety took possession of their hearts; and when they learned that he secretly indulged in the sinful pastime of making verses, they even thought it necessary to punish their favorite. Their punishment was indeed an odd one, for they obliged him to turn the hymns of the Roman breviary into French verse! Novels were placed under the same ban as poetry. One day the sacristan Lancelot found him reading the Byzantine romance of Bishop Heliodorus (q. v.), entitled *The Loves of Theagenes and Charicleia*, and threw the book in the fire; but R. says that it was already fixed in his memory, and that he smiled at this futile attempt to rob him of it. We can easily see that R. was not at all ascetically disposed as yet. After a residence of three years at Port-Royal, during which time he had, among other things, read and annotated the best Greek and Latin classics, he went to the Collége d'Harcourt to finish his curriculum with the study of logic. Then he went out to 'see life,' got into loose company, became irregular himself, and even grew so reckless as to burlesque, in his correspondence, the pious phraseology in vogue at Port-Royal. Deep was the grief and incessant were the remonstrances of his old friends, but they were long without avail. He had made some little name as a poet by an Ode on the marriage of the king, and had had the good fortune to get a pension for it, but still his income was small and precarious; and when a maternal uncle, who was a canon-regular of the church of St. Genevieve at Uzès, in Languedoc, held out to him the hope of a benefice, R. went to live with him in 1661, and tried to study systematic theology. But the effort was a hopeless one.

While he gazed vacantly into the *Summa* of St. Thomas, his thoughts were with Ariosto and Sophocles. In the summer of 1662, he returned to Paris in disgust, and commenced life as a dramatic writer, having meanwhile made the acquaintance of Molière and Boileau. His first piece was the *Frères ennemis*, played in 1664; but it was not till 1667, when his *Andromaque* appeared, that the power and peculiar character of his genius excited marked attention. For the next ten years, his career as a

dramatist was unsurpassably brilliant, yet, strange to say, we know almost nothing of his private or social life during that time. We have to content ourselves with little more than a few meagre facts relative to his literary performances, the chief of which are *Britannicus*, *Berénice*, *Bajazet*, *Mithridate*, *Iphigénie*, and *Phèdre*. Suddenly, at the early age of 38, in the full sunshine of his fame and vigor of his power, he resolved to abandon both the stage and the world, and become a Carthusian monk. The effect of his Port-Royal training was now seen. In the midst of all his literary ambitions and strifes, his little excesses, irregularities, and amours, R. had carried with him a keen and faithful conscience; and partly from disappointment, partly from remorse, he longed to forget all in acts of devotion. With difficulty, he was prevailed upon to modify the rigor of his purpose, and instead of seeking for religious felicity through the privations of solitude, and the severities of penance, to do so through marriage with some pious woman, and the cultivation of domestic virtues. A suitable lady—very devout, but not very intelligent—was found for the poet in the daughter of the city-treasurer of Amiens, and the marriage took place in 1677. Seven children, two sons and five daughters, were the fruit of this union. Shortly after it, R. was appointed historiographer to the king. Henceforth, his course of life was pursued with the utmost regularity—one-third of the day being given to God, another to his family and friends, and the remainder to the king.

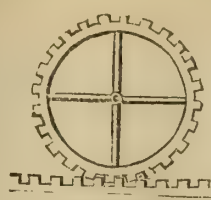
His *Esther* (1690) and *Athalie* (1691) are the only dramas which he produced after his conversion, and they are profoundly imbued with religious feeling. *Athalie* is reckoned by some his finest effort, and certainly the only one which can at all be placed in comparison with it is the *Phèdre*. The poet died, after a brief illness, on the 21st of April 1699.

R.'s dramatic genius was essentially French, or pseudo-classical, and therefore it is not easy for Englishmen trained to appreciate the power, magnificence, and variety of the Shakspearian tragedy, to sympathize with it or to criticize it impartially. In the eyes of his countrymen, he is the most perfect, if not the most sublime, of all their dramatists. Corneille may at times exhibit a grander and more rugged energy, but in beauty, grace, and a certain tender majesty of style, R. is held to be without a rival; and it must be remembered that *style*, and not portraiture of human character, is the thing in which French dramatists aim to shine. The declamations in which the heroes and heroines of R. indulge, are marvelously fine pieces of rhetoric; but, compared with the Elizabethan drama, they are deficient in deep insight into human nature and in genuine passion, while humor is altogether excluded. See *Mémoirs* of R., edited by his son Louis. The editions of his works are innumerable, and some are of great splendor; that of Girodet (Paris, 3 vols. 1801—1805) being reckoned one of the finest specimens of typography in the world.

RACI'NE, a city of Wisconsin, U.S., situated on Lake Michigan, at the mouth of Root River, which forms an excellent harbor, and on the line of the Chicago and Milwaukee Railway, 23 miles south of Milwaukee. It has ship-yards, factories, furnaces, &c. Pop. (1860) 7822; (1870) 9880; (1880) 16,031.

RACK (Sax. *wrocan*, Ger. *recken*, to stretch), an instrument of torture, used for extracting confessions from criminals and suspected persons. It consisted of a large oblong frame of wood, with four beams a little raised from the ground, on which the sufferer was stretched and bound. Cords were attached to his extremities, and gradually strained by means of a lever and pulleys, till the operation, if persisted in, caused dislocation of the limbs. The rack was known in the 1st and 2d centuries in the south of Europe, and applied to the early Christians. It was in use in England in the 15th and 16th centuries. According to Coke, it was first introduced into the Tower by the Duke of Exeter, Constable of the Tower, in 1447, whence it came to be called the 'Duke of Exeter's daughter.' It is mentioned by Holinshed in 1467; but its use first became common in the time of Henry VIII. as an implement of torture for prisoners confined in the Tower. The infliction of the punishment of the rack took place during the reign of the Tudor sovereigns, by warrant of council, or under the sign-manual. In 1628, however, on the murder by Felton of the Duke of Buckingham, it being proposed in the Privy Council, to put the assassin to the rack, in order that he might discover his accomplices, the judges resisted the proceeding, as contrary to the law of England. In various countries of Europe, the rack has been much used both by the civil authorities in cases of traitors and conspirators, and by members of the Inquisition to extort a recantation of heresy. It is no longer in use in any part of Europe.

RACK, or RACK-WORK, is a straight bar, with cogs or teeth placed along it, so as to correspond with similar cogs or teeth placed on a wheel, thus: If the bar is not movable, the wheel is attached to a traversing frame, and as it revolves, is moved along by the resistance of its teeth to those on the bar. It was in this way that the formation of a railway was first projected; the rail and the driving-wheel of the engine to be both furnished with corresponding teeth. In mechanics, rack-work has innumerable applications.



Rack-work.

RA'CKETS (Fr. *raquette*), a game frequently played in England; it is merely a modern variety of the old game of TENNIS (q. v.).

RACK RENT is the full yearly value of lands let upon lease, or to an occupier, or held by a tenant for life, as distinguished from the value fixed by the lease or agreement between the parties, and which is often less or greater than the real value.

RACOO'NDA, or NUTRIA, the four of the Coypu (q. v.).

RACZ, or O BECZE, a town of Hungary, in the Servian Wojwodschaft, on the right bank of the Theiss, 26 miles N.E. of Peterwardein. It carries on an extensive trade in corn. Pop. (1880) 15,040.

RADACK AND RALICK, two parallel chains of islands in the group called Marshall's Islands. See POLYNESIA.

RADCLIFFE, DR. JOHN, a celebrated physician, and the founder of the Radcliffe Library at Oxford, was born at Wakefield in Yorkshire, in the year 1650. He was instructed in Greek and Latin at the grammar-school of his native town; and at the early age of 15, was sent to University College, Oxford. In 1672, he took his degree of M.A., applied himself to the study of medicine, and having taken his degree of M.B. in 1675, began to practise as a licentiate at Oxford. He immediately made himself conspicuous by the originality of some of his ideas, treating the cases in which he was engaged with a total disregard of the usually received rules of the profession, and even holding up these to censure and ridicule. At the very commencement of his practice he made some remarkable cures; and in less than two years, was on the high road to celebrity. In 1682, he took the degree of M.D., and remained still two years longer at Oxford in the practice of a lucrative profession.

In 1684, Dr. R. removed to London. He established himself in Bow Street, Covent Garden, where, in less than a year, he became the most popular physician of his time. It is said that his conversational powers, ready wit, and pleasantry contributed to this result, quite as much as his professional skill. In 1686, the Princess Anne of Denmark made him her physician. After the Revolution, he was sent for by King William, who frequently had recourse to his advice, and the example of the sovereign was followed by most of the nobility and influential persons about the court. Dr. R., however, was himself no courtier; he had no occasion to become one. Dr. Mead, who knew him well, pronounced of him, that he was 'deservedly at the head of his profession, on account of his great medical penetration and experience.' Blunt and independent in his manners—some indeed say even *brutal*, people nevertheless recognized under his rough exterior that quick perception and keen observation of symptoms which are so important in a master of the healing art; and thus his advice was asked by persons of all ranks, in return for which he received fees of an unprecedented amount.

In 1694, he was called upon to attend Queen Mary, when attacked by the small-pox. It proved to be her last illness, as Dr. R. predicted, even before seeing her—merely upon reading the prescriptions of the other physicians in attendance before he was sent for. He did what he could, however, to save her, but in vain; and some attributed her death either to his want of skill or negligence. About this time he offended the Princess Anne, who, having sent for him on some occasion to St. James's, had the mortification to hear that he swore all her Royal Highness's ailments were nothing else than 'the vapors.' This, combined with her knowledge of Dr. R.'s too great fondness for the bottle, made her appoint Dr. Gibbons as her physician in his place. Still, the king continued to employ him. On one occasion, he sent for him to the Netherlands to attend upon his favorite, the Earl of Albemarle, for which he received £1200 from the king, and £400 from the patient himself, besides a diamond ring. To the king himself, he frequently spoke with much honesty and plainness concerning his ailments; once, however, he took too great a liberty, for upon his Majesty showing him his swollen ankles, and asking him what he thought of them, Dr. R. replied: 'Why, truly, I would not have your Majesty's two legs for your three kingdoms.' This was towards the end of 1699. He was not again consulted by that sovereign, who soon afterwards died; nor was he ever again completely reinstated in the good graces of Queen Anne, although she occasionally consulted him, and rewarded him handsomely for his services.

In 1713, he was elected M.P. for Buckingham. He had a country-house at Carshalton, to which he used occasionally to

retire; and here he was living in 1714, when Queen Anne was attacked with what proved to be her last illness. Dr. R. was summoned to attend her; but he either would not or could not come. He had taken physic, he said, and it was impossible for him to attend. The queen died in August; and the populace were so enraged against Dr. R., that he dared not again show his face in London. This much chagrined him, as it kept him a prisoner in a country village. His own end, however, was fast approaching. He must have been really ill when sent for to the queen, as he himself survived her for only two or three months. Dr. R. died of gout at Carshalton on the 1st of November 1714, and was buried at Oxford in St. Mary's Church with much ceremony. He died possessed of considerable property, the whole of which he bequeathed to public uses. Thus, to University College he left his estate in Yorkshire, in trust, for the endowment of two traveling fellowships, and the purchase of perpetual advowsons, together with £5000 for the enlargement of the college buildings. He left £40,000 for the erection of a public library in Oxford, since known as the Radcliffe Library (q. v.), which he endowed with £150 per annum for a librarian, and £100 per annum for the purchase of books. To St. Bartholomew's Hospital, London, he bequeathed the yearly sum of £500 towards mending the diet, and £100 per annum for the purchase of linen. The rest of his property he gave to his executors in trust for such charitable purposes as they might best approve. The Radcliffe Infirmary and Radcliffe Observatory, at Oxford, were both erected out of this fund; and from the same source, in 1823, the Radcliffe Trustees contributed the sum of £2000 towards the erection of the College of Physicians in Pall Mall.

RADCLIFFE, Ann, the most popular English novelist at the close of the last century, was born in London, July 9, 1764. She was of respectable parents named Ward. In her 23d year, she married Mr. William Radcliffe, a student of law, but who became proprietor and editor of a weekly newspaper, the *English Chronicle*. Mrs. R. lived much in retirement, known only to a few friends by whom she was warmly esteemed. Her works are—*The Castles of Athlin and Dunbayne* (1789), *A Sicilian Romance* (1790), *The Romance of the Forest* (1791), *The Mysteries of Udolpho* (1794), *A Journey through Holland*, &c. (1794), and *The Italian* (1797). Mrs. R.'s popularity was constantly increasing down to the date of her latest work, when, in her 33d year, 'like an actress in full possession of her applauded powers,' as Scott has remarked, 'she chose to retreat from the stage in the full blaze of her fame.' She lived 26 years afterwards, dying in 1823. For the copyright of her *Mysteries of Udolpho*, her best work, she received £500; and for that of *The Italian*, £800. These sums were at the time considered excessive, and were perhaps the largest ever given in this country for works of fiction until the great era of the Waverly Novels. A sixth romance, entitled *Gaston de Blondeville*, and a collection of *Poems* by Mrs. R., were published after her death.

As a novelist, Mrs. R., is pre-eminent for vivid poetical imagination, and for great power of romantic narrative and description. Her paintings of external nature, and of scenes of feudal pomp, gloom, terror, or mystery, are quite unrivalled in modern romance. In the art of awakening curiosity and enchaining attention, she is no less skilful. She keeps her readers in a state of breathless awe and suspense; but in the end, when she resolves all the seemingly supernatural agencies and horrors of her tales into simple natural causes, she unquestionably fails, for her explanations are inadequate to account for the effects produced. She has also little variety of character or striking individual portraits, and no wit or humor. Hence her works, with all their gorgeous pictures and potent spells, seldom interest beyond the period of youth.

RADCLIFFE LIBRARY, Oxford. This institution, founded by Dr. John Radcliffe (q. v.), stands in the central area of Radcliffe Square. The building is in the form of a rotunda, standing upon arcades, from the center of which rises a spacious and well-proportioned dome. This dome is 84 feet in height from the pavement, and is beautifully wrought in stucco. The architect was James Gibbs, who commenced the building in 1737, and completed it in 1747. The library is approached by a handsome stone staircase, and over the entrance-door hangs the portrait of the founder by Sir G. Kneller. The books composing the library are for the most part works on natural history, physical science, and medicine. Besides these, Gibbs, the architect, bequeathed to it a collection of works, chiefly architectual; Wise, the first librarian, a collection of coins; Kennicott, a theological collection; Frewen; a miscellaneous library; Viner, some law-books; while from the Frazer and Sale collections, the trustees purchased 355 Oriental MSS. in the years 1758 and 1760. In 1856, the number of volumes comprising the scientific and medical collection was estimated by Dr. Acland, the librarian, as not less than 14,000, and not more than 15,000. From the year 1834 to the year 1840, the trustees expended £500 annually on the purchase of books. The grant, however, was reduced to £200 in 1841, and continued at that low figure until 1863, when it was again raised to the sum of £500. In 1861, by an agreement between the Radcliffe Trustees and the university, the scientific books of the Radcliffe Library were removed to the University Museum, then recently erected, for public use under prescribed regulations, and the spacious room in the Radcliffe Library was opened as a reading-room in connection with the Bodleian Library. This reading-room is now open daily until 10 o'clock at night, to the great comfort and convenience of numerous readers.

RADEGUNDA, St., daughter of Berthar, a prince of Thuringia, in the earlier part of the 6th century. Having been carried as a prisoner to France in the twelfth year of her age by Clotaire, at that time king of the district whose capital is now called Soissons, she was educated in the Christian religion, and when she reached a maturer age, was induced, very reluctantly, to become the wife of Clotaire. Her own wish having been to become a nun, her married life was in great measure given up to works of charity and religion, and Clotaire complained that he 'had married a nun rather than a queen.' Eventually, about the year 553, she obtained his leave to retire to a monastery at Noyon, where she was consecrated a deaconess by the bishop Medard. Soon afterwards, she founded a monastery at Poitiers, in which she lived as a simple sister, but which she endowed richly, not only with money and lands, but also with relics and other sacred objects obtained from the Holy Land and all the more eminent churches of the East and West. It was on the occasion of the translation to her church at Poitiers of a relic of the holy cross that the Christian poet Vexantius Fortunatus composed the celebrated and truly magnificent hymn *Vexilla Regis Prodeunt*. R. outlived her husband by more than a quarter of a century, during which she was regarded as a model of Christian virtue; and her life has formed the subject of many beautiful legends, still popular in Germany and France. Her monastery, before her death, which took place in 587, numbered no fewer than 200 nuns. Her feast is held on August 13, the anniversary of her death.

RADETSKY, Johann Joseph Wenzel, Count of Radetz, and an Austrian field-marshal, was born at Tzrebnitz, in Bohemia, in November 1766; and in 1784, entered the Austrian military service as a cadet in a Hungarian cavalry regiment, making his first campaign against the Turks in 1788—1789. He took part in the Austrian wars with Napoleon, brilliantly distinguished himself, and rose to the rank of lieutenant field-marshal. After the conclusion of peace, he was stationed mostly in Hungary; but the threatening aspect of affairs in Italy caused him to be sent to take the command of the Austrian army in Lombardy; hostilities were, however, deferred, and R. seized this opportunity of putting Verona in a complete state of defence. The Emperor Ferdinand, on his accession in 1836, acknowledged R.'s numerous and valuable services by raising him to the rank of field-marshal. The rebellion at last broke out suddenly in 1848, and R. was forced to retire from Milan and continue his retreat to Verona (April 2). His departure was the signal for a general insurrection, only the renowned Quadrilateral (q. v.) and the citadel of Ferrara remaining in the hands of the Austrians; and the revolt of Venice cut off all R.'s communications except that to the Tyrol. The Piedmontese army had now effected the passage of the Mincio (May 7), and closely invested Peschiera, thus rendering R's position an extremely critical one. He had only 50,000 men to oppose to the Piedmontese army of 41,000 men around Peschiera, a corps of observation 6000 strong near Mantua, a body of 4000 guarding the passage of the Mincio, the Roman army of 14,000 men holding the south bank of the Po, and an army of Venetian insurgents, numbering 15,000, in his rear. Being thus unable to take the offensive, he waited anxiously for the reinforcements which he expected by the Illyrian frontier, and which, after defeating the Venetian and Roman armies which attempted to stop their progress, joined him at Verona on May 22.

The Austrians now assumed the offensive, and marched on Mantua, defeating the Italians in two bloody conflicts at Montanara and Curtatone, but were in turn signally vanquished at Goito by Charles Albert, who gained by this victory the immediate surrender of Peschiera (May 29), and rendered R.'s position more critical than ever. But the gallant Sardinian was no match for R. in generalship, for he wasted his time before Mantua, till R. had raised an army of 82,000 men, with which he drove the king (July 22 and 23) back, defeated him at Custozza (July 25), pursued him closely, converted his retreat into a disorderly flight, and again defeated him under the walls of Milan (August 4). The king was now besieged in Milan, but (August 6) a six months' armistice was agreed to, and war was not resumed by the Piedmontese till March 1849. R. was this time better prepared, and at once invaded Piedmont; after a successful brush with the enemy at Vigevano (March 21), he totally routed them at Novara (March 23), after an obstinate conflict of six hours' duration. Peace was now concluded with Piedmont, and R. next besieged Venice, which surrendered after a long siege (August 23). He

was then appointed governor-general of Lombardy and Venice, and ruled with absolute authority till his retirement on February 28, 1857, suppressing all insurrections and disturbances with the utmost rigor. He died at Milan, January 5, 1858, at the age of 91 years. He bore the character of a brave soldier and consummate tactician, and, strange to say, acquired all his European reputation after he had passed his 80th year.

RADIA'TA, the lowest of Cuvier's four great divisions of the animal kingdom, derive their name from the organs of sense and motion being disposed as rays round a center; the other three, in ascending order, being the *Articulata*, the *Mollusca*, and the *Vertebrata*. Before Cuvier's time, all invertebrate animals were divided into *Worms* and *Insects*. In 1795, he presented a Memoir to the Natural History Society of Paris, in which, to use his own words, he 'marked the characters and limits of the molluscs, crustaceans, insects, worms, echinoderms, and zoophytes;' and in a Memoir read before the Institute in July 1812, he 'distributed these various classes under three grand divisions, each of which is comparable to that of the vertebrate animals.' The necessity for the dismemberment and re-arrangement of this heterogeneous assemblage which Cuvier grouped together in his RADIATA, has long been felt; and at the present day, 'the radiate mob' (as Professor Huxley terms it) may be regarded as effectually demolished. To show how these animals have been re-arranged, it is necessary first to mention that Cuvier himself divided them into five classes—namely, (1) the *Echinodermata*, (2) the *Entozoa* (or Intestinal Worms), (3) the *Acalephæ* (or Sea-nettles), (4) the *Polypi*, and (5) the *Infusoria*. The *Echinodermata* were included by Huxley (*Elements of Comparative Anatomy*, 1864) in the *Annuloida;* while J. Victor Carus (*Handbuch der Zoologie*, 1863) made them an independent group. (For a newer and complete classification, see the article ZOOLOGY.) The Entozoa are placed by Huxley under the *Annuloida*, and by Carus under the *Vermes*. The Acalephæ are by unanimous consent placed in the *Cœlenterata*, a primary group established by Frey and Leuckart. Of the Polypi, those with ciliated arms (the Bryozoa or Polyzoa, of which the Sea-mat or Flustra is a well-known example) are now placed among the lower molluscs, which, under the term *Molluscoida*, are considered by Huxley as one of the eight primary groups; while the remainder are placed amongst the *Cœlenterata*. For the Infusoria, see that head; see also PROTOZOA, SUB-KINGDOMS (ANIMAL).

RADIA'TION OF HEAT. See HEAT.

RA'DICAL (Lat. *radicalis*, fundamental, from *radix*, root), originally *radical reformer*, a name used for one of the party which advocates extreme changes of a democratic character in the state.

RADIOLARIA, a class of the Protozoa (q. v.), along with Rhizopoda, Foraminifera, Infusoria. See also ZOOLOGY.

RADIOLI'TÉS, a genus of lamellibranchiate mollusca, found only in Cretaceous rocks, and remarkable for the great diversity of its valves. The upper valve is flat or conical, with a central umbo; and the lower is an elongated cone, and has on its inner surface two large dental sockets, and lateral muscular impressions. The upper valve is not perforated with canals, as in the nearly related genus Hippurites. More than forty species have been described.

RADISH (*Raphanus*), a genus of plants, of the natural order *Cruciferæ*, having a spongy Silique (q. v.), which does not split open when ripe, ends in a conical or awl-shaped beak, and is more or less divided into transverse cells, in some species adhering together even in decay, and in some falling asunder. The flowers are yellow, red, or purple.—The COMMON R. (*R. sativus*) has thick, round, tapering, and pointed pods, little longer than their stalks, very slightly contracted, and not falling to pieces. It is an annual, with branching stem from two to four feet high, rough, lyre-shaped leaves, and pale violet-colored flowers with dark veins. It is a native of Asia, from the coasts of the Mediterranean to Japan, and has been cultivated in China, India, and Europe from the most ancient times, for the sake of its fleshy roots, which have a sharp biting taste, and are much used when young as a salad, and also to some extent as a boiled vegetable. In this latter way, the young and tender leaves were also formerly used.

The varieties of R. in cultivation are extremely numerous; but they are generally classed under the two heads of *Long-rooted* and *Turnip-rooted* Radishes, the roots of the former resembling the carrot in shape, and the latter the turnip. The varieties differ very much, not only in form of root, but in color and size, a red color generally prevailing. Some of the darker-colored turnip-rooted radishes attain the size of a man's head. Radishes are sown at different seasons, and are generally used when young and small; but some kinds are occasionally stored for winter. The root of the R. possesses demulcent, stimulant, and diuretic properties, and is sometimes used in cases of atony, or of excessive secretion of mucus by the organs of digestion or the urinary organs. R. juice mixed with sugar-candy, is a popular and useful German remedy for hoarseness and cough.—Distinct from both the varieties above-named is the OIL R., which has a slender—scarcely fleshy—root, a short much-branched stem, and many-seeded pods. It is cultivated in China for the oil of its seeds.—Another species of R. (*R. caudatus*), a native of Japan, is there cultivated as an esculent.—To this genus belongs the JOINTED CHARLOCK of our corn fields (*R. raphanistrum*), which has found its way from Europe to North America, and is a troublesome weed there also. The seeds, however, may be advantageously crushed for oil.—The SEA R. (*R. maritimus*) is a more rare British species, the roots of which are of fine quality and great pungency.

RA'DIUS, in Geometry, is a straight line drawn from the center to the circumference of a circle. See CIRCLE and QUADRATURE. In Trigonometry, the radius is taken as unity, and the sines, cosines, &c., are expressed in terms of it. In Astronomy, the same term is employed in a slightly different sense; and to prevent confusion, it is changed into *radius-vector*. The radius-vector is a straight line drawn from the center of force to the position of a body which describes its orbit round that center; if the orbit is a circle, the radius-vector is invariable in its length, but constantly changes if the orbit be any of the other conic sections. From astronomy the term has been transferred to what are called *polar equations* in the higher mathematics. To express a curve by this method a point is taken for the *pole;* through this point a line, the *axis*, is drawn, indefinite in length and arbitrary in direction; then as one end of the radius-vector is at the pole, its inclination to the axis, and its length at this inclination, will give a point in the curve. Equations to curves, when thus expressed in terms of the radius-vector, and its inclination to the axis, are called *polar co-ordinates*, and are generally much simpler in form than when expressed by rectangular *Co-ordinates* (q. v.).

RA'DNOR, NEW, a municipal and parliamentary borough in Radnorshire, of which it was formerly the capital, stands in the midst of exceedingly wild and hilly scenery on the south border of Radnor Forest, and 8 miles west-south-west of Presteigne. In the immediate vicinity is the cascade of *Water-break-its-neck*, which descends from a height of 70 feet, and is one of the most celebrated in Wales. N. R., once comparatively important, has dwindled into a small country town, remarkable only for the beauty of the surrounding scenery. In 1864, a statue in memory of Sir George Cornewall Lewis was erected at New Radnor. Pop. (of parliamentary borough) in 1871, 2190. The business of the county is transacted at Presteigne, the county town, which contains (1871) 1910 inhabitants.

RADNORSHIRE, an inland county of South Wales, bounded on the N. by Montgomeryshire and Shropshire, and on the S. and S.E. by Brecknock and Hereford. Area, 276,552 acres; pop. (1871) 25,430; (1881) 23,539. Groups of mountains, seldom forming themselves into continuous chains, cover the greater part of the surface of the county. Radnor Forest, which attains the height of 2163 feet, runs east and west, and is the loftiest and most connected of the ranges. The south-eastern district is flat, with a gradual slope towards the east. Of the rivers, the chief of which flow southward, the principal is the Wye (which forms the greater part of the southern boundary of the county), and its tributaries the Ithon, the Elan, and the Lugg. The county formerly comprised large tracts of bog and moorland, which are in course of being gradually reclaimed and cultivated. Its valleys, especially that watered by the Lugg, are famed for the richness of their pastures, which feed splendid herds of 'Herefords.' In the east and south-east districts of R. excellent wheat, barley, oats, and potatoes are grown. Though rather more than half the county is cultivated, yet of this less than a third is under the plough, fully two thirds being in permanent pasture, chiefly for rearing sheep. The county returns one member to the House of Commons.

RA'DOM, a government in the kingdom of Poland (q. v.), is situated to the south of the government of Warsaw. Area, 4755 square miles; pop. (1880) 613,086. The surface, partly traversed by the Sandomir Mountains, which rise in the Katherinenberge to the height of upwards of 2000 feet, is the most elevated of the kingdom. The principal rivers are the Pilica and the Vistula, both of which flow north. The soil is diversified.

RADOM, capital of the government of the same name, stands on the Radomka, 60 miles south of Warsaw. It has considerably improved in size within late years, and is the seat of an active trade and commerce. Pop. (1880) 12,061.

RADOWITZ, JOSEPH VON, Prussian general and statesman, born February 6, 1797, at Blankenburg, was the son of a nobleman of Hungarian descent, received his professional education at Paris, and in the Military School of the kingdom of Westphalia, which he left in 1813, in order to enter the Westphalian army as an officer. After the peace in 1815, he received an appointment as

Master of Mathematical and Military Sciences in the Military School of Cassel; but in 1823, he entered the Prussian service, and in 1830, became chief of the general staff of artillery. By his marriage with the Countess Maria v. Voss (1828), he became connected with the Prussian aristocracy, and soon became the leader of the anti-revolutionary party. In 1836, R. was sent as Prussian military commissioner plenipotentiary to the German Diet at Frankfurt. In 1842, he was named ambassador extraordinary and minister plenipotentiary at the courts of Carlsruhe, Darmstadt, and Nassau; and in 1845, he was raised to the rank of Major-general. Meanwhile his influence on public affairs in Germany became more and more conspicuous; above all, he was the confidant and adviser of King Frederick-William IV. in his endeavors to bring about a reform of the German Diet, as his pamphlet, Germany and Frederick-William IV. (*Deutschland und Friedrich Wilhelm IV.*, Hamb. 1848), proves. His Conversations about State and Church, suggested by the present state of affairs (*Gespräche aus der Gegenwart über Staat und Kirche*, Stuttg. 1846) may be taken as a manifestation of the intentions which tried to find a practical issue in the constitution of February 3, 1847.

When the revolution of 1848 broke out, a new field opened itself for Radowitz. The endeavors of Prussia to give a constitution to Germany, by means of the alliance of the three kings, was principally his work. He now obtained the leadership of the affairs of the union in the Prussian chambers as well as in the parliament, which assembled (March 1850) at Erfurt, but was unable to prevent the failure of the union scheme. On September 27, 1850, he became formally Secretary for Foreign Affairs, but in 1851 retired to Erfurt, where he wrote his *Neue Gespräche aus der Gegenwart* (2 vols., Erf. and Leip. 1851). He died December 25, 1853.—Consult Frensdorff, *Joseph v. R. A.* (Leip. 1850.)

RAEBURN, Sir Henry, R. A., a distinguished portrait-painter, was born on March 4, 1756, at Stockbridge, then a village near Edinburgh, where his father was a manufacturer. His parents died when he was little more than six years old, and he was educated in that well-known institution, George Heriot's Hospital. He was apprenticed to a goldsmith and jeweler when about fifteen years of age; but having a very decided taste for art, he practised miniature-painting during his leisure hours with such success, that he was soon able to buy up his indenture, and devote himself first to miniature, and not long after to portrait-painting in oil. He married when he was twenty-two, and acquired some fortune by his wife. Proceeding to London, with introductions to Sir Joshua Reynolds, he was kindly received by him, and practised in his studio for about two months. Sir Joshua very soon perceived the high talent evinced by the young artist; advised him to visit Rome, and offered him funds for the purpose. Acting on this advice—he had funds sufficient—R. set out, furnished with letters from Reynolds to Pompeo, Battone, and other artists of note in Rome at the time. After remaining two years in Italy, he returned and settled in Edinburgh in 1787, where he soon received full employment as a portrait-painter.

In 1812, R. was elected President of the Society of Artists in Edinburgh; in 1814, Associate of the Royal Academy of London, and in the following year, Academician. He was knighted in 1822, when George IV. visited Scotland, and shortly after was appointed King's Limner for Scotland. He died at Edinburgh on 8th July 1823. R.'s style was modelled in a great degree on that of Reynolds—he aimed, like him, in his pictures to produce breadth—which is the effect obtained by massing together and keeping as far as possible the lights distinct from the shadows, and making them respectively effective, in place of dividing and mixing them up all over the picture; but he carried out this principle in a manner and with a feeling peculiarly his own. He never attempted, by thick impasto and semi-transparent painting, to produce texture and luminous effect, but adopted the opposite mode of painting in a low tone with a sharp touch, working his colors with little admixture of any unctuous medium. In his portraits of men, in particular, he gives the characteristic expression in a simple but decided and effective manner. His style has been thought by connoisseurs to resemble in many respects that of Valasquez. R.'s reputation was very high in his lifetime, and it is still rising, his pictures being now much sought after. Among the notable personages who sat to R. for their portraits were Sir David Baird, Sir Walter Scott, Henry Mackenzie, Neil Gow, Harry Erskine, Dugald Stewart, Professor Playfair, Francis Jeffrey, Henry Cockburn, and many Scottish nobles. An exhibition of his works was held at Edinburgh in 1876.

RAFFLES, Sir Thomas Stamford, a distinguished traveler and naturalist, was the son of a captain in the West India trade, and was born at sea, off Port Morant in Jamaica, on the 5th of July 1781. His first apointment was to a clerkship in the East India House. Having attracted the notice of his superiors by his talents and industry, he received a permanent appointment in the office. In 1805, the Court of Directors determined on sending out an establishment to Penang or Prince of Wales' Island, and young R. was appointed assistant-secretary. He arrived at Penang in September of the same year; and having studied the Malay language with great diligence during the voyage, he was enabled to enter upon his duties with efficiency on his arrival. He continued his study of the Malay and other eastern languages, in which he made considerable progress. Eventually, R. was made principal secretary. In 1808, he made a voyage to Malacca, where he had the opportunity of mixing with Javanese, Amboynians, Borneans, Papuans, Cochin-Chinese, and Chinese Proper. With respect to Malacca itself, he collected much interesting information. In 1811, when it was resolved by the English government to take possession of Java, then belonging to the Dutch, it was arranged that Mr. R. should accompany the expedition as secretary to the governor-general, Lord Minto, who was himself to take the chief command. After some hard fighting, the troops took possession of the island. Mr. R. received the appointment of lieutenant-governor of Java and its dependencies; and upon the departure of Lord Minto, took upon himself the entire administration of the newly-acquired territory. Much had still to be done in the way of conciliating the native princes and chiefs to the British rule. He had to appoint British residents at several of the native courts, and to frame rules and regulations for their conduct. He ordered a general survey to be made of the whole island, the reading of which, as well as of all the reports connected with that and other things, occupied a considerable part of his time.

By frequent personal interviews with the natives also, he sought to become acquainted with their manners and character, and to make such regulations as would be for their best interests both morally and materially. While engaged in this career of usefulness, his health gave way; and in 1816 he returned to England, stopping by the way at St. Helena, where he had an interview with Napoleon. On his arrival in England, he wrote his well-known *History of Java*, published in two volumes 4to in 1817, in which year he received the honor of knighthood. Java having by this time been restored to the Dutch, Sir Stamford R. was appointed lieutenant-governor of Bencoolen, a settlement upon the coast of Sumatra, where he landed in March 1818. In the latter part of that year he was called to Calcutta, on a visit of business, and instead of returning directly to Bencoolen, was sent to form a new settlement at Singapore. Here he remained for some months, and then again returned to Bencoolen, where he continued to discharge the duties of lieutenant-governor until February 1824, when he was compelled by ill-health to return to England. The vessel in which he set sail took fire, the crew and passengers escaping with difficulty in the boats. By this accident, Sir Stamford R. lost the greatest part of his effects, including a fine collection of natural history, and other things, valued at about £20,000. After his arrival in England, he lived to carry out what had been one of his favorite projects—namely, the formation of the Zoological Society of London, of which he was named President, and to the interests of which he devoted himself to the time of his death. This took place on the 5th of July 1826.

RAFFLE'SIA, a remarkable genus of plants belonging to the small natural order *Rafflesiaceæ*, an order composed entirely of



Rafflesia Arnoldi.

parasitic plants, which consist merely of a flower, and form part of the *Rhizogens* (q. v.) of Lindley. The *Rafflesiaceæ* are natives partly of the Indian islands and partly of South America. The plants of the genus *Rafflesia* have neither stalk nor leaves, but are mere flowers seated upon the roots of species of *Cissus*, making their appearance at first as a hemispherical swelling of the bark of the root, and, after the bark has broken, rising up in the form of a head of cabbage, while the perianth is covered with imbricated bracteæ, which are more or less recurved after it has opened. The perianth is thick, fleshy, and 5-partite. The germen is inferior, and contains many ovules; and the anthers, which are numerous, are seated under the revolute margin of the

top of the style column. After the flower has expanded, it diffuses a carrion-like smell, that even attracts flies, and induces them to deposit their eggs. The largest and first-discovered species, *R. Arnoldi*, was discovered in 1818 in Sumatra by Dr. Arnold, and was sent to the eminent botanist, Robert Brown, by Sir Thomas Stamford Raffles, the British governor in Sumatra. Its flower measures fully three feet in diameter, is capable of containing almost two gallons of fluid, sometimes weighs ten pounds, and is the largest of all known flowers. A smaller species, *R. patma*, whose flowers are 16 inches—two feet in diameter, is highly prized by the Javanese as a medicine, for its strong styptic powers. *R. Horsfieldii*, another Javanese species, is still smaller, its flowers being only three inches broad.

RAFN, KARL CHRISTIAN, a celebrated Danish critic and archæologist, was born at Brahesborg, in the island of Fünen, January 16, 1796, and educated at the university of Copenhagen, of which he was appointed sub-librarian in 1821. Even while a boy at the gymnasium of Odense, he was distinguished by his fondness for the old Norse literature and language, and when he became officially connected with the university, he undertook a general revision of all the Icelandic and Old Norse MSS. preserved there. It is to R.'s unwearied exertions that Denmark owes the foundation (1825) of the 'Society for Northern Antiquities,' whose principal object is the publication of criticism of all documents that can throw light on the subject of Old Norse literature. To this single end, R. devoted his whole life. As secretary of this society, he edited and published a great many ancient Scandinavian MSS., occupying about seventy volumes. Among his numerous important works, we may mention a Danish translation of Norse Mythic and Romantic Sagas (3 vols. 2d ed. 1829—1830); an edition (from a manuscript), with philologico-critical remarks, of Ragnar Lodbrog's death song, under the title of *Krákumál, seu Epicedium Rœgnaris Lodbroci, Regis Daniæ* (Copenh. 1826); a complete collection of the Norse sagas (many of these MSS. being hitherto unedited) entitled *Fornalder-Sögur Nordlanda* (Copenh. 3 vols., 1829—1830); and the *Färeyinga-Saga* (1832) in Icelandic, with translations in Danish and Faroese, and a critical apparatus.

But his most widely-known and perhaps his most interesting work, is his *Antiquitates Americanæ, seu Scriptores Septentrionales Rerum Ante-Columbianarum in America* (Copenh. 1837), in which, from a critical examination of numerous geographical, nautical, and astronomical data in certain Old Norse MSS., he comes to the conclusion that America was discovered by Norsemen in the 10th c., 400 years before Columbus was born; and that, from the 11th to the 14th century, a large tract of the North American coast had been visited and even partially colonized as far south as Rhode Island and Massachusetts—a conclusion, it may be added, the probability of which has been confirmed in several important points by recent topographico-antiquarian researches in these states. The subject was followed up by him and Finn Magnussen in their *Historical Monuments of Greenland* (3 vols. Copenh. 1838—1845). Another very important work to which R. furnished a great part of the text, carefully worked up from MSS., and a Danish translation of the first three and the 11th books in parallel columns, is the great collection of historical sagas representing events that took place out of Iceland, and entitled *Forumanna Sögur* (12 vols., Copenh. 1828, et seq.). He has also had a great share in drawing up and editing the Icelandic MSS. relating to the history of Russia and other eastern countries, and of which two vols. appeared at Copenhagen in 1850—1852, under the title of *Antiquités Russes*. R. died at Copenhagen, 20th Oct. 1864.

RA'FTERS, the sloping timbers of a Roof (q. v.), which meet in an angle at the ridge, and on which rest the laths or boarding which carry the tiles or slates.

RAGGED SCHOOLS. The ragged school, as distinct from the Certified Industrial School, is a voluntary agency providing education for destitute children, and so preventing them from falling into vagrancy and crime. Vagrant children, and those guilty of slight offences, are provided for in the Certified Industrial School; but the two institutions are frequently combined. See article INDUSTRIAL SCHOOLS. The movement which established ragged schools was almost simultaneous with that which instituted reformatories. John Pounds, a poor shoemaker at Portsmouth, has the honor of originating the idea. For twenty years, up to the time of his death in 1839, he gathered the ragged children of the district round him as he sat at work. They came freely, and were taught gratuitously. The success attending his humble efforts soon led many more influential friends of the 'outcasts' to engage in the same work. In 1838, London had a Ragged Sunday School, which eventually became a free day-school. Field Lane followed in 1843. But the first ragged feeding-school was opened in 1841 by Sheriff Watson, in Aberdeen. In 1845, Dr. Robertson not then aware of the existence of Sheriff Watson's, opened a similar school in the Vennel, Edinburgh. Soon afterwards Dr. Guthrie's famous *Plea for Ragged Schools* appeared, a work which gave an irresistible impetus to the movement, and caused the author to be generally regarded as the father of ragged schools.

After this, ragged schools spread over all the land, until there was scarcely a town of any importance that had not one or more. The recent Education Acts, however—that for England, 1870, and that for Scotland, 1872—introduced the principle of compulsory attendance at school; under this provision, a large number—especially in England—of such as were merely free day-schools, have become public schools. But as the Education Acts make no provision for feeding the children, the managers of feeding-schools find themselves compelled to continue their efforts. In places where the system has been efficiently conducted, juvenile crime has sensibly diminished. The governor of the Edinburgh prison has stated frequently in his reports, that since the establishment of ragged schools, the number of young persons committed to prison has gradually decreased. It may be mentioned that in one large ragged feeding-school, where in the course of 10 years 4000 children have been enrolled, only 7 deaths have occurred during the period of school attendance. The ragged schools do not receive government aid. The capitation grant of £2, 10s., allowed by a Privy Council minute in 1856, was withdrawn in 1859.

RAGGEE (*Eleusine corocana*), an Indian grain (see ELEUSINE), very prolific, but perhaps the least nutritious of the cereals, although it is the chief food of the poorer classes in Mysore and on the Neilgherries. It is made into dark-brown cakes and porridge, which are described as very poor fare.

RAGHU is, in the legendary history of ancient India, the name of a celebrated king of Ayodhyâ. See OUDE. He belonged to the royal dynasty which derived its origin from the sun; and amongst his descendants is Râma (q. v.). See also the next article.

RAGHUVANS'A (from *Raghu* [q. v.] and *vans'a*, race or family, hence 'the family of Raghu') is the title of one of the most celebrated poems of Sanscrit literature, attributed to the authorship of Kâlidâsa (q. v.). It consists of 19 sargas—i. e., sections or cantos—and its subject-matter is the legendary history of the kings of the solar race, beginning with that of Dilîpa, the father of Raghu, and ending with that of Agnivarn'a. The text of the poem, with an excellent Latin translation of it, was published by Professor A. F. Stenzler (London, 1832); the text, with a prose interpretation in Sanscrit, by Pandits of the Sanscrit College of Calcutta (1831); and the text, with the complete and important commentary of Mallinâtha, by Girîs'achandra Vidyâratna, one of the professors of the government Sanscrit College (Calcutta, 1852). Single cantos with the same commentary have also been published at Bombay and Madras.

RAGLAN, LORD, FITZROY JAMES HENRY SOMERSET, Field-marshal, G.C.B., eighth son of the fifth Duke of Beaufort, was born September 30, 1788. He entered the army in his 16th year, and in 1807, served on the staff of the Duke of Wellington in the expedition to Copenhagen. He went to the Peninsula as aide-de-camp to the Duke, and in 1812 became his military secretary. As Lord Fitzroy Somerset, his name became a household word. He was present at all the great actions of the Peninsular campaign which illustrate the career of the great commander. He was among the first to mount the breach at the storming of Badajoz, and it was to him that the governor gave up his sword. On the return of Napoleon from Elba, he served under the Duke in Flanders, and lost his sword-arm in the crowning victory of Waterloo. The very next day, he was seen practising writing with his left hand! For his brilliant military services, he was made K.C.B., and received orders from several foreign potentates. He was minister-plenipotentiary at Paris in 1815, and secretary to the French embassy from 1816 to 1819. The Duke was appointed in 1819 Master of the Ordnance, and R. again became his secretary. In 1822, he went to the Congress of Verona in attendance on the Duke, who was the English plenipotentiary. In 1827, the Duke was appointed commander-in-chief of the British army, and called R. to the Horse Guards as his military secretary. This office he held until the death of his chief in September 1852. He was then made Master-general of the Ordnance, and in October was called to the House of Peers as Baron Raglan of Raglan, in the county of Monmouth. He had previously sat in the Lower House during the parliaments of 1818 and 1826 for the borough of Truro.

While Master-general of the Ordnance, he was appointed, with the rank of general while so employed, commander of the English forces, which were despatched to Turkey in February 1854. The allied armies of Britain and France, under R. and Marshal St. Arnaud respectively, made good their landing in the Crimea. The victory of the Alma, the flank-march to Balaklava (q. v.), the cavalry charge which has made that place immortal, the sanguinary and desperate infantry-battle of Inkermann (q. v.) (which obtained for R. the baton of Field-marshal), and the siege of Sebastopol, are too well-known to need description. Unfavor-

able comments began to be made, as the campaign proceeded, upon R.'s conduct of the war. During the winter, 1854—1855, his soldiers suffered unspeakable privations, and hundreds perished in camp and on board transports for want of the food, clothing, and medicines which were in store, but could not be found in the confusion and mismanagement that prevailed. Supplies arrived; but the siege continued without much apparent success until June 18, when a general assault was ordered, and when R.'s troops, as well as the French, received a terrible repulse. R. had been suffering from a slight attack of cholera, and the disaster of June 18 weighing upon his mind, he suddenly became worse, and died of exhaustion, June 28, 1855. His remains were brought to England, and buried in the family cemetery at Badminton. R. was an indefatigable and experienced administrator. He proved himself to be a skilful tactician, although it may be doubted whether he had the qualities of a great general. He was undeniably gifted with many qualities that shone with great lustre in the field as well as in council. His demeanor in action was so calm that it excited the admiration of the French, and Marshal St. Arnaud declared that his bravery rivalled that of antiquity. His courteous and noble bearing, his gentleness of temper and firmness of mind, and his constant worship of 'duty,' invest his character with something of the chivalrous. See Kinglake's *Invasion of the Crimea*.

RAGMAN ROLL (*ragman*), a word of uncertain origin, used in ancient diplomatic language for an indenture or legal deed), the name given to the collection of instruments which record the acts of fealty and homage performed by the Scottish nobility and gentry to Edward I. of England during his military progress through Scotland in 1296, and afterwards at the parliament held at Berwick. The original instruments of homage under the seals of the parties were deposited in the Royal Treasury of England, and have almost entirely perished; but the roll in existence in the Tower preserves a record of them. Its contents were given in an abridged form in Prynne's *Records*, and afterwards printed *in extenso* by the Bannatyne Club in 1834. An especial value attaches to the Ragman Roll as containing the largest and most authentic enumeration extant of the nobility, barons, landholders, and burgesses, as well as of the clergy of Scotland, prior to the 14th c., and the only genuine statistical notices of Scotland of the period.

RAGOUT (Fr. *ragoûter*, to revive the appetite; appears to be from Lat. *re-ad-gustare*), a name much less in use now than formerly, for a dish of stewed meat and vegetables, usually flavored with herbs and other condiments. It differs but little from the olla of the Spaniards and the pilau of the Turks.

RAGS. Fragments of nearly all textile materials have now a commercial value; those of cotton, linen, and hempen cloths are used in the manufacture of Paper (q. v.); and woollen and worsted rags are made available for respinning either alone or mixed with fresh wool, whilst the refuse is ground into powder, dyed various colors, and forms the material called flock, used by the paper-stainers to produce their ornamental flock-papers. The trade in rags is enormous. Linen and cotton rags to the extent of from 15,000 to 16,000 tons per annum, of the value of nearly £300,000, are now imported by British paper-makers, and perhaps quite as large a quantity is collected at home. The greatly increased use of esparto makes the import of R. of less cardinal importance than it used to be to the paper-makers of this country. See SHODDY and RAG-TRADE.



Raguly.

RAGU'LY, in Heraldry, a term applied to an ordinary whose bounding lines are furnished with serrated projections.

RAGU'SA (Slav. *Dubrovnik*, Turk. *Paprovnik*), formerly an independent republic, now a decayed episcopal town and seaport of Austria, in the crown land of Dalmatia, lies at the base and on the steep slopes of Mount Sergio, 40 miles west-north-west of Cattaro. Its higher streets communicate with its lower by means of flights of steps. It is surrounded on the land side by double walls, surmounted by old towers. Immediately south of the town is a harbor, which admits only small vessels; but two miles west is Gravosa, the proper harbor of R., and which offers secure and spacious accommodation to the largest vessels. The trade of R., which was once extensive and profitable, has sunk, and its inhabitants, 7000 in number (about a sixth of the former population), support themselves by the manufacture and export of oil (very excellent), soap, liqueurs, malmsey wine, silk, leather, and tobacco. R. also carries on a considerable transit trade with Turkey by means of Turkish caravans, about 200 of which—in all about 7000 horses—visit the town annually.

R. is supposed to have been founded in 656 by refugees from Old Ragusa (the ancient *Epidaurus*, situated 10 miles south-east), which was at that time destroyed by a tribe of Slavonians. It formed itself after the model of Venice, into an aristocratic republic, governed by a rector. In 1358, it placed itself under the protection of Hungary, and later it became tributary to the Porte. Napoleon, in 1808, abolished the republican government of R., and incorporated the town with the province of Dalmatia. After 1814, the town, together with the province, came into the possession of Austria.

RAGUSA, an old town in the south of Sicily, in the province of Syracuse, and 30 miles west-south-west of the city of that name, stands on a narrow and steep ridge between two ravines, on the right bank of the Ragusa, and about 15 miles from the sea. In the cliffs below the walls and around the town, ancient tombs of various shapes have been hollowed out. R. is supposed to occupy the site of the ancient *Hybla Minor*. Pop. (1872) 21,546, who manufacture cotton, woollen and silk goods.

RA'GWORT, the common English name of those species of *Senecio* (q. v.) in which the heads of flowers have a spreading ray,



Common Ragwort (*Senecio Jacobæa*).

the involucre has small scales at the base, and the leaves are pinnatifid. The British species are large coarse weeds, with erect stem, and yellow flowers; one species, the COMMON R. (*S. Jacobæa*), a perennial, is too plentiful in many pastures. It is refused or disliked by horses, oxen, and sheep. It generally disappears from thoroughly drained land, at least after a little labor has been expended in grubbing up its roots. The fresh herbage has been used to dye wool green, but the color is not permanent.

RAG-STONE, an impure limestone, consisting chiefly of lime and silica, much used in Kent. It breaks up into pieces about the size of a brick, and is hard and flat bedded. The name is also applied to the hard irregular rock which frequently overlies better building materials. Besides being used for building purposes, hones or sharpening stones for scythes and other large blades are made of it.

RAG TRADE. This trade, even within the limits of a generation, has undergone extraordinary changes. Woollen rags, which some thirty years ago were all allowed to rot on the dunghill, save the very small quantity required for flock papers and stuffing saddlery, are now consumed, under the name of 'shoddy,' to a vast extent in the manufacture of the cheaper woollen cloths, more than 30,000 tons having been imported in 1872; and in the same year, probably a like quantity was obtained in Great Britain itself.

Linen and cotton rags are, as is well known, nearly all consumed in the manufacture of paper; but of late years the demand for paper has increased at so great a rate, especially for the American and colonial markets, that rags can no longer be looked upon as the principal raw material from which it is made. It was stated by Mr. Routledge, to whom the country is mainly indebted for the successful introduction of esparto fibre, at a meeting of the London Society of Arts, in December 1871, that rags were now used alone only for the paper of bank-notes, ledgers, and such-like special purposes, esparto fibre being even preferred as a material for printing-paper. Wood pulp is also largely used on the continent, as well as in America, to mix with rags for all kinds of papers, often forming as much as 70 per cent. of their weight. For some time past, the amount of cotton and linen rags annually imported into Great Britain has been below 30,000 tons; while the imports of esparto and other vegetable fibre reached, in 1880, the amount of 191,229 tons. Moreover, no less a quantity than 11,000 tons of rags and other paper material, but chiefly rags, were exported from British ports, nearly the whole of which went to the United States.

Unfortunately, there seems but too much reason to fear that the regular supply of esparto, as the staple material for paper, cannot

be depended upon; and even though it could, rags will always be of great value for the better kinds. The consumpt per head of the population in the various countries differs, of course, very largely. In an average year, between 1870 and 1880, the consumpt has thus been estimated: In Russia, 1 lb. per head of the population; Spain, 1½ lb.; Mexico and Central America, 2 lbs.; Italy and Austria, 5 lbs.; France, 7 lbs.; Germany, 8 lbs.; United States, 10¼ lbs.; and Britain, 11½ lbs. Britain had 385 mills, producing annually 360,000 tons of paper, valued at £20,000,000. When, the continent had more rags than it required, England and America had to import rags to keep their mills going. The state of matters is still the same as regards the continent; but, in the meantime, the increased use of esparto appears to admit of England sending away as many rags as she imports. Most of the imported linen rags come from Germany and France. Cotton, flax, and jute waste from spinning-mills are all used for paper-making.

It is believed that the home supply of linen and cotton rags might be largely increased by greater care in housekeeping economy. Mr. Herring, partner in a firm of paper-merchants, and author of several articles on this branch of industry, published, in 1860, a 'Letter,' addressed to clergymen and others, suggesting an organized plan for the attainment of this object. 'There are,' he remarks, 'more rags wasted, burned, or left to rot, than would make our paper-manufacturers independent of all assistance from abroad.' Whatever may have been the case in 1860, it is plain that, however carefully collected, all the rags produced in Great Britain would now be far short of meeting the demands of our paper-mills if no other material were used.

The managers of the ragged schools in London organized a *Rag-collecting Brigade* in 1862 for the systematic collection of the rags of the metropolis.

RAHDUNPU'R, a large fortified town of Hindustan, in a protected state of the same name, in the north-west of Guzerat, about 150 miles north-west of Baroda. The majority of the inhabitants, who are chiefly Rajuts and Coolies, are engaged in agriculture; trade and manufactures, however, are carried on to some extent. Coarse cotton cloths—the staple manufacture—and grain, leather, and hides are exported. Pop. 15,000. The state of R. which is under British protection, has an area of 850 square miles, and a pop. of 91,500. The climate, very hot during October and November, is delightful from December to April.

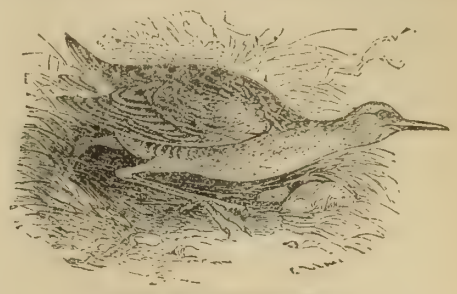
RAHU is, in Indian Mythology, the demon who is imagined to be the cause of the eclipses of sun and moon. When, in consequence of the churning of the milk-sea, the gods had obtained the Amr'ita, or beverage of immortality, they endeavored to appropriate it to their exclusive use; and in this attempt they had also succeeded, after a long struggle with their rivals the Daityas, or demons, when R., one of the latter insinuating himself amongst the gods, obtained a portion of the Amr'ita. Being detected by the sun and moon, his head was cut off by Vishn'u; but the Amr'ita having reached his throat, his head had already become immortal; and out of revenge against sun and moon, it now pursues them with implacable hatred, seizing them at intervals, and thus causing their eclipses. Such is the substance of the legend as told in the *Mahâbharata* (q. v.). In the *Purân'as* (q. v.), it is amplified by allowing both head and tail of the demon to ascend heaven, and produce the eclipses of sun and moon, when the head of the demon is called *Râhu*, and his tail *Ketu*, both, moreover, being represented in some *Purân'as* as the sons of the demon *Viprachitti* and his wife *Sinhikâ*. In the *Vishn'u-Puran'a*, R. is also spoken of as the king of the meteors.—In Hindu Astronomy, R. is personified as the moon's ascending, and Ketu as the moon's descending, node.

RA'HWAY, a city of New Jersey, U. S., on the Rahway River, 5 miles from its mouth, and the New Jersey Railway, 19 miles west of New York. It contains numerous manufacturing establishments, a large proportion of which are for carriages. Pop. (1860) 7130; (1870) 6258.

RAIKES, Robert, See Sunday Schools.

RAIL (*Rallus*), a genus of birds of the order *Grallæ*, and family *Rallidæ*, having a slender bill, longer than the head, the body of a very compressed form, wings of very moderate length, a very short tail, long and strong legs, and long toes. The only European species is the Common R. or Water R. (*R. aquaticus*), sometimes called *Bilcock*, a bird which occurs in almost all parts of Britain and is not unfrequent in marshy situations and the reedy margins of lakes and rivers, although it often eludes observation, threading its way among reeds—for which its compressed form seems specially adapted—and diving when compelled to betake itself to open water. It does not rise, except in extreme necessity; and when flushed, flies heavily. It is more plentiful in most parts of the continent than in Britain; and is there generally a bird of passage, breeding in the north, and migrating southward on the approach of winter. It makes its nest of coarse grass and sedges among thick aquatic plants. The whole length of the bird is about eleven inches and a half. The sexes are very similar in plumage, olive-brown, marked with black above; bluish-ash color beneath, with white transverse markings on the belly.

The water R. feeds on worms, molluscs, and soft vegetable substances. It is in the highest esteem for the table.—America produces a number of species of R., as the Virginian R. (*R. Virginianus*), a species rather smaller than the Water R. of Europe, and much resembling it in its habits; a bird of passage, and in many parts of North America very abundant; the Great Red



Water Rail (*Rallus aquaticus*).

Breasted R., or Fresh-Water Marsh Hen (*R. elegans*), a much larger bird, fully 20 inches in length, inhabiting the extensive marshes of the southern states of North America; the Clapper R., or Salt-Water Marsh Hen (*R. crepitans*), extremely abundant in the salt-marshes of the same regions, its whole length about 15 inches; all of which are much esteemed for the table, the eggs of the Clapper R. being also collected in great numbers as a delicacy. The name Clapper R. is from the cackling cry which the bird seems to delight in emitting.—The Mangrove Hen (*R. longirostris*) abounds on the muddy shores of the West Indies, and its flesh is held in the highest esteem.—In general form, and in the character of their plumage, all these and other species are very similar.

RAILS, in Architecture, are the horizontal bars in panelled stone or wood work, such as doors, shutters, &c., which enclose the panels, the upright pieces being termed styles. The word is also applied to the level piece over balusters or between posts.

RAI'LWAYS. The origin of these now vast undertakings is traced to a contrivance for simplifying the transit of coal from the mines in Northumberland and Durham to the places of shipment on the Tyne and Wear. The invention consisted of a double parallel line of wooden beams or trams fixed to the ground, and furnished with flanges to prevent the wheels of vehicles from slipping aside. Along these flanged beams wagons were drawn by horses with such comparative ease, that instead of a load of 17 cwt. by a common road, a load of 42 cwt. could now be drawn by a single horse. These new thoroughfares, called tramways, were made across fields, the proprietors of which received a certain rent for the way-leave or use made of them—which term, way-leave, is still employed in arrangements of this kind. To the coal districts of the north of England, therefore, is indisputably due the simple yet meritorious contrivance which, from less to more, led to the modern railway, with all its wonderful machinery; nor is it useless to note, that the invention, in its early stages, owed nothing to men of education or high scientific attainments, but was mainly the work of obscure mechanics and illiterate enthusiasts.

The date of the invention of tramways is uncertain, but by good authorities it is referred to the period between 1602 and 1649. From the northern coal districts it gradually came into use in other mining districts in England, as also in the south of Scotland. The 17th c. was not favorable to mechanical improvement. Not till about 1700 was there any marked advance on the original tramway. The first step was the clothing of the wooden beams with long slips of iron, to prevent excessive tear and wear. This also being found defective, a second and more complete improvement, about 1740, was the substitution of cast-iron rails fixed in parallel lines on cross wooden sleepers. This species of railway became pretty general in mining districts between 1745 and 1775. In the former of these years, one was in operation in Scotland—namely, a short coal-line from Tranent to Cockenize, which General Cope selected as a position at the battle of Prestonpans. Though now considerably improved, railways did not attract attention as being suitable for general traffic. The success of canals not only turned the public mind in that direction, but raised up a powerful canal interest, which viewed the progress of railways with extreme jealousy and ill-will.

The use of cast-iron rails led to an improved method of traction. Instead of employing a single large wagon, the plan of linking together a series of smaller wagons was adopted—the germ of the modern train. The next improvement consisted in putting flanges on the wheels instead of the rails, by which great facility

of transit was afforded. The draught still continued to be executed by horses; but as the railway system seemed to possess immense capabilities of expansion, many minds labored in devising schemes to substitute steam-apparatus. The invention of the locomotive, like that of railways, was the work of successive geniuses. Watt had shown the practicability of fixed steam-engines; what was now wanted was an engine that would travel by its own internal impulse. The merit of inventing a self-acting steam-carriage is allowed to be due to Richard Trevethick, a clever but eccentric engineer. In 1802, he took out a patent for a steam-carriage, and this novel machine he exhibited to large crowds of admiring spectators on a piece of ground near London. Immediately afterwards, he adapted his carriage for the drawing of wagons on railways, a duty which it successfully executed on the Merthyr-Tydvil Railway in 1804. This was the first locomotive; but it was far from perfect. It drew only 10 tons of bar-iron at the rate of five miles an hour.

Trevethick did not remain in England to improve on his invention, nor did the moderate achievements of his machine immediately induce others to make any distinct advance on his ingenious contrivance. For this lethargy there were various causes; but the principal consisted in a universal belief among engineers, that the locomotive could not be expected to gain great speed, to ascend a moderate incline, or to draw a heavy load, unless the wheels were provided with a cogged rim to work on a corresponding rack along the rails. Numerous schemes were made the subject of patents to overcome this imaginary difficulty—a circumstance which gives one a poor opinion of the state of engineering knowledge at the beginning of the 19th century. That locomotives running with smooth wheels on smooth rails, by mere weight and friction, as exemplified by Trevethick, could draw heavy loads up a moderate incline, was at length, in 1811, established as a fact by Mr. Blackett, a coal-proprietor, on the Wylam Railway. The means for imparting speed alone remained to be given.

Locomotive power was employed by George Stephenson (q. v.) on the Killingworth Railway in 1814, and with such success, that it was afterwards applied on the Stockton and Darlington Railway, for which the first act of parliament was passed in 1821. In this last undertaking, Stephenson was encouraged by the generous and enlightened aid of Edward Pease, a member of the Society of Friends, whose name will always be associated with the history of railway enterprise. The Stockton and Darlington was the first railway in which carriages traveled with passengers; yet, even with the measure of success so secured, the locomotive was still an imperfect machine, for its rate of progress continued to be little faster than the walk of a horse. Acceleration was now the grand desideratum, and it was attained by using a very simple contrivance—that of sending the waste steam up the chimney, so as to cause a powerful draught in the fire; a rapid generation of steam was the consequence, and by this appliance, along with the multitubular boiler, the machine shot forward with an energy hitherto unknown (see STEAM-ENGINE).

It certainly seems very strange, that notwithstanding the proved feasibility of railways, the public at large could not be stimulated to give any heed to the subject. It was shown in this, as in the analogous case of steam-boats, that the world may remain sceptical of an invention long after it has been practically established beyond cavil. The idea of extending railways over the kingdom for general traffic was perhaps first conceived by Thomas Gray of Nottingham, who, full of enthusiasm, besieged the public, and memorialized the government on this his favorite project, between 1820 and 1824. A work embodying his views, *Observations on a General Iron Railway, &c.*, was published in 1820. Gray's ardent notions met with little favor. Unfortunately, he was no mechanic, and, seemingly unacquainted with the advances which had been made, labored under the old exploded belief, that locomotives must have cogged wheels. After Gray, there appeared another projector, William James of London, who, in 1822, endeavored without success, to establish a railway between Liverpool and Manchester. Opposition caused his plans to be laid aside. The next and more fortunate projector was Joseph Sanders of Liverpool. He issued the prospectus of a railway from Liverpool to Manchester, 29th October 1824; and this line, surveyed by Stephenson, was, after much unworthy opposition, and some changes of route, sanctioned by the legislature. It was formally opened for traffic, September 15, 1830. Provided with some of George Stephenson's improved locomotives, the success of the line was immediate and complete—in fact, the great railway system was inaugurated.

Now, properly speaking, began that course of commercial enterprise, unregulated, and often wasteful, which has since assumed such importance. Refraining from all control over railway operations, the government, left speculators to carry lines anywhere or anyhow that parliament could be persuaded to sanction. The result, as it is well known, has been in many places a complication of competing lines on no principle of economy or enlightened foresight. Abandoned, as it were, to the audacity of promoters, and the mere brute force of capital, schemes, good, bad, and indifferent, had to fight their way at a cost almost exceeding belief; while at the same time there has been much waste of money in allowing circuitous lines to places which are afterwards in a great measure, superseded by others more direct.

LEGISLATION AND MANAGEMENT.—In the United Kingdom, railways are the property of independent companies, who construct and work them under the provisions of acts of parliament. The first step consists in organizing a company. Generally, a solicitor and a few active projectors draw up a prospectus, call meetings, suggest the names of directors, and appoint an engineer to make a survey. In no case does government or any public body take any part in the initiatory proceeding, or find any part of the capital. By the engineer and solicitor there is much to be done at the outset. Having procured a copy of the survey, the solicitor has to discover the name of every proprietor whose land is interfered with, as well as every tenant or occupant; all which names, with the extent and nature of the land to be taken, are entered in a roll, called the *Book of Reference;* and with every person so concerned, a schedule must be lodged, stating all particulars. The recipients of the schedules are requested to state in reply, whether they design to assent, to oppose, or to remain neuter; by which means, the mind of every one territorially interested becomes known to the promoters. Land to be taken for, or damaged by, railways is valued under different categories: 1. The quantity and quality at so much per acre; 2. The injury caused by cutting off one part of a field from another, called intersectional or severance damages; and 3. The damage done to the amenity or beauty of the place. Besides claiming compensation on these different grounds, the proprietor demands, for the sake of convenient communication, that bridges or level crossings shall be made across the line, or that passages be left beneath it; also that all ordinary means of drainage be maintained by culverts. Sometimes, he stipulates for a siding or station. Should the lands be let to a farmer, as is very generally the case, he is treated with separately for the loss he is likely to sustain during his lease, including any loss by unexhausted manure in the lands appropriated.

Being thus compensated for his claims, the farmer continues to pay his rent as usual, without deduction, according to the obligations of his lease, and any question is saved between landlord and tenant. Such is an outline of the usual method of settling 'land-claims,' though much depends on the feeling on both sides. At one time, enormous sums were asked and paid for alleged damage to land; now, the claims are more moderate, and in few instances is damage to amenity an element of consideration.

Until a statutory enactment is procured, the shares of a company are in that embryo state called *scrip*. Allotted to applicants by the provisional directors, the shares are 'taken up' by paying a small instalment of from 5*s*. to 20*s*. per share. These preliminary sums are paid in to a specified bank, the receipt of which is the scrip or certificate that so frequently becomes the subject of eager transfer among jobbers. The bank deposits of the allottees constitute the fund from which are paid—1. Expense of survey; 2. Expense of advertisements, prospectuses, &c.; 3. Parliamentary expenses; and 4. The amount to be lodged with an officer of government as a guarantee that parliament shall not be troubled with a merely pretended scheme. Should the bill not pass, the sum last mentioned is returned, and is, along with any residue, divided *pro rata* among the holders of scrip. Should the bill become law, scrip-holders are required to present their names with the amount of their respective shares for register at the office of the secretary of the company. 'Calls' are next made on the shareholders. If the shares be £10, a call of £2, 10*s*. per share, at intervals of three months till the whole is paid, is customary. Any failure to pay calls by a prescribed day incurs the risk of forfeiture. In authorizing a company, parliament gives power to raise so much money by shares, and so much by borrowing. The amount that may be borrowed is equal to a third of the stock, but it cannot be legally borrowed until all the shares have been issued, and at least one-half of all the shares has been paid up. The lender has a mortgage over the whole property of the company, called a Debenture (q. v.).

The entire amount paid for shares and borrowed on mortgage forms the 'capital account' of the company. See CAPITAL ACCOUNT, in which an explanation is offered of the manner of disbursing from capital and also from revenue; it being from revenue alone that dividends can be legally paid.

The act which authorizes the undertaking constitutes the company a corporation, the members of which are responsible only to the extent of their respective shares. In the act, the names of the first directors are given; it is also stated who are first to retire, and how elections are to be conducted. A director must possess a prescribed amount of stock. The directors are empowered to appoint from their number a chairman and deputy-chairman. They likewise have the appointment of secretary, traffic-managers, and other paid officials. The directors themselves profess

to give their services without any species of remuneration; but the shareholders usually vote a small sum to be put at their disposal, adequate to meet absolutely necessary expenses. Where the duties are very onerous, a special allowance per annum is voted to the chairman. It is likewise customary for the directors to have free passes over the line, which privilege is also enjoyed by the secretary and some other officials. In some instances, a free pass for a day is given to the shareholders to enable them to attend the stated half-yearly or special meetings. The principal business at the half-yearly meetings is the reading and approval of the 'report' of the directors. As the report is always printed and circulated previously, all are prepared to discuss its merits.

The organization of the present railway system has not depended on the private acts authorizing the several undertakings. There is now a body of general railway law, springing from a number of public acts, which have from time to time received the grave consideration of the legislature. These statutes date from 1838 onwards; some of the more important were passed in 1845; among these were several comprehensive statutes, including 'The Companies Clauses Consolidation Act,' and 'The Companies Clauses Consolidation (Scotland) Act;' also 'Railway and Lands Clauses Consolidation Acts;' to which supplementary acts were added in 1863, in 1864, in 1867, and in 1871. Among the diversity of matters treated of are as follows—obligations as to carrying mails, and conveyance of troops and police; regulations as to gates at level crossings, signals, and junctions; penalties for obstructing engines or railway officers, and trespassing on lines; limitations of gradients and curves; gauge; time within which railway must be made; notices to be given to Board of Trade before line can be opened, and not to be opened without authority, after due examination of works; returns to Board of Trade as to accidents; maintaining of fences; making of sidings for farming and other purposes; one cheap train to be run each way daily; rules for registering and transferring shares; voting according to ratio of shares held; payment of poor-rates and public assessments; leasing of lines; agreements to work lines; surrender of shares; authority to buy, hire and use steam-vessels; &c.

Besides these public acts, there is a code of regulations as regards the mode of commencing and carrying railway bills through the Houses of Parliament. This code, embodied in a work issued annually, is styled *Standing Orders of the Lords and Commons relative to Private Bills* (1 vol. 12mo, issued by Waterlow and Sons, Westminster). With this, all parties engaged in procuring railway acts require to be well acquainted, for neglect of any of the prescribed forms is almost certain to be fatal.

We give the following as specimens of 'Standing Orders:' Notices of applications for acts to be advertised in October or November; plans, sections, and books of reference to be lodged with clerk of the peace or sheriff-clerk of county for public inspection, on or before 30th November [often an immense struggle up till last moment to get this done]; petitions for act stating particulars to be lodged at the Private Bill Office of the House of Commons on or before 23d December; on or before same date, copy of proposed bill to be lodged with Board of Trade; on or before 31st December, declarations, lists of owners, lessees, and occupiers, also estimate of expense, to be deposited in Private Bill Office; a sum not less than 8 per cent. of the estimated expense to be deposited with the Court of Chancery, England, an officer of the Court of Exchequer, Scotland, or Court of Chancery, Ireland, previous to 15th January; examination of petitions to commence on 18th January; if promoters do not appear after a notice of seven clear days, examiners may throw out petition; certification by examiners whether standing orders have been complied with; bill submitted to select committee; proceedings in opposed bills; report of Board of Trade on bill; report of Board of Admiralty on bill, should any tidal or navigable river be proposed to be interfered with; preamble of bill proved or otherwise; bill to give power for future revision by parliament, &c.

There are equally explicit standing orders as regards the House of Lords, whose chairman of committees subjects all private bills to a sifting examination. Whatever, therefore, may have been the negligence of the government at the outset, railway legislation has latterly received a painful degree of attention. As marking a desire for simplifying procedure and lessening expenses, parliament passed an act, 1864, giving the Board of Trade power to authorize bills for a smaller class of railways, provided they were unopposed—a concession which may promote a minor but useful kind of branch-lines.

In issuing the prospectus of a railway, an estimate is given of the probable amount of traffic of all kinds; but in every case, sometimes to a surprising degree, the traffic exceeds expectation. Railways have not improperly been compared to navigable rivers. To inland and not easily reached towns, they impart the character of a seaport placed in ready communication with all the world. The exciting of a desire to travel, and the developing of local trade and resources, accordingly attend on railway undertakings, and the consequence is a universal activity and prosperity, and the creation of wealthy industrial centers.

Railways were at first detached undertakings between one large town and another, but now many of the companies have for mutual advantage amalgamated in groups; and in a number of cases for economy in working, lesser lines have been leased to companies of larger means. In this, as in most other commercial concerns in Great Britain, the tendency is to concentrate business in the hands of monopolists possessing large capital, or at least those having a great capacity and disposition to borrow. One of the advantageous results of a union of railway interests is, that passengers are able to procure 'through-tickets' to carry them forward for hundreds of miles without delay or change of carriage; but it is not less conspicuous that the 'railway interest' has become a formidable power in the state, and is able to carry lines almost anywhere, in disregard of land-proprietors or town-authorities, as if the destruction of rural amenity and the wholesale ruin of dwellings were matters of perfect indifference. Making every allowance, therefore, for the high social value of the railway system, it has certainly reached a point of despotic overbearance that requires some species of control more effectual than that which is embraced in the irregular action of parliamentary committees or of the Board of Trade.

This question has lately been attracting much attention. The government has tried in various ways to ameliorate the evils arising from its early apathy, and to control the excesses of railway enterprise. The latest of these efforts was the appointment of a Joint Committee of Lords and Commons, and a bill based on the report of that committee was in 1874 before parliament. One of the conclusions arrived at by this committee is worth noting: 'That no means have yet been devised by which competition can be maintained. Nor is there any reason to suppose that the progress of combination will cease until Great Britain is divided between a small number of great companies.'

Two great propositions for amalgamation made recently have been negatived by parliament. It remains to be seen whether the act will prove more successful than antecedent legislation. Its principal feature is the appointment of a mixed tribunal—composed of three eminent men—for the regulation and control of the working of railways.

The only alternative proposed to the present system is the government purchase of railways. An act of parliament was passed in 1844 for the purpose of enabling government to purchase all lines after they had respectively been 21 years in existence, dating from the passing of the act. This statute came into operation in 1865, but the Joint Committee of 1872 report that they do not think the terms of the 1844 act suited to the present condition of railway property, or ever likely to be adopted by parliament.

There is much to be said on both sides of this question; most of the arguments advanced *pro* and *con.* may be found in articles respectively in the *Quarterly Review* and *British Quarterly Review*, April 1873.

CONSTRUCTION.—Railways in the United Kingdom are of two kinds—double and single. The double consists of two lines of rails—an *up*-line, conducting towards, and a *down*-line, leading from the metropolis or principal center of traffic. By far the larger number of lines are of this double variety. Single lines, with places where trains may pass each other, are mostly of recent construction, and have received their chief development in Scotland. On some of the main lines to London it has been found necessary to add a third, and in some cases a fourth line, to accommodate the enormously increased traffic. Whether double or single, all the lines are enclosed. At the chief terminus there is a group of buildings for offices, workshops, sheds for locomotives, &c. Within late years the terminal stations at the larger towns have assumed vast proportions, and in them comfortable waiting and refreshment rooms are provided. In many cases, also, hotels on a very large scale have been erected as part of the buildings at the termini.

The construction of a railway is the business of contractors, who execute the works by estimate, according to the plans and specifications of the engineers. A railway contractor is a capitalist with a practical knowledge of earth-digging, blasting rocks, pumping, embanking, boring, and building tunnels, erecting bridges, and other rough operations. He possesses a stock of the various necessary apparatus, light rails, tools, &c., including horses, wagons, and locomotives for dragging materials. He has subordinates called time-keepers, foremen, gangers, and under-gangers, placed over detachments of operatives. These operatives are a remarkable class of men. Originally from Lincolnshire and Lancashire, they are popularly known as *navvies* (contracted from 'navigators'), from having been engaged in excavating navigable canals. Navvies sometimes labor in bands, called *butty-gangs*, by piece-work, and are known to draw large sums, but more generally they are employed at days' wages.

Signals.—The signalling arrangements form an important part of railway construction. The most common form of signal is

the semaphore, and at night, colored lights. A red light signifies danger; a green, caution; and a plain light, that the line is clear. Much care is given to the arrangement and construction of crossings, junctions, &c., with their numerous *switches*, or movable rails, used for changing the direction of a train from one line to another. The *switches* are generally worked directly from the signal-stations, and are so arranged that their points shall *not* face towards the advancing traffic. Numerous accidents have been caused by 'facing points.' Many improvements have been lately introduced in signalling, crossings, &c., all with a view to increased safety. The 'block' system has been adopted by the principal railway companies, particularly in the neighborhood of busy centers of traffic. Under this system each signal station is in direct telegraphic communication with the nearest signal-stations, both up and down the line, and a train is not allowed to pass any signal station until the train immediately preceding it has started from the next station in advance. Thus the driver may push on without hesitation from point to point; and thereby the traffic is expedited, and at the same time safety increased. The system of *interlocking* has also been extensively introduced. Under this system, the pointsman can *only lower one* signal—namely, that which corresponds to the line which, from the position of the switches, is *clear;* and before he can alter the position of the switches, he is compelled to return this signal to 'danger.'

Curves and Gradients.—Engineers endeavor to render their lines as level and straight as possible, but circumstances often necessitate the use of considerable curves and gradients. As a general rule, there are few curves of less than three-eighths of a mile, or 30 chains' radius; when they are employed, the exterior rail is super-elevated, to counteract the centrifugal force, otherwise a quickly moving train might leave the rails. Gradients being expensive to work according to their degree of inclination, few are more steep than 1 in 60, though 1 in 30 is not unknown. On steep gradients, stationary engines were sometimes employed, but in nearly every case, these have been abandoned for locomotive power. On local and private lines, much steeper gradients and sharper curves are common. One of the earliest, if not the first trial of a locomotive on an incline of 1 in 12, was made in Scotland in 1862. One of the Brazilian railways has a gradient of 1 in 10, with smooth-wheeled locomotives.

Gauge and Earth-works.—In the early stage of railway operations, the gauge or width between the rails excited considerable discussion. When wayleaves, or tramways, were introduced in the coal districts, their gauge was adapted to the common road-wagons that were to be put upon them, and it happened that the gauge between the wheels of these wagons was 4 feet 8½ inches. Accustomed to this width, George Stephenson believed that it 'was most economical in construction, not only as regarded the engines and carriages, but more particularly of the railway itself.' This gauge was accordingly adopted on most of the earlier-made railways, and, notwithstanding the keen contests of engineers, who were generally favorable to a 5 feet or 5 feet 3 inches gauge —Brunel contending for 7 feet—this original 4 feet 8½ inches gauge —measured from the inside of one rail to the inside of the other —was irrevocably fixed by a public act, 1846, as applicable to all the railways in England and Scotland, the Great Western and certain branches excepted, on which the gauge was regulated at 7 feet. Owing to inconvenience in communicating with other lines, and from other causes, the Great Western has found it advisable to conform to its neighbors, and has now relaid its lines on the standard gauge. By the same act, the gauge in Ireland was fixed at 5 feet 3 inches. The government of India fixed the gauge of all the railways in that country at 5 feet 6 inches. But a movement in an opposite direction has set in within the last few years, and the battle of the gauges is renewed.

A horse tramway at Festiniog in Wales, constructed in 1832 for the conveyance of slates from a quarry, and laid with a 1 foot 11½ inches gauge, was, in 1863, transformed into a locomotive railway for passengers and goods, and was found to work with perfect safety, and with remarkable economy. The success of this experiment has awakened the attention of many engineers to what they believe to be the needless extravagance of the standard gauge; and railways with gauges varying from 2 feet 6 inches to 3 feet 6 inches are now in operation in the Isle of Man, Norway, Sweden, Russia, Queensland, Peru, Chili, Brazil, Canada, and the United States, where a vast mileage is built or in course of construction. The great argument for the narrower gauge is the obvious economy both in first cost and in working. It is calculated that, on an average, companies have to haul over their lines seven tons of dead-weight in order to carry one ton of goods; and in the case of passenger carriages the excess is even greater. With the whole apparatus on a smaller scale, this waste is greatly reduced. Another advantage of the narrow gauge is, that much sharper curves may be adopted than are possible on the broader one, and thus the route may be chosen to much greater advantage. While it may be an open question whether the narrow gauge is adequate for a thickly peopled district, where 'express' trains may be indispensable, and where traffic may at times be exceptionally heavy, it is, without doubt, especially suitable for sparsely peopled districts and half-developed territories. Indeed, it affords the means of supplying the benefits of railway communication where otherwise they would be hopeless. After careful investigation, the Indian government of the late Lord Mayo decided to adopt the mètre gauge, about 3 feet 3 inches, for the greater part of an extensive series—1500 miles—of state railways. In Canada, there are already over 6000 miles of railway with a gauge of 4 feet 8½ inches (there called 'medium' gauge).

Ballast.—This is the name given to the mass of broken stones or dry gravel on which the sleepers are placed, and which serves to keep them steady. Material for ballast is generally got in the cuttings or near the line, but it is often brought a considerable distance. The term *ballast* originated in the practice of using the gravel-ballast emptied from the ships in the Tyne, for the tram and railways in the neighborhood of Newcastle.

Rails.—Rails are generally of wrought iron, but steel rails have been extensively adopted where there is a continuous heavy traffic, and are found to reduce greatly the cost of maintenance, and promise to supersede wrought iron. Rails differ in shape and weight. The most common form is the 'double-headed' rail, which is reversible (fig. 1). Another form, which was once used on the Great Western for the broad-gauge line, is known as the 'bridge-rail;' and a form frequently used on the continent, and generally on narrow-gauge lines, has a flat base formed by a flange on each side of the vertical web. The last two descriptions do not require *chairs*, but are fastened directly to the sleepers by spikes. Rails are generally 21 or 24 feet long, and for light railways vary in weight from 20 to 45 lbs., and for heavy lines from 60 to 80 lbs. per lineal yard. Cross sleepers are laid at 2 feet 6 to 3 feet 6 inches apart, usually about 3 feet, and on these sleepers the *chairs* of cast-iron are fixed and held firmly down by iron spikes driven into the sleepers. The ends of the rails are now almost always joined together by a plate of malleable iron placed on each side, called a fish-plate; two of these are used at each joint, and are bolted together by strong bolts passing through the rails. In the joining of the rails end to end, to make a smooth surface, great care is bestowed; perfect steadiness in the required line of direction is secured by means of wooden wedges acting on the rails and the chairs.



Fig. 1.

Hitherto, the sleepers have been of seasoned native larch, as the most durable; but latterly, from the growing scarcity and cost of this article, sleepers have been made of imported timber from ports in the Baltic. They are sometimes *creosoted* to render them durable, but generally they are found to require renewal on account of splitting before they rot. Many patents have been taken out for methods of dispensing with wood sleepers, and substituting some more lasting material. Some of them are extensively used abroad, but they are scarcely to be found in this country.

Tunnels and Viaducts.—Tunnels are avoided as far as possible on account of their costliness. They are made only when the excavations would be more than 60 feet in depth, or when landproprietors force their adoption, in order to spare the amenity of grounds near a mansion. For this latter reason, some short tunnels are known to have cost railway companies as much as £50,000. Latterly, the execution of underground railways in the metropolis has offered examples of tunnelling more extensive than were previously known in England, and at the same time popularized a method of subterranean transit almost as marvelous as anything in the way of viaducts. The Woodhead Tunnel is probably the longest in Britain, being 3 miles 60 feet. (The Channel Tunnel to France, if carried out, would extend some 20 miles beneath the British Channel.) In the first of the great continental tunnels, the Mont Cenis Tunnel, the summit level is 4246 feet above the sea. It was completed in 13 years, at a cost of about £3,000,000, the total length being 7½ miles, and was opened in 1870. A still greater undertaking, the St. Gothard Tunnel, was begun in 1872, and the borings from opposite sides met early in 1880. The length of the tunnel is 9½ miles: the contract, ultimately much exceeded, was £2,000,000.

Viaducts are frequently of stone, and of handsome architecture, but now commonly of malleable iron girders, of various forms, set in stone or iron piers. In the construction of viaducts, there is a growing boldness of conception. Remarkable works of this kind are the great suspension East River Bridge, connecting New York and Brooklyn, more than a mile long, the central opening having a span of nearly 1600 feet; and the St. Louis Bridge, crossing the Mississippi by three arches, the center span being 520 feet. But the longest bridge in the world was the railway bridge across the Firth of Tay, near Dundee. It was of iron girders: its length was 3450 yards, in 85 spans, 90 feet above high water, and it cost £350,000. During a wild storm in December 1879, 400 yards length of the bridge fell into the river. A scheme for replacing the bridge at a lower level was soon brought forward.

The building of a great suspension-bridge across the Firth of Forth, abandoned in 1880, was resumed in 1882.

Cost of Permanent Way.—Owing to the obstructions offered by landowners, and their excessive claims for amenity damages, also the opposition of rival companies, the cost of railways was at one time very much greater than it is at present. The expenditure incurred in securing legislative authority to construct railways was likewise enormous. The parliamentary costs of the Brighton Railway averaged £4806 per mile; of the Manchester and Birmingham, £5190 per mile; and of the Blackwall, £14,414 per mile! The cost of carrying the Liverpool and Manchester line was £27,000. It has been shown that the solicitor's bill for the South-eastern Railway contained 10,000 folios, and amounted to £240,000. These few facts, however, afford but a feeble idea of the reckless wastefulness of capital on railway undertakings; it is universally allowed that, under a better policy, not only a much better railway-system might have been provided, but a saving effected of at least fifty millions. At the end of 1871, the total average cost of all the railways in the kingdom was £35,943 per mile open, or about double that of any other country.

The cost of construction varies so much, that it is impossible to say definitely what would be the average cost nowadays; but in England a double line, including station-houses, signals, and all other fixed plant, would probably cost, under ordinary circumstances, from £15,000 to £20,000 per mile. Single lines are made at perhaps a fourth less, but nowhere in the United Kingdom have they been executed so economically as in Scotland. There, some single lines have cost for land and everything not more than about £5000 per mile—such economy, however, being greatly due to the fact, that the undertakings were promoted and watched over by bodies of land proprietors deeply interested in in restraining expenditure. Of these cheap Scotch lines a good example is offered by the Peebles Railway (practically a branch of the North British), extending to 18¾ miles, the entire cost of which, land and station-houses included, was about £95,000. The cost of rolling stock was additional.

Maintenance of Way.—Every railway, great or small, is at a considerable expense in keeping the line in proper working order, for which purpose a staff of officials is required. Besides a general superintendent there is an effective staff of 'platelayers,' whose duty it is to watch over and repair the permanent way.

Rolling Stock.—Under this head are comprehended locomotives, carriages, and trucks for goods and minerals, the whole forming an important part of railway undertakings.

Locomotives.—Locomotives are of several kinds, varied in construction to suit the traffic for which they are designed. They may be classed as express, ordinary, passenger, goods, and tank engines. In the latter class the tender for fuel and water forms an extension of the locomotive, but for the most part the tender is detached, and only connected by couplings. Locomotives for ordinary traffic have generally six wheels. In the first two classes where speed is the principal object, only two, or at most four of the six wheels are *driven*, and these are made of large diameter. There has been a continual tendency to increase the speed, and this has led to an increase in the size of the driving-wheels, which are in some cases eight feet in diameter. All the wheels of locomotives for heavy traffic are coupled together, so as to utilize the entire weight for adhesion. The smaller class of locomotives have only four wheels. The present price of first-class locomotives—of the largest size in general use—including the tender, varies from £3000 to £4000. Locomotives of this class weigh in trim from 30 to 40 tons; but there are, of course, much lighter locomotives; while sometimes they are as much as 55 or 56 tons.

Carriages.—There are three distinct kinds of carriages to suit the several classes of passengers. Each first-class carriage consists of three or four distinct compartments; but in the other

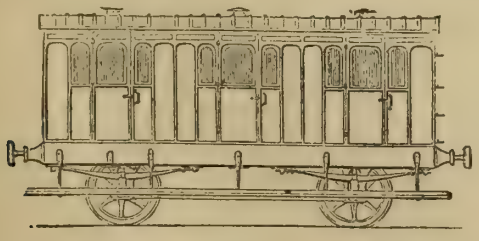


Fig. 2.

classes the backs of the seats are in many cases not carried to the roof, leaving the upper part of the carriage open fore and aft. At night the carriages are lighted with lamps; on the Metropolitan lines gas is sometimes used. Special saloon-carriages are reserved for royalty. The first-class compartments are handsomely fitted up, and in winter are heated by hot-water tins. Recently, one of the leading companies abolished its second-class carriages; and some companies now run third-class carriages with all trains. Passenger carriages made of iron have been used in America. Sleeping-carriages and the American Pullman cars have also been introduced into this country. Many efforts have been made to devise some simple and efficient contrivance by which passengers

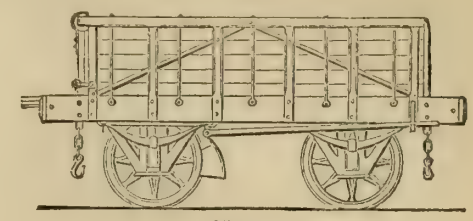


Fig. 3.

might, in cases of emergency, summon the guard, but no plan has as yet been adopted to any extent. The 'continuous brake' is an improvement and novelty which has already been successfully tried, and is likely to be soon generally applied. By its use trains can be stopped in a much shorter time and distance than under the present system, and thus the risk of accident is reduced; brakes are fitted to each carriage, and all are simultaneously ap-

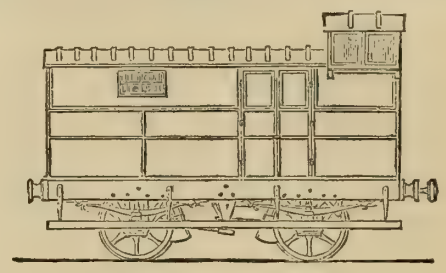


Fig. 4.

plied to the wheels. Figs. 2, 3, and 4 represent respectively a passenger carriage, a heavy coal truck without elastic buffers, and a guard's van. The latter contains space for luggage, and is provided with a look-out box, from which the guard can see along the roofs of all the carriages in the train.

Wagons and Luggage Vans.—To accommodate its traffic, every railway must be provided with a large stock of trucks or wagons for carrying goods, minerals, cattle, timber, and other articles. Except for the heaviest traffic, wagons are now very generally fitted with elastic buffers.

Traffic.—The traffic on railways is of two distinct kinds—passengers and goods; with the goods we include minerals, also timber and other bulky articles. The passenger and goods traffics are placed under separate managements. Usually, there are passenger-trains and goods-trains, but mixed trains are very common on branch lines.

In almost every railway in the United Kingdom, passengers are of three classes—first, second, and third. Though from the fares charged, first-class carriages possess an air of exclusiveness, no more objection is popularly taken to them than to the use of boxes in theaters; and, indeed, they are universally recognized as an advantage, for the reason that by the comparatively high fares exacted for them, the companies are enabled to lower the charges for second and third-class passengers. On some lines, compartments are set apart for ladies if they choose to use them. Special compartments of each class are now also allotted to smokers, a custom one may contrast with the special *non-smoking* carriages common on the continent. The first-class passengers have distinct waiting-rooms at the termini and stations, with generally a waiting-room in addition for ladies; for the second and third class, there is a waiting-room in common. The several waiting-rooms are neatly fitted up, and provided with suitable conveniences, including basins and water for washing the hands—accommodations which contrast favorably with what were furnished to travelers in the old coaching establishments. The waiting-rooms are open all day to the public, and there is seldom any restriction as to going on the platforms. Tickets are sold at a wicket not earlier than a quarter of an hour before the starting of the train.

The tickets, marked in consecutive numbers, are stamped with the date on delivery, and excepting 'return tickets,' will not answer for any other day. Return tickets at a fare and a half are issued on most lines for the date of issue, or from Friday till Monday. On most lines first and second-class untransferable season tickets are issued for various periods at a considerable reduction on ordinary fares. To encourage the building of villas at a distance of ten to twenty miles from termini, by which means a

traffic may be developed, some companies give a personal ticket free for a number of years corresponding to the rental. Some return tickets and tourist tickets are available from one to six months.

The number of trains run daily depends on the pleasure of the directors. There are ordinary, mail, and express trains; of this last kind, two usually go each way daily, the fares on which are sometimes higher than by the others. Ordinary fares are about 2½*d.* per mile first class, 1¾*d.* second class, and 1*d.* to 1½*d.* third class; but on some lines the fares are considerably lower. According to one of the provisions of a general act, all companies must run one train daily each way, stooping at all stations, and at a rate of speed not less than 12 miles per hour, at a fare of a penny a mile. Some of the express trains are run at very high speeds, and with wonderful punctuality. On June 1, 1872, London was brought, for the first time, within 9½ hours of Edinburgh, by a train running on the East Coast route, which, deducting stoppages, travels at an average speed of nearly 47 miles an hour. By an act, 5 and 6 Vict. cap. 79, there is payable to government 'a duty at and after the rate of £5 per £100 upon all sums received or charged for the hire, fare, or conveyance of all passengers.' By 7 and 8 Vict. cap. 85, it is enacted that no tax shall be levied on the receipts for passengers conveyed at fares not exceeding one penny per mile; but by the 26 and 27 Vict. cap. 33, it is enacted that this exemption shall only extend to trains running six days in the week, or on market-days for the conveyance of passengers at one penny per mile. From this passenger-tax Ireland is exempted.

All trains are accompanied by a 'guard,' who is responsible for their management while running. For the most part, guards are intelligent and obliging, and do all in their power to render service to the passengers. Nor must we omit to say that the porters on duty are remarkable for the trouble they take to carry luggage, find cabs at the termini, and to answer civilly such inquiries as may be put to them by strangers. It may be said with perfect justice, that in no department of affairs in Great Britain is there seen such readiness to oblige as in that connected with railways. Considering the vast number of servants on some lines—the total on all lines is probably about 300,000—the general good conduct that is shown, and the few accidents that occur, constitute a gratifying social phenomenon.

According to English routine, passengers are allowed to find their way promiscuously to the proper carriages, the only check being a call by the guard to 'show tickets' previous to starting. All passengers are expected to see their luggage labelled for the place of destination, and to point out what belongs to them on arrival. This is a loose practice, often remonstrated against, but it suits the temperament and self-relying habits of the people. Amidst the crush of traffic, and with little time to spare, the formalities of the continental system would be unendurable. Should labelled packages, resigned to the porters and guard, be lost, recourse lies against the company. Another peculiarity of railway traveling in Great Britain consists in the privacy secured to passengers while on their journey. Instead of being intruded on, as in American and continental railways, by the constant perambulation of the guard through the train, they are left unmolested to read, talk, or sleep, according as fancy may direct. This very seclusion, however, is thought to be attended with a disadvantage —namely, that passengers are unable to call for the assistance of the guard in cases of threatened outrage by one of their number.

To all the numerous devices for summoning the guard, and, if need be, stopping the train, there is unfortunately the grave objection, that if passengers were enabled to call the guard at pleasure, they would frequently do so for no sufficient reason, as whim or imaginary fear prompted; and also, that the unexpected stoppage of trains would seriously derange the keeping of time, and in many lines jeopardize the safety of the whole of the passengers. Seemingly, it would be difficult to fall upon any plan free of this species of objection, unless recourse be had to the American construction of carriages, and the free perambulation of the guard through the trains—a remedy which involves a revolution in English railway transit, as well as in English feelings and manners.

To enable companies to reckon easily with each other as regards intercommunication of traffic in passengers, goods, use of carriages, &c., an institution called the Clearing-House has been established in London, to which tickets are transmitted for cross-reckoning and settlement. There is a similar establishment in Dublin. See CLEARING-HOUSE.

Cost of Working.—The cost of working railways, including general expenditure, in Great Britain amounts to from 48 to 50 per cent. of the returns from traffic. The remainder forms the divisible profit to pay—1st, the interest on debentures; and 2d, the dividend to shareholders. Of these shareholders, some, as defined by statute, have a preference claim of 5 per cent. per annum, what is left over being divisible among the ordinary or original shareholders. In the general expenditure of railway companies is included the outlay for passenger-tax, also police, poor, and parish-rates. Besides supporting the poor, the railways in Scotland are rated like Heritors (q. v.) for building new parish churches.

According to a return made by railway companies to the Board of Trade for 1880, the cost of running trains was on an average 32·37*d.* per mile, or say about £13, 10*s.* for 100 miles. Lowness of fares can only be secured by a large and well-sustained traffic; and the main reason why fares are much higher than they seemingly might be, is the frequent insufficiency of the number of passengers compared with the accommodation provided for them. A striking exemplification of the possibility of conveying large numbers at very low fares is afforded in the case of 'excursion trains,' in which sometimes 1000 individuals are taken 50 or more miles and brought back the same day for one or two shillings each.

STATISTICS.—A parliamentary return gives the following statistics for the United Kingdom for 1880: Number of miles open, double lines, 9803; single lines, 8130—total, 17,933. Number of passengers (exclusive of holders of season and periodical tickets), first class, 38,767,926; second class, 65,034,870; third class, 500,-082,229—total, 603,885,025. Minerals carried, 165,670,304 tons; general merchandise, 69,635,325. The traffic under all these heads has been more than doubled within ten years. Miles traveled by passenger-trains, 122,548,258; by goods-trains, 115,408,845 —total, 240,956,494; equal to near 10,000 times the circumference of the world; or 500 *double journeys* to the moon, and much more than a double journey to the sun. Receipts from passengers, £23,761,659. Receipts for excess luggage, parcels, carriages, horses, dogs, &c., £2,728,690; receipts for carrying mails, £704,-909. Total receipts from passenger-trains, £27,200,464; an increase of fully 64 per cent. in ten years. Receipts for live-stock, £1,170,-437; for minerals, £14,679,226; general merchandise, £19,901,741 —total of goods-traffic, £35,761,303; an increase of fully 93 per cent. in ten years. Total recipts from all services, £65,491,625. Working expenses, including maintenance of way, locomotive power, repairs and renewals of carriages and wagons, &c., £33,-601,124; net balance of receipts over working expenditure, £31,-890,501. Proportion of expenditure to receipts, 51 per cent. Vehicles of all sorts employed, 432,466. The traffic receipts per mile of line open amounted to £3511, and per mile traveled by train, to 5*s.* 2¾*d.* In 1872, the receipts were £3244, 5*s.* 4¼*d.*, and in 1854, £2510, 5*s.* 6½*d.* The receipts per train mile were highest in 1856, 5*s.* 11½*d.*; and lowest in 1870, 5*s.* 1½*d.*

The authorized capital by shares was £596,248,649; by loans, £205,765,355—total £802,014,004. Total paid up on shares and debenture loans, £728,316,848. The proportion of paid-up capital to total length of line open, was £40,613 per mile, the highest proportion yet reached, having risen gradually from 1863, which was the lowest, viz., £32,804 per mile. Of the total capital, about forty-eight millions received no dividend at all; the highest dividend received was 15 per cent.; but the greater part received from 4 to 5 per cent. For the first time since 1858, the returns for 1878 showed a falling off of 0·31 per cent. in traffic; but there was a very marked revival in 1880–81. At the same date, the amount of authorized capital in shares and loans was £778,872,572; of paid-up capital, £698,545,154; the length of single and double lines, 17,333 miles; gross receipts, £60,454,375; per mile of line open, £3488; per train mile, 5*s.* 5½*d.* The number of third-class passengers had increased 4 per cent.; while there had been a decrease of first and second.

Accidents.—During the year 1880, the number of railway accidents (collisions, running off lines, breaking of axles, &c.) in the United Kingdom was over 300—Passengers killed, 143; passengers injured, 1613; number of servants of companies, trespassers, &c. killed, 993; injured, 2345—total killed, 1136; injured, 3958. A large proportion of the accidents to passengers were due to causes within the control of the sufferers. The number reported killed in 1878 was 1053, and injured, 4007; the list of casualties in 1876 was considerably larger, including 1245 killed and 4724 injured.

FOREIGN RAILWAYS.—The first continental country that availed itself of railway locomotion was the small kingdom of Belgium, where a number of lines in connection with each other were constructed between 1834 and 1836, and in about ten years afterwards the group was nearly completed in a well-devised and comprehensive scheme. From Belgium railways spread to France, where they were laid down on a plan prescribed by the government, which offered special encouragement to capitalists. The method adopted was to give the land and make the bridges, but besides these heavy items of expenditure, the government was in a number of instances at the cost of the entire permanent way. So far favored, the promoters, who formed a company, had only to find capital to work and maintain the line. The government, however, relinquished the property only on the footing of a lease for such a number of years as a company was disposed to be satisfied with. Tenders were ordinarily taken from competing

bodies of promoters; in this manner the 'concession,' or right of tenancy, has been adjusted at from 50 to 99 years; at the end of the prescribed periods the lines will fall into the hands of the government. Latterly, the French system has outgrown this kind of tutelage; and there is a disposition in companies to act on an independent footing; the state, however, has secured a very general right of property in the existing lines, whether by the method of assistance originally fallen upon, or by giving large subventions of money, on the plan of receiving a share of profits after a certain dividend has been reached. By means of these subventions, as well as a species of guaranteed monopoly of traffic, the profits to shareholders in some French lines reach from 10 to 12 per cent. Within 99 years from 1852, a large proportion of the French railways will lapse into possession of the state. On one or other of the various plans of government helping companies, and preventing ruinous competition, nearly the whole railway system of continental Europe, Asia, and Africa is established; and in a large number of the foreign railway undertakings everywhere much British capital is invested. The principal continental railways, particularly in France and Belgium, are double lines, and under good management; but the rate of transit is generally slower than in England, and the formalities as to taking tickets and being allowed to enter the trains are exceedingly troublesome.

Various continental lines have been constructed by English contractors, who employed English navvies for the purpose. In Italy, however, as lately as 1862, we observed that the work of construction was performed in a tedious and laborious manner by women and girls, who carried the earth in baskets on their heads, under the superintendence of taskmasters with whips—a sorrowful spectacle, and the more surprising as being in a country noted for its advancement in practical engineering.

In Canada, Nova Scotia, and Australia, railways have been successfully established; but in no British dependency has the railway system been latterly pushed forward with such activity or likelihood of advantage as in India, where, at the end of 1874, 6273 miles were open for traffic; and at the beginning of 1881, 9179 miles. The undertakings have been materially assisted by government, by giving the land to the companies, by subventions in proportion to the actual outlay, and in some instances by guarantees of a minimum dividend of five per cent. to shareholders. Railways have likewise been introduced into China and Japan. A line from Shanghai to Woosung, in China, was opened in 1876 (unhappily closed again); and Japan in 1878 possessed 66½ miles of railway, with 142 miles in construction, and 455 miles sanctioned by government.

The year 1830 witnessed the introduction of railways into the United States, Massachusetts claiming that proud distinction. To-day, there are close upon 90,000 miles of road, some of these ironways being the most complete and superbly equipped in the world. In fact, as all travellers cheerfully admit, the railway service in the United States excels all other such service elsewhere, while the palace, dining, and sleeping cars are more or less of revelations. The railways in this country are constructed and owned by companies. The cost of procuring legislative authority for a considerable number has been comparatively small, while the land grants given in consideration of construction have, in some cases, been disproportionately large. The longest continuous railway journey in the United States is that from New York City to San Francisco, occupying six days and nights. Save in close proximity to large cities the lines are not fenced, the bell, whistle, and cow-catcher being brought into requisition as occasion may demand. The traveller can journey to the city of Mexico from New York and change cars but once, at El Paso, on the Rio Grande. The average rate of speed used in the United States is 20 miles an hour; but the fastest time on record has been made by a 'flying special' used for delivering a New York daily, 68:2.28 miles having been done in one hour. The 'Chicago Limited,' between New York and that wondrous City of the West, averages 37½ miles an hour the entire trip. Great taste is of late being displayed in the architecture of depots, and in New England especially, the way-station houses are putting those of Old England completely in the shade. The conductors, unlike the guards on European lines, expect no 'tip.' The porters on the sleepers are colored, and as they polish boots, fetch ice water, brush clothes, and perform other such offices, twenty-five cents is usually allotted to them. Ticket offices are established in every city, where tickets can be obtained in advance without the trouble of proceeding to the depot, and baggage can be checked to any part of the continent.

Tramways in city streets, for carriages drawn by horses, were first brought into extensive use in America, and were introduced after opposition into European cities. The first 'elevated railroad' came into operation in New York in 1872. A single track for a train of three carriages, carrying 36 persons each, is borne on longitudinal wrought-iron girders resting on corbels supported by a single line of wrought-iron posts planted along the edge of the foot-path. The dummy engine moves the train at the rate of 20 miles an hour.

Electric railways, in which a single car is propelled by apparatus depending on electric current, were successfuly tried at Paris and at Berlin in 1881; and in the same year a line was laid for an electric tramway from Portrush to the Giants' Causeway. The current in such cases is supplied by a dynamo-electric stationary engine at the end of the track.

There are several weekly newspapers devoted to railway subjects, the oldest of which is *Herapath's Railway Journal*. *Bradshaw's Railway Guide* (q. v.) is well known for its careful time-tables. Other countries have of course their own time-tables.

The following table, taken from an official *Statistical Abstract* and various other sources, shows the mileage of 1855 and 1880 respectively:

States.	Length of Railways open for traffic. 1855. Eng. miles.	1880. Eng. miles.
EUROPE	21,140	102,781
Austria-Hungary	1,758	11,327
Belgium	828	2,550
Denmark	18	975
France	3,436	14,789
Germany	4,863	21,275
Great Britain	8,336	17,933
Greece	—	7
Italy	566	5,339
Netherlands	195	1,442
Norway	42	759
Portugal	22	746
Rumania	—	862
Russia in Europe	649	14,698
Spain	275	4,067
Sweden	23	3,576
Switzerland	129	1,650
Turkey in Europe	—	786
ASIA	156	10,096
India	156	9,179
Other Asiatic Countries	—	97
AFRICA	—	2,578
AMERICA	20,042	101,696
Argentine Republic	—	1,439
Brazil	—	1,711
Chili	—	1,049
Dominion of Canada	—	7,000
Peru	52	1,750
United States	19,247	86,497
Other States	—	2,250
AUSTRALASIA	—	5,661
New South Wales	—	958
New Zealand	—	1,286
Queensland	—	640
South Australia	—	822
Tasmania	—	196
Victoria	—	1,686
West Australia	—	73

The total mileage open over the whole world is now considerably above 220,000 miles.

RAIMONDI, MARC ANTONIO, a celebrated engraver, was born at Bologna in 1487 or 1488. He studied for several years under the celebrated painter Francia, the head of the old Bolognese School. On quitting Francia's studio, he went to Venice, and having seen there, for the first time, prints from the woodcuts after Albert Dürer, he engraved on copper two sets of Prints from that great master's designs, viz., those illustrating the 'Life of the Virgin,' and of the 'Life and Passion of Christ;' to that of the former he attached the cipher or monogram of Albert Dürer, and it is said that the artist complained of the deception to the senate, but only obtained an order that in future the monogram of Albert Dürer should not be copied; at all events, the latter set is without the monogram or mark. From Venice, R. proceeded to Rome, soon attracted the notice of Raphael, and engraved those works after that master that are so highly valued. R. greatly improved his style by imitating the remarkable delicacy and clearness exhibited in the engravings of Albert Dürer and Lucas Van Leyden; and though, perhaps, in these qualities he did not surpass, or perhaps equal, these masters, he went far beyond them in power and purity of drawing, which he carried further than any other engraving; indeed, it has been stated that Raphael himself assisted the engraver in drawing on several of the plates.

After Raphael's death, having engraved some plates after draw-

ings of a licentious kind by Giulio Romano, he was thrown into prison by Clement VII., but was afterwards liberated, taken under the protection of the pope, and fully employed. This prosperous state of matters, however, soon terminated, for on the sack of Rome by the Spaniards under the Constable Bourbon, in 1527, he was plundered of all he had, and was obliged to flee and take refuge in Bologna, where he seems to have lived till the period of his death, the exact date of which is not known, but it must have been after 1539, for a print by him, after Giulio Romano, of the 'Battle of the Lapithæ,' bears that date.

Good impressions of this eminent engraver's works bear, perhaps, a higher value than any other engravings; but there are numerous impressions from his plates to be met with which are of little value, having been thrown off after they had been greatly worn, and repeatedly retouched. The best impressions are without the name of any publisher. After the plates were taken from the stock of Tommaso Barlacchi, they came into the possession of Antonio Salamanca; afterwards, they passed through the hands of Antonio Lafreri, from thence to Nicholas van Aelst, and lastly, became the property of Rossi or De Rubeis, and by that time they had been completely worn out. See catalogue of R's. engravings by Baron Heineken, and Bartsch, vol. 14. Very fine collections are to be seen in the British Museum and the Louvre.

RAIN. At a given temperature, air is capable of containing no more than a certain quantity of aqueous vapor invisibly dissolved through it, and when this amount is present, it is said to be saturated. Air may at any time be brought to a state of saturation by reducing its temperature; and if it be cooled below this point, the whole of the vapor can now no longer be held in suspension, but a part of it, passing from the gaseous to the liquid state, will be deposited in dew, or float about in the form of clouds. If the temperature continues to fall, the vesicles of vapor that compose the cloud will increase in number, and begin to descend by their own weight. The largest of these falling fastest, will unite with the smaller ones they encounter in their descend, and thus drops of rain will be formed whose size and thickness will depend on the thickness and density of the cloud. The point to which the temperature of the air must be reduced in order to cause a portion of its vapor to form cloud or dew, is called the dew-point.

Hence, the law of aqueous precipitation may be stated: Whatever lowers the temperature of the air at any place below the dew-point, is a cause of rain. Various causes may conspire to effect this object, but it is chiefly brought about by the ascent of the air into the higher regions of the atmosphere, by which, being subjected to less pressure, it expands, and in doing so, its temperature falls. Ascending currents are caused by the heating of the earth's surface, for then the superincumbent air is also heated and consequently ascends by its levity. Air-currents are forced up into the higher parts of the atmosphere by colder, drier, and therefore heavier wind-currents getting beneath them, and thus wedgeways thrusting them upwards; and the same result is accomplished by ranges of mountains opposing their masses to the onward horizontal course of the winds, so that the air, being forced up their slopes, is cooled, and its vapor liberated in showers of rain or snow. Again, the temperature of the air is lowered, and the amount of the rainfall increased, by those winds which convey the air to higher latitudes. This occurs chiefly in temperate regions, or in those tracts traversed by the *return trade-winds*, which in the north temperate blow from the south-west, and in the south temperate zone, from the north-west. The meeting and mixing of winds at different temperatures is also known to produce rain, but not nearly to the extent at one time believed. It is also increased or diminished according as the prevailing winds arrive immediately from the sea, and are therefore moist, or have previously passed over large tracts of land, and particularly mountain ranges, and are therefore dry. Since the rainfall is evidently much modified by the temperature of the earth's surface over which the rain-producing winds blow, it follows that sandy deserts, by allowing solar and nocturnal radiation to take immediate effect in raising or depressing the temperature, and forests, by delaying, if not, in many cases, counteracting these effects of radiation, have each a peculiar influence on the rainfall.

Rain is the most capricious of all the meteorological phenomena, both as regards its frequency and the amount which falls in a given time. It rarely or never falls in certain places, which are, on this account, designated the rainless regions of the globe —the coast of Peru, in South America; the great valley of the rivers Columbia and Colorado, in North America; Sahara, in Africa; and the Desert of Cobi, in Asia, are examples, whilst on, the other hand, in such regions as Patagonia, it rains almost every day. Again, the quantities which have been recorded at some places to have fallen at one time, are truly enormous. In Great Britain, if an inch fall in a day, it is considered a very heavy rain. In many parts of the Highlands of Scotland, three inches not unfrequently fall in one day. On the 5th of December 1863, there fell at Portree, in Skye, 12¼ inches in 13 hours; and on the same day, 5·2 inches fell at Drishaig, near Loch Awe, where also, two days afterwards, 7·12 inches fell in 30 hours. At Seathwaite, in Borrowdale, 6·62 inches fell on November 27, 1845. But it is in continental, and especially tropical countries, where the heaviest single showers have been recorded. The following are a few of the most remarkable: At Joyeuse, in France, 31·17 inches fell in 22 hours; at Geneva, 30 inches in 24 hours; at Gibraltar, 33 inches in 26 hours; on the hills above Bombay 24 inches in one night; and on the Khasia Hills, 30 inches on each of five successive days.

In all places within the tropics where the trade-winds are blowing regularly and steadily, rain is of rare occurrence, the reason being, that as these winds come from higher latitudes, their temperature is increasing; and hence they are in the condition of taking up moisture rather than of parting with it; and the return trade-winds, which blow above them in an opposite direction, having discharged the greater part of their moisture in the region of the calms, are also dry and cloudless. Where, however, these winds are forced up mountain-ranges in their course, as on the east of Hindustan, they bring rain, which falls chiefly during night, when the earth's surface is coolest.

The region of calms is a broad intertropical belt about 5° in breadth, characterized by calms, and towards which the northern and southern trades (see TRADE-WINDS) blow. This, the region of calms, is at the same time the region of constant rains. Here the sun almost invariably rises in a clear sky; but about mid-day, clouds begin to gather; and in a short time, the whole face of the sky is covered with dense black clouds, which pour down prodigious quantities of rain. Towards evening, the clouds disappear, the sun sets in a clear sky, and the nights are serene and fine. The reason of this daily succession of phenomena in the belt of calms is, that there the air, being heated to a high degree by the vertical rays of the sun, ascends, drawing with it the whole mass of vapor which the trade-winds have brought with them, and which has been largely added to by the rapid evaporation from the belt of calms; this vapor is condensed as it is raised towards the line of junction of the lower and upper trade-winds, and the discharge is in some cases so copious, that fresh water has been collected from the surface of the sea. As evening sets in, the surface of the earth and the superincumbent air are cooled, the ascending currents cease, the cooled air descends, and the dew-point is consequently lowered, clouds are dissipated, and the sky continues clear till the returning heat of the following day brings round a recurrence of the same phenomena. Since the belt of calms, which determines the rainy season within the tropics, moves northward or southward with the sun's declination, carrying the trade-winds with it on each side, it follows that there will be only one rainy and one dry season in the year at its extreme northern and southern limits; but at all intermediate places, there will be two rainy and two dry seasons, at the equator these will be equally distant from each other.

This state of things is only of strict application to the Pacific Ocean, whose vast expanse of water, presenting a uniformly radiating and absorbing surface, is sufficient to allow the law to take full effect. But over the greater part of the earth's surface disturbing influences draw the trade-winds more or less out of their normal course, and sometimes produce a total reversal, as in the case of the Monsoons (q. v.). These winds determine entirely the rainfall of India, and but for them, the eastern districts of Hindustan would be constantly deluged with rain, and the western parts constantly dry and arid. As it is, each part of South Asia has its dry and wet season, summer being the wet season of the western parts and interior as far as the Himalaya, and winter the wet season of the eastern, and especially south-eastern parts.

The heaviest annual rainfall on the globe is 527 inches, at Cherro Punji, on the Khasia Hills, 494 inches of which falls from April to September during the S.W. monsoon. The astonishing amount is due to the abruptness of the mountains which face the Bay of Bengal, from which they are separated by 200 miles of low swamps and marshes. The winds not only arrive among the hills heavily charged with the vapor they have absorbed from the wide expanse of the Indian Ocean, but being near the point of saturation, their temperature not being raised in passing over these swamps, they are, so to speak, ready to burst in torrents over the abrupt cliffs which divert them from their horizontal course into the higher regions of the atmosphere.

At 20 miles inland, the annual fall is reduced to 200 inches; 30 miles further south, it is only 100 inches; north, at Gowhatty in Assam, it is only 69 inches. In the north-west of the Bay of Bengal, at Cuttack, it is only 52 inches; while in the north-east, in Arracan, owing to the S.W. direction of the winds, it is from 200 to 240 inches. At Madras, the annual fall is 48 inches; at Seringapatam, only 24 inches; at Bombay, 71 inches; at Uttra-Mullay, 263 inches, and at Mahabalishwar, 254 inches, both on the Western Ghauts; and at Poona inland, 27 inches. The

south-west monsoon discharges from 50 to 90 inches of rain over the parts of Hindustan not bounded by high mountains to the west, before reaching the Himalayas, after which it discharges the greater part of its moisture, 120 to 140 inches, on the outer Himalayan range, at elevations of 4000 to 8000 feet. Thus, four times more rain falls annually on the Khasia Hills than on the Himalaya, owing to the less abrupt face these latter mountains present to the south, to the sandy burning plain, which raise the winds considerably above the dew-point, and to the larger tract traversed by the winds, over which their moisture continues to be discharged as they pass.

The following are a few of the annual rainfalls in the tropics; Singapore, 97 inches; Canton, 78 inches; St. Benoit (Isle of Bourbon), 163 inches; Sierra Leone, 126 inches; Caracas, 155 inches; Pernambuco, 106 inches; Rio Janeiro, 45 inches; Georgetown, 95 inches; Barbadoes, 50 inches; St. Domingo, 107 inches; Bahamas, 55 inches; and Vera Cruz, 183 inches. In many places in the interior of continents within the tropics, the rainfall is small —not greater, in fact, than in temperate countries, such as the eastern parts of England. At Poona, only 23 inches fall annually.

The periodicity of the rainfall disappears as we recede from the tropics, and the times of the year during which it occurs are different—the greater quantity falling in summer at places within the tropics and in the interior of continents, but in winter in countries bordering on the sea in temperate regions. In respect of the rainfall, Europe may be divided into two distinct regions: Western Europe, and the countries bordering on the Mediterranean. A vast ocean on the one hand, a great continent on the other, and a predominance of west winds, are the determining circumstances in the distribution of the rainfall over Western Europe. As the south-west winds, which are the return trades, descend to the earth and blow over the surface of Europe, and as the whole of this continent is thus within their influence, it follows that the western parts, especially where mountain-ranges stretch north and south, are rainy districts; for these mountains, diverting the south-west winds from their horizontal course, force them up into the higher regions of the atmosphere, where, chilled, they form into clouds, or deposit in rain the vapor they can no longer hold in suspension. Hence, the rainiest regions of Europe are Norway, Ireland, the west of Great Britain and of France, Spain, and Portugal. At the Stye, in the Lake District, 38·9 inches fell in January in 1851; at Drishaig, 33·2 inches, and at Portree, 32·4 in December 1863; and in the same month, from 23 to 30 inches at many other places in the Scottish Highlands. In the west of Great Britain and Ireland, in the vicinity of high hills, the average rainfall is from 80 to 128 inches. At Bergen, in Norway, it is 70 inches; in the Peninsula, at Oporto, it is 54 inches; at Bilbao, 47 inches; and at St. Jago, 65 inches; and in France, it is 51 inches at Nantes, and 49 at Bayonne.

At places at some distance from hills, and in more inland districts, the annual fall is much diminished. Thus, in the west of Great Britain, away from hills, it is from 30 to 45 inches; while in the east, it is from 20 to 28 inches. In France, it averages 30 inches; and in the plains of Germany and Russia, 20 inches; while in some parts of Sweden and Russia, it falls as low as 14 inches. In the interior of Europe, in mountainous districts, it rises much above these amounts; thus, at Ischl, it is 62 inches. An important distinction between the mode of distribution of the rainfall in the west of Europe and that of more inland places is, that the greater part of the annual amount in the west falls in winter; but in the interior, in spring or summer. This difference is particularly striking on the different sides of Great Britain, and arises from this circumstance, that as the clouds are much lower in winter, they are arrested and drained of their moisture by the less elevated hills, leaving little to be deposited eastwards; but in summer, being high, they pass above, and discharge themselves in the interior. Thus, for every 10 inches of rain which fall at the following places in winter, there fall in summer respectively 8½ inches in the west of Great Britain, 11 inches in the east of Great Britain and west of France, 15 inches in the east of France, 20 inches in Germany, and 27 inches in the north and east of Russia.

The peculiarity of the rainfall of the basin of the Mediterranean depends on its proximity to the burning sands of Africa, a predominance of northerly winds, and the position of the Pyrenees and Spanish sierras to the west, on which the south-west winds discharge their rains before arriving on the north shores of the Mediterranean. In the valley of the Rhone, four times more rain falls in autumn than in summer; and south of the Alps, six times more rain falls with the north-east than with the south-west winds being the reverse of what takes place in England. In Italy, the quantity diminishes as we approach the south. On the coasts of the Mediterranean, it rarely rains in summer, but frequently in winter. In the valley of the Rhone, the annual fall ranges from 20 inches at its mouth to 63 inches at St. Rambert, the average being 30 inches. This is also the average of the valley of the Po; but on ascending to the Alps, it rises, as at Tolmezzo, to 96 inches.

The rainfall in the west of the American continent is distributed similarly to that of Europe—the amount being dependent on the physical configuration of the surface over which the westerly winds blow. The yearly amount increases as we proceed northward; thus, at San Francisco it is 21 inches; at Fort Reading, 29 inches; at Fort Oxford, 72 inches; at Fort Vancouver, 47 inches; at Astoria, 86 inches; at Steilacoom (Wash. Ter.), 54 inches; and at Sitka, in Alaska, 82 inches.

But in the United States, the manner of the distribution of the rain is very different from that of Europe. The United States are dependent for their rain not on the Pacific Ocean, but on the Gulf of Mexico. There can be little doubt that, but for the high range of the Rocky Mountains in Central America, the greater part of the States would be an arid waste. These mountains are so high as to present an effectual barrier to the passage of the trade-winds, which blow over the Gulf of Mexico; they are, on this account, turned northward, and spread themselves over the States, especially over the low basin of the Mississippi. These winds being characterized by great heat, and loaded with much moisture from the warm waters of the Gulf of Mexico, tend to disturb the statical equilibrium of the atmosphere. When they have blown for some time, vast accumulations of heat and moisture take place, the equilibrium is destroyed, a great storm arises in consequence, sweeping eastward over the States, and in many cases crossing the Atlantic, and descending with violence on Western Europe. In the States, the southerly winds preceding the storm give place to the dry north-west winds, which rapidly clear the sky, and bring brilliant bracing weather in their train.

It appears, in short, that the south winds from the Gulf of Mexico spread the moisture over the State, and the north-west wind disengages this moisture from them by getting below them, by their greater density, and thrusting them into the higher regions of the atmosphere. If this be the case, as the phenomena seem to warrant, then the heaviest rainfalls will be in the valleys, and the least on the higher grounds—a mode of distribution quite different from what prevails in Europe. And such is really the case, for the greatest amount of rain falls in Florida, the low flats of the Mississippi, then along its valley, and lastly in Iowa, or in that remarkable depression at the head of the river; and the least quantities on the Alleghanies, especially on their higher parts, and on the high grounds of the Missouri district. The following figures, giving the average annual amount in inches, show this in a clear light: Pensacola, 57; Fort Brooke, 55; and Fort Pierce, 63—in Florida: Monroeville, 66; and Mobile, 64—in Alabama: Natchez, 58; Jackson, 53—in Mississippi; Rapides, 68; New Orleans, 52—in Louisiana: Savannah, 48—in Georgia: Nashville, 55—in Tennessee: Dubuque, 33—in Iowa. At Athens, in Georgia, south of the Alleghanies, the amount is 36 inches; at Alexandria, in Virginia, also 36 inches; and at Jefferson, in Missouri, 38 inches. In the Northern States, the quantity diminishes at most places to between 27 and 45 inches, and the mode of its distribution becomes assimilated to that of Europe.

When raindrops fall through a stratum of air below 32°, they become frozen, and form *Hail* (q. v.). When the vesicles are formed in air under 32°, *Snow* (q. v.) is the result.

RAI'NBOW. The ordinary phenomena of the rainbow are usually visible on every occurrence of a 'sunny shower,' and we need not describe them particularly until we deduce them, one after another, from their cause. The most careless observation shows us that, for the production of a rainbow, we must have a luminous body of moderate angular diameter, and *drops* of water; for it is never seen except by direct sun or moon light, and never in a cloud unless rain be falling from it. Now, a falling drop of water takes, by its molecular forces, a *spherical* form. Also, as there is separation of the various colors of which white light is composed, the cause of the phenomenon must involve *Refraction* of Light (q. v.), because by Reflection (q. v.) these colors are not separated. But, again, the spectator who views the rainbow has his back to the sun, and rays of light merely refracted by a raindrop could not be thus sent back to the spectator. The phenomenon must therefore depend upon successive reflections and refractions, and we shall investigate in an elementary manner what appearances we ought to *expect* as the result of such processes according to the known laws of optics; merely premising that the fundamental points of the explanation were first given by Newton in the second book of his *Optics*.

First, then, let us consider what becomes of parallel rays of light, *of one color* or refractive index (see REFRACTION), which are successively refracted and reflected in a single spherical raindrop.

For our immediate purpose, it is sufficient to suppose that the refractive index (see REFRACTION) of water is ⅓; that is, the incident and refracted rays make with the perpendicular to the refracting surface of water, angles whose sines are in the ratio of 4 to 3.

Let the circle represent a section of the drop made by *any* plane passing through its center O, and the line SO, which joins its center with the sun; the sun being supposed, for the moment, to be a single luminous point, situated at so great a distance that lines drawn to it from different points of the drop are parallel. A ray of light, SB, falling on the drop in the plane of section

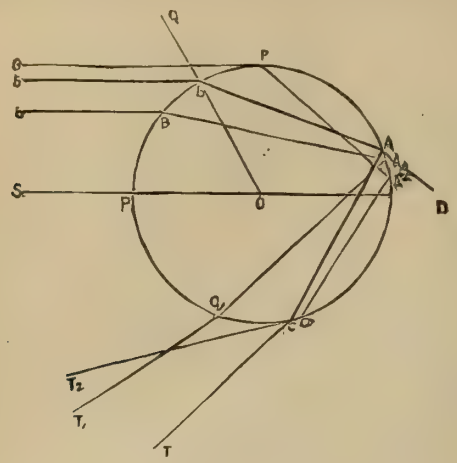


Fig. 1.

will be, of course, partly reflected and partly refracted at B. The reflected part does not concern us, as in it all colors would travel together; and, in fact, the result of reflection from external surfaces of the drops is simply to illuminate the background feebly. Join OB, and produce it to Q. Then the refracted ray (see REFRACTION) will have in the drop the direction BA, where the ratio of the sines of SBQ and OBA is the refractive index of water—i. e., 4 : 3 nearly. Arriving at A, the ray will be partly refracted in some such direction as AD, and the rest reflected in the direction AC. Now AD obviously cannot fall on the eye of a spectator whose *back* is turned to the sun, and it has, therefore, nothing to do with the rainbow. The internally reflected ray, AC, on reaching the surface at C, is partly refracted in the direction CT (where BS and CT are symmetrically situated on opposite sides of OA), and partly reflected internally. The latter portion we must consider when we come to the cause of the *secondary*, or outer rainbow, the former is that which at present concerns us. Let SB_1, SB_2, be other incident rays. After a refraction, a reflection, and a second refraction, they emerge in the directions C_1T_1, C_2T_2, respectively. From the figure, which is drawn from calculation, it is obvious that both C_1T_1 and C_2T_2 are *less* inclined to OS than CT is. Hence for rays parallel to SO, falling on the drop, and emerging after suffering two refractions and a reflection, the *final* direction is more and more inclined to SO, as the point of incidence, B_1, is further from P, at least up to some such point as B; after which (for points situated at B_2) it diminishes again. By proper mathematical methods, it is easy to find that the angle SOB is about 59° 24′, if the refractive index be $\frac{4}{3}$. Now, by a general property of maxima or minima in optics (see CAUSTIC), the rays falling on the drop near to B will emerge nearly parallel to CT; while those incident near any other point (as B_1) will be widely scattered at emergence. And we may evidently extend this reasoning to all other rays by supposing the above figure to rotate about the axis SO.

The conclusion is, therefore, that if homogeneous light fall in parallel lines on the spherical drop, those rays which have been *twice* refracted at the surface, and *once* internally reflected, will, on emergence, all lie within the cone formed by the revolution of CT about SO, and will be *condensed* towards the surface of that cone. Hence such an illuminated drop gives off by this particular process a solid cone of rays, much condensed towards its external boundaries.

So much for each drop. Next let us inquire what the appearance will be to an eye in any given position. Referring to the next figure, in which the letters are the same as in the former, draw TS′ parallel to SO. Then TS′ is the direction of the line drawn to the point on the heavens diametrically opposite to the sun. So are E_1S_1' and E_2S_2', drawn from any assumed positions, E_1 and E_2, of the spectator's eye.

If the eye be placed in the surface of the cone just described, as at T, it will receive the condensed ray which emerges in the direction CT; if at E_1 (within the cone), it will receive diffused rays from the drop; if at E_2 (outside the cone), it will receive no light at all.

To put this in a simpler form: Draw E_1F_1 and E_2F_2 parallel to TC; then we may evidently say that the eye receives a condensed light from any drop whose angular distance from the point opposite the sun is CTS′, a diffused light if the angular distance be less than this, and none at all if it be greater. By methods al-

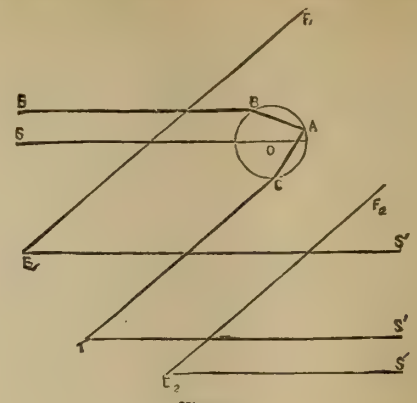


Fig. 2.

ready alluded to, it is found that CTS′ is nearly 42° 12′ for the index of refraction $\frac{4}{3}$.

Hence, if the sun were a luminous point, emitting homogeneous light whose index of refraction in water is $\frac{4}{3}$, a spectator looking through a shower of falling raindrops towards the point immediately opposite to the sun, would see a bright circle of angular diameter 84° 24′ surrounding this point, diffused light within that circle, and darkness without it.

The effect of the finite angular diameter of the sun is evidently to widen this circle into a circular luminous band, whose breadth is the sun's apparent diameter, and whose mean radius is 42° 12′.

Next, let us consider the different refrangibilities of the colored constituents of white light. The investigation above hinted at shows that the radius of the luminous circular band is greater, the less the refractive index; the proof, though very simple, would be out of place in this work. Hence the appearance actually observed with sunlight will be formed by the superposition of concentric, overlapping, circular bands, the radii being less and less as we consider the primary colors in the order from red to violet (see SPECTRUM). That is, we shall have a circular illuminated space, brightest towards the edge, with a homogeneous red ring as its external boundary, and a gradual mixture of the prismatic colors as we look nearer to the center. This agrees very well with observation, and so do the calculated diameters of the external red (42° 22′) and internal violet (40° 35′) rings.

But what becomes of the light *twice* reflected inside the drop, and then refracted out? Let. fig. 3 represent again a section of

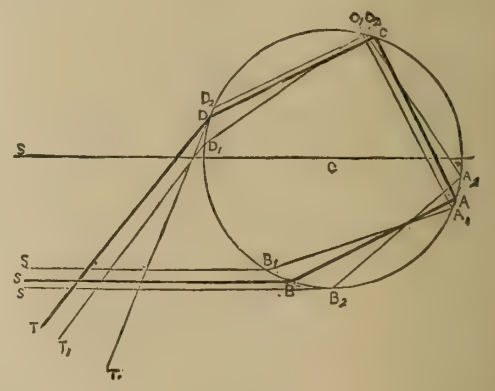


Fig. 3.

the drop, with sunlight falling on it in lines parallel to SO, and let us trace the course of one ray, as SB. The part reflected at B is to be disposed of as before; it goes merely to illuminate, feebly, the otherwise dark background of cloud and vapor. The refracted portion proceeds, as before, to A, where part is reflected internally along AC, and part refracted out. The latter portion, as we have already seen, cannot possibly reach the eye of a spectator whose back is turned to the sun. Similarly, at C, there is internal reflection along CD, and refraction out of the drop. The refracted part has already been considered, as the cause of the *primary* rainbow. The reflected part will again at D. be separated into two; one reflected internally, which proceeds to form the tertiary and higher orders of bow; and the other, escaping from the drop in the line DT, which goes to form the *secondary* bow. This we will consider with some care,

because the secondary bow, though necessarily fainter than the primary, is usually seen; the tertiary and higher bows, each much fainter than the preceding one, since the beam inside the drop is weakened at each succeeding reflection, require no notice, as even the tertiary has never been observed in nature.

As before, we have traced the courses of two other beams, SB_1 and SB_2, in their passage to form part of the secondary bow. They are respectively $SB_1A_1C_1D_1T_1$ and $SB_2A_2C_2D_2T_2$; and the figure shows us that the final rays D_1T_1 and D_2T_2 are each *more* inclined to SO than DT is. There is, therefore, a particular ray, SB, whose final direction, DT, is *less* inclined to SO than that of any other ray which has suffered two refractions and two internal reflections; and, as before, the emergent light is condensed towards this minimum. If then, the figure be made to revolve about SO, we see that DT will describe a cone, that *inside* this cone there is no refracted light, that towards the surface of the cone, part of the light is condensed, and that the rest of it is diffused through *exterior* space.

So much for one drop; let us now, as before, consider what will be seen by an eye in any position with regard to this particular drop. In fig. 4, the letters denote the same things as in fig. 3. Hence, if the eye be placed at T, it will receive the maximum of light, in a direction making an angle DTS′ with the point in the heavens opposite to the sun. If at E_1, it will receive some of the diffused light from a drop whose angular distance from the point opposite the sun is *greater* than DTS′; and if at E, it will receive no light at all, the drop's angular distance from the point opposite the sun being *less* than DTS′. Hence the appearance presented by a shower of drops is, for homogeneous light coming in parallel lines, a bright circle, whose angular radius is DTS′;

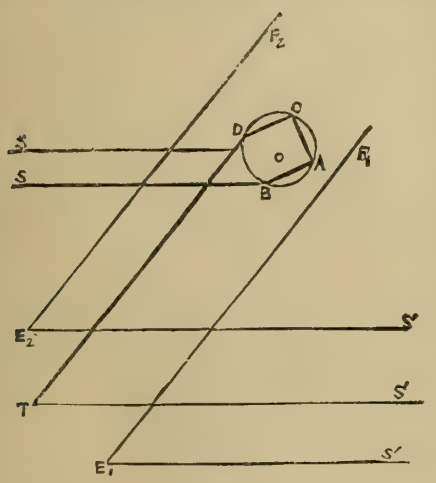


Fig. 4.

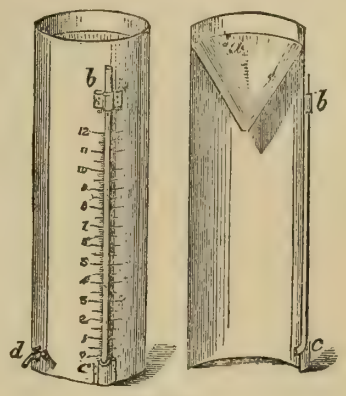
diffused light outside that circle, and no light within it. When the light comes from a source of finite angular diameter, as the sun, the only effect is, as in the primary bow, to *widen* the bright circular band. When we consider the various components of white light, calculation shows us that DTS′ is least for red, and greatest for violet. Hence we have a series of concentric colored bands superposed, their diameters increasing from the red to the violet. Hence the secondary rainbow has its inner edge red, and its outer violet; the intermediate space being an exceedingly mixed, or impure Spectrum (q. v.). The results of geometrical optics show us that the angular diameter of the red is 100° 48′, and of the violet 106°44′; so that the breadth of the bow is 3° 30′ nearly.

In nature, these rough results are pretty closely verified; but a more profound investigation into the circumstances of the problem shows us some modifications. In the first place, we find that for each kind of homogeneous light the actual maximum of brightness is in a circle of rather less angular diameter than that given by the more elementary investigation for the primary bow; and rather greater for the secondary. Secondly, and still with homogeneous light, there is a succession of feebler and feebler concentric circles of maximum brightness—inside the principal maximum in the primary bow, and outside it in the secondary. These give rise to what is always seen in a fine rainbow, the so-called *spurious* or *supernumerary* bows, lying close inside the violet of the primary bow, and outside that of the secondary. These are fainter and more impure as they proceed from the principal bow, and finally merge into the diffused white light inside the primary bow, and outside the secondary.

The angular dimensions of these bows, principal and spurious, were calculated from theory by Airy, and carefully measured by Miller in the artificial bow formed by passing light through a very fine column of water descending through a small aperture, and the accordance was perfect.

The lunar rainbow, which is a comparatively rare, but very beautiful phenomenon, differs from the solar simply in the source and intensity of the light by which it is produced; and, as in all cases of feeble light, the distinction of the colors is very difficult. In fact, except under the most favorable circumstances, the lunar rainbow rarely shows colors at all, giving a pale ghostly gleam of apparently white or yellow light.

RAIN-GAUGE. The use of rain-gauges is to ascertain the amount of rain which falls at any given place. They are of various constructions. The simplest is that which consists of a metallic cylinder, from the bottom of which, a glass tube (*bc*), divided into inches and parts of an inch, projects downwards. It is provided with a funnel, inserted within at the top, to prevent evaporation, and the rain-water is emptied out by means of a stop-cock (*d*) at the bottom, or, still simpler, by a hole (*a*) pierced in the funnel at the top. (See accompanying wood-cut.) As this



Rain-gauge.

form of gauge is objectionable on account of the frequent breakage of the glass-tube by frost, a float is used instead, which is raised by the water, and a scale is attached to it, to show the quantity of rain received. As this gauge does not admit of very nice readings, another sort is frequently employed, viz., a receiving-vessel and a glass measure of much smaller diameter, which thus admits of as nice graduation as may be desired. As, practically, there is often great difficulty or trouble experienced in replacing the glass measure when it chances to get broken, the late G. V. Jagga Ráo, a wealthy zemindar of Vizagapatam, proposed a gauge in the form of a funnel having a diameter of 4·697 inches, or an area of 17·33 square inches. Now, as a fluid ounce contains 1·733 cubic inches, it follows that for every fluid ounce collected by this gauge, the tenth of an inch of rain has fallen. This measure can, of course, be graduated to any degree of nicety, and may be reproduced at pleasure. It has also the great merit of being by far the cheapest gauge, costing only 4*s*. 6*d*. Self-registering rain-gauges have been invented by Osler, Crosley, and Beckly, but they are too expensive to come into common use.

A most important point with regard to the rain-gauge is its height above the ground. Professor Phillips found the fall of rain at York for twelve months in 1833—1834, to be 14·96 inches at a height of 213 feet from the ground; 19·85 inches at 44 feet; and 25·71 inches on the ground. This remarkable fact—viz., that different quantities are collected at different heights, the amount being always greater at the lower level, has been confirmed wherever the experiment has been made. No perfectly satisfactory account has yet been given of this singular phenomenon. The condensing of the vapor of the atmosphere on the surface of raindrops as they fall—the rebound of the finer particles into which many of the drops break themselves as they strike with violence on the ground—and the eddies and currents which prevail most and strongest around isolated objects raised above the surface of the ground, to a large extent account for the phenomenon. Of these three, the greatest weight is to be given to the last two; and this is confirmed by the fact, that a gauge placed on the roof of a building that happens to be flat, of considerable area, and with few or no chimney-stalks to disturb the air-currents, collects an amount equal to that collected at the same place by a gauge on the ground. The proper size and shape of the rain-gauge, and its height above the ground, so as to measure with the greatest exactness possible the real quantity of rain that falls are still debated. There are pluviometers or rain-gauges that indicate the duration of rainfall, by marking the rain-drops on a chemically sensitized plate; and there is a 'self-registering' R., which, by means of a float, rod, and spring pencil or pointer, marks the duration and quantity of rainfall by tracing a line on a revolving drum with diagram sheet.

RAIN-PRINTS, in Geology. See ICHNOLOGY.

RAI'NY LAKE forms a portion of the boundary-line between British North America and the United States. It is situated 160 miles west of Lake Superior, is 1160 feet above sea-level, and is about 35 miles long, and 5 miles in average breadth. Its surplus waters are carried off to the Lake of the Woods, in a west-north-west direction, by the Rainy River, which is about 100 miles in length, and the banks of which are covered with pine-forests.

RAISED SEA-BEACHES. See BEACHES, RAISED.

RAISINÉE, a *rob*, or sweetmeat, much esteemed in France, made by boiling new wine, and skimming until only half the quantity of wine remains; after which it is strained; apples, pared and cut into quarters, are added to it, and it is allowed to simmer gently, till the apples are thoroughly mixed with the wine, when it has a very pleasant sweetish acid taste. Cider may be used instead of wine.

RAISINS are dried grapes, prepared by two different methods. The one method consists in partially cutting through the stalk of the ripened bunches, and allowing them to shrink and dry upon the vine by the heat of the sun. These are by far the better sort, and are called *Raisins of the Sun*, or Muscatels. Malaga is much celebrated for its sun-raisins, which are the finest in the world. The raisins prepared by the other method are called *Lexias*, and are gathered and hung on lines, or laid on prepared floors to dry in the sun. When dried, they are dipped in a hot *lye*, made by dissolving the alkali out of wood-ashes or barilla with water, until the filtered fluid has a specific gravity of about 1·100; to this is added, for every four gallons, a pint of olive oil and a quarter of a pound of salt. After dipping, the fruit is laid on hurdles of wicker-work to drain, and is continually exposed to the sun for about a fortnight. The raisins are then pulled from the stalks, and packed into boxes for transport to other countries. The qualities best known in the markets are Valencias and Denias from Spain, Malagas from Malaga, and black Smyrnas and Sultanas from Asiatic Turkey. The ravages of the *phylloxera* in France have led to an immense importation of raisins from the East (to Marseilles chiefly), for the manufacture of wine (see WINE). The Currant (q. v.) is only a small variety of grape. In 1880, Britain imported 395,290 cwts. of raisins, and currants to the amount of 820,146 cwts.

RAJAH, or more correctly RAJA (from the Sanscrit *rajan*, king, cognate with the Latin *reg* or *rex*), is originally a title which belonged to those princes of Hindu race who, either as independent sovereigns or as feudatories, governed a territory; it then, however, became a title given by the native governments, and, in later times, by the British government to Hindus of rank, and it is now not uncommonly assumed by the zemindars or land-holders; the title Maharajah, or 'great Rajah,' being, in these days, generally reserved to the more or less independent native princes. According to the ancient social system of India, the rajah belonged to the kshattriya or military caste (see CASTE); now, however, the title is given to, and assumed by, members also of an inferior caste.

RA'JAMAHE'NDRI, or RAJAMUNDRY, a town of Hindustan, capital of the district of Godavari, in the presidency of Madras, stands on the left bank of the Godavari, about 50 miles from the mouth of that river, and in long. 81° 53′ E. To the north of the town is the Fort, a square edifice, comprising the barracks, hospital, jail, and magazine. The nobler kinds of game, as well as wild-fowl of all sorts, abound in the vicinity, and the situation and scenery are in the highest degree beautiful. The Godavari is here about two miles wide, and is crossed by a steam-ferry. Napkins and table-cloths are manufactured. Pop. 19,738, about a fourth of whom are Brahmans. The collectorate of Godavari, of which R. is the capital, has an area of 6224 square miles, and a pop. (1871) of 1,592,939.

RAJATARANGIN'I (or 'the river of kings,' from the Sanscrit *rajan*, king, and *tarangin'i*, a river or stream) is the name of four chronicles of the history of Cashmir written in Sanscrit verse; the first by *Kalhan'a*, bringing the history of Cashmir till about 1148 after Christ; the second, a continuation of the former, by *Jonarâja*, to 1412; the third, a continuation of the second, by *S'rîvara*, a pupil of Jonarâja, to 1477; and the fourth by *Prâjyabhat't'a*, from that date to the conquest of the valley by the Emperor Akber. Amongst these chronicles, however, it is especially the first which has earned a great reputation, inasmuch as it is the most important and the completest of all *known* Hindu chronicles, and, for this reason, may be considered as the only surviving work of Sanscrit literature which betrays an attempt at historiography. The author of the work, the Pandit Kalhan'a—of whom we merely know that he was the son of Champaka, and lived about 1150, under the reign of Sinhadeva of Cashmir—reports that before entering on his task, he had studied eleven historical works written previously to his time, and also a history of Cashmir by the sage Nîla, which seems to be the oldest of all; but that, not yet contented with these sources of information alone, he had also examined old documents, such as grants and proclamations made by kings, texts of laws, and sacred books. It may be presumed, therefore, that Kalhan'a had not merely the desire, but set honestly to work to elucidate the history of Cashmir up to his date. And so far as the last few centuries preceding him are concerned, it is possible that the facts narrated by him are reliable; but owing to the uncritical disposition of the Hindu mind in all matters that regard historical facts, those especially of a more or less religious or legendary character, and also to his bias to produce a consistent system of chronology, great doubts must attach to all that relates in his work to the ancient history of India. In spite of these shortcomings, however, which are more those of the nation to which the author belonged, than those of the individual himself, much that is reported by Kalhan'a is the only source of information we have of the history of Cashmir, and much very valuable as coming from an indigenous source.

Kalhan'abegins his work, as may be expected, with the mythological history of the country; the first king named by him is Gonorda, who, according to his chronology, would have reigned in the year 2448 before Christ; and the last mentioned by him is Sinhadeva, about 1150 after Christ. The Sanscrit text of the complete work, together with that of the three other Râjatarangin'îs, which is of little extent, has been edited at Calcutta in 1835, under the auspices of the General Committee of Public Instruction and the Asiatic Society of Bengal. Six sections of it have been edited, with notes, and learned appendixes, in French, by A. Troyer, who likewise translated into French these sections, as well as the remaining two (*Râdjatarangini. Histoire des Rois du Kachmir*, &c., vols. 1—3, Paris, 1840—1852) —See also H. H. Wilson, *An Essay on the Hindu History of Cashmir*, in the *Asiatic Researches*, vol. xv., and Lassen's *Indische Alterthumskunde*, vols. i. and ii.

RAJMAHA'L, a town of India, in the district of Bhaugulpore, Bahar, Lower Provinces of Bengal, and a station on the line of railway from Calcutta to the north-west frontier, stands on a steep eminence on the right bank of the Ganges, 200 miles by land north-north-west of Calcutta. Its position is advantageous, and it was long the chief town of the Bengal and Bahar provinces. Since the removal of the British courts of justice, however, its prosperity has declined. It now presents a deserted and ruinous appearance, but is still noteworthy for the remains of its once splendid palace, and for its important transit-trade. It contains twelve market places, and has about 30,000 inhabitants, most of whom are employed in providing for the wants of the vast number of travelers who pass through the town by land and water.

RAJPOOTS, or RAJPUTS (from the Sanscrit *rajan*, king, and *putra*, son; hence literally, 'sons of kings'), is the name of various tribes in India which are of Aryan origin, and either descended from the old royal races of the Hindus, or from their Kshattriya or warrior caste (see CASTE). At all periods, they seem to have played a conspicuous part in the history of India; and all over Hindustan there are many families who, rightly or wrongly, claimed the title of Râjputs. At present, they occupy chiefly the country known as Râjasthân or Râjputana, including, amongst other states, those of Mewar, Marwar, Jeypur, Bikanir, Jessulmir, Kotah, and Bundi. Before the invasion of Mahmud the Ghiznevide, four great kingdoms were under the dominion of Râjput families—viz., Delhi, Kanoj, Mewar, and Anhulvarra; and all the kings mentioned in the *Rajatarangin'i* (q. v.) of Kalhan'a were of Râjput origin.—For the history, &c., of the R., and the geography of Râjputana, see Colonel James Tod's *Annals and Antiquities of Rajasthan, or the Central and Western Rajpoot States in India* (2 vols., Lond. 1829); Ritter's *Erdkunde*, vol. vi. pp. 724, ff.; Lassen's *Indische Alterthumskunde*, vols. i. and ii. (*passim*); A. Troyer's *Radjatarangin'i*, vol. iii. (*Eclaircissements historiques*, &c.).

RAKE, an agricultural and horticultural implement, in use from very ancient times. In its simplest form it consists merely of a bar of wood or iron, with wooden or iron teeth inserted into it, and attached at right angles across the end of a long handle. It is used for collecting straws, &c., from a field after it has been reaped or mown, or stones from newly-tilled ground, sometimes also in gardens, for covering seeds. A long rake, with a short triangular framework instead of a handle, and curved teeth, is much used in hayfields in England, and is known as the *ell-rake*. Rakes are also adapted for being drawn by horses; and there are many modifications both of the hand-rake and the horse-rake.

RAKE, in Naval Language, has more than one meaning. The rake of a ship's stern or bow is the length to which the keel would have to be prolonged to bring it under the most projecting point of the stern or bow. Raking masts are masts set aslope, so that the angle they make with the keel towards the stern is less than a right angle, as in a brigantine. To rake a ship is to bring guns to bear so as to fire them along her deck from end to end: this is

the most disastrous thing that can happen to a vessel in action, and it is the object of all good seamanship to avoid it. When a ship is raked at short range, grape can be used with great and fatal effect.

RAKING MOULDING, a moulding not horizontal or vertical, but sloping at an angle. When joined to a horizontal moulding, the raking moulding is run so as to mitre with the true vertical profile of the former, and is therefore different from it in section.

RAKO'CZYMARSCH, a simple but grand military air by an unknown composer, said to have been the favorite march of Francis Rako'czy II. of Transylvania, and at all events much played in his army. The Magyar Hungarians adopted it as their national march, and in 1848 and 1849, it has been alleged to have had the same inspiriting effect on the revolutionary troops of Hungary as the *Marseillaise* on the French. Like the *Marseillaise* in France, it has been placed under the ban of the Austrian government at various periods of political excitement. In 1848, several attempts were made by Hungarian poets to set it to appropriate verses, but without much success. The air most generally known in Germany and elsewhere out of Hungary as the Rako'czymarsch, which is introduced by Hector Berlioz in his *Damnation de Faust*, is a weak paraphrase of the original by Ruziska.

RAKSHAS, or RAKSHASA, is, in Hindu Mythology, the name of a class of evil spirits or demons, who are sometimes imagined as attendants on Kuvera, the god of riches, and guardians of his treasures, but more frequently as mischievous, cruel, and hideous monsters, haunting cemeteries, devouring human beings, and ever ready to oppose the gods and to disturb pious people. They have the power of assuming any shape at will, and their strength increases towards the evening twilight. Several of them are described as having many heads and arms (see, for instance, RAVANA), large teeth, red hair, and, in general, as being of repulsive appearance; others, however, especially the females of this class, could also take beautiful forms in order to allure their victims. In the legends of the *Mahâbhârata*, *Ramayana*, and the *Puran'as*, they play an important part, embodying, as it were, at the period of these compositions, the evil principle on earth, as opposed to all that is physically or morally good. In the *Puran'as*, they are sometimes mentioned as the offspring of the patriarch Pulastya, at other times as the sons of the patriarch Kas'yapa. Another account of their origin, given in the *Vishn'u-Puran'a*, where, treating of the creation of the world (book i. chap. v.), is the following: 'Next, from Brahmâ, in a form composed of the quality of foulness, was produced hunger, of whom anger was born; and the god put forth in darkness beings emaciate with hunger, of hideous aspects and with long beards. Those beings hastened to the deity. Such of them as exclaimed: "Not so, oh! let him be saved," were named Râkshasa (from *raksh*, save); others who cried out: "Let us eat," were denominated, from that expression, Yaksha' (from *yaksh*, for *jaksh*, eat). This popular etymology of the name, however, would be at variance with the cruel nature of these beings, and it seems, therefore, to have been improved upon in the *Bhagavata-Puran'a*, where it is related that Brahmâ transformed himself into night, invested with a body; this the Yakshas (q. v.) and Râkshasas seized upon, exclaiming: 'Do not spare it—devour it!' when Brahmâ cried out: 'Don't devour me (*ma*, *mam*, *jakshata*)—spare me! (*rakshata*).' (See F. E. Hall's note to Wilson's *Vishn'u-Puran'a*, vol. i. page 82.) The more probable origin of the word *Rakshas*—kindred with the German *Recke* or *Riese*—is that from a radical *r'ish* or *rish*, hurt or destroy, with an affix *sas;* hence, literally, the destructive being.

RALEIGH, SIR WALTER, the son of Walter Raleigh of Fardel in Devonshire, was born in 1552 at Hayes, on the coast of that county. In 1568, he was sent to Oxford as a commoner of Oriel College, and though his residence there was brief, gave token of remarkable ability. Only the year after, relinquishing study for adventure, he went to France as volunteer in an expedition in aid of the Huguenots; and some years subsequently we find him serving in the Low Countries in a force sent by Queen Elizabeth to assist the Dutch in their patriotic struggle against the Spaniards. Of this earlier part of his career, nothing specially remarkable is recorded. In 1579, he made his first venture in the field of activity which through life continued at intervals to attract him, sailing, in conjunction with his half-brother, Sir Humphrey Gilbert, with the purpose of founding a colony in North America. The expedition proved unsuccessful, being roughly handled by a Spanish force, and obliged to return in somewhat evil case. During the year following, R. held a captain's commission in Ireland, where, in operations against the rebels, he distinguished himself by his courage and conduct. Shortly after his return, he seems first to have attracted the notice of Queen Elizabeth, with whom he speedily rose high in favor. The story which attributes the commencement of his relations with her to his graceful gallantry in spreading before her his costly mantle as a carpet, is so well known, that it need only be glanced at in passing. For some years forward, he was constant in his attendance upon the queen, who distinguished him by employing him from time to time in various delicate offices of trust, and by substantial marks of her favor. The spirit of enterprise was, however, restless in the man; and in 1584, a patent having been granted him to take possession of lands to be discovered by him on the continent of North America, he fitted out two ships, which soon visited what was afterwards by the gracious permission of the Virgin Queen called Virginia. Next year the beginnings of colonization were made; year after year reinforcements were sent; and between 1597 and 1602 five several Virginian expeditions were fitted out at R.'s expense. Elizabeth conferred on R. the honor of knighthood. No immediate good, if we except tobacco, came of the colony; and after some years of struggle, he was forced to relinquish his connection with it.

During the years 1587—1588, the country being menaced by a Spanish invasion, R. was actively and responsibly occupied in organizing a resistance, and held command of the queen's forces in Cornwall. In the latter year, he shared with new access of honor in the series of actions which ended in the defeat and dispersion of the great Armada, and was thanked and rewarded for his services. Shortly after (1593), in consequence of an intrigue, resulting in his private marriage with Elizabeth Throckmorton, one of the queen's maids of honor, he incurred her majesty's severe, but only temporary, displeasure. In his banishment from court, he recurred to those schemes of conquest and adventure in the New World, which formed one main dream of his life; and, in 1595, headed an expedition to Guiana, having for its object the discovery of the fabled El Dorado, a city of gold and gems, the existence of which in these regions was then generally believed in. Of this brilliant but fruitless adventure, on returning, he published an account. Having been reinstated in the royal favor, he held in 1596 the post of admiral in the expedition against Cadiz, commanded by Howard and the Earl of Essex, and was admittedly the main instrument of its success. Also, in the year following, he took part in the attack on the Azores made by the same commanders. In the court intrigues which ended in the downfall of the Earl of Essex, he after this became deeply involved; and certain points of his conduct, as notably the sale of his good offices with the queen in behalf of such of the earl's adherents as would buy them, though easily regarded by the current morality of the time, have fixed somewhat of a stain on a fame otherwise so splendid.

With the death of Elizabeth in 1603 ends the brilliant and successful portion of R.'s career. Her successor, James, from the first regarded him with a suspicion and dislike which he was at no pains to conceal. He had besides made powerful enemies—the principal of whom were Cecil and Howard. His ruin was resolved on, and means were soon found to compass it. He was accused of complicity in a plot against the king; and though no jot of evidence of his being any way concerned in it was produced at his trial, a verdict was readily procured, finding him guilty of high treason. The language of the prosecutor, Attorney-general Coke, was outrageously abusive. He called R. 'a damnable atheist,' 'a spider of hell,' a 'viperous traitor,' &c. Sentence of death was passed, but James did not venture to execute him; and he was sent to the Tower, where, for thirteen years, he remained a prisoner, his estates being confiscated, and made over to the king's favorite, Carr, subsequently Earl of Somerset. During his imprisonment, he devoted himself to literary and scientific pursuits, his chief monument in this kind being his *History of the World*, a noble fragment, still notable to the student as one of the finest models of our quaint and stately old English style. Certain of his poetical pieces, giving hint of a genius at once elegant and sententious, also continue to be remembered, and are more or less familiar to every one. In 1615, he procured his release, and once more sailed for Guiana. The expedition, from which great results were expected, failed miserably. R. himself, in consequence of severe illness, was unable to accompany it inland; and nothing but disaster ensued. To add to his grief and disappointment, his eldest and favorite son was killed in the storming of the Spanish town of St. Thomas, and he returned to England, broken in spirit and in fortunes. He returned only to die. On the morning of the 29th October 1618, in the sixty-sixth year of his age, he was infamously executed, nominally on the sentence passed on him sixteen years before, but really, there is reason to suppose, in base compliance on James's part with the urgencies of the king of Spain, who resented his persistent hostility.

R. was a man of noble presence, of versatile and commanding genius, unquestionably one of the most splendid figures in a time unusually prolific of all splendid developments of humanity. In the art and finesse of the courtier, the politic wisdom of the statesman, and the skilful daring of the warrior, he was almost alike pre-eminent. The moral elevation of the man shone out eminently in the darkness which beset his later fortunes; and the calm and manly dignity with which he fronted adverse fate conciliated even those whom his haughtiness in prosperity had offended. R.'s 'Life' has been written by Oldys, Cayley (1806); P. F

Tytler (1833); Edwards (1868), St. John (1868); his poems were published by Sir E. Brydges (1814); his *Miscellaneous Writings*, by Dr. Birch (1751), and his *Complete Works*, at Oxford (8 vols. 1829).

RA'LEIGH, the capital of North Carolina, is six miles west of the Neuse River, near the center of the state; lat. 35° 47′ N., long. 78° 48′ W. The town is regularly built on an elevated site, with a central park, containing a large domed state-house, and broad streets. It contains a court-house, jail, 3 banks, 12 newspapers, 6 churches, deaf and dumb and lunatic asylums, and extensive railway connections. Pop. (1870) 7790; (1880) 14,110.

RALLENTA'NDO (Ital., becoming slower), a musical term, abbreviated *rallent*, or *rall.*, indicating a gradual relaxing or diminution of time.

RA'LLIDÆ, a family of birds of the order *Grallæ*, characterized by a long bill, which is more or less curved at the tip and compressed at the sides, the nostrils in a membranous groove, the wings of moderate length, the tail short, the legs and toes long and slender, the hind-toe placed on a level with the others. To this family belong rails, crakes, gallinules, coots, &c. The toes of some, as coots, are margined with a lobed membrane; but these are by some ornithologists separated from this family (see COOT). Even those R. of which the toes have no marginal membrane, are fitted, by the length of their toes, for walking on mud or ooze. Many of them swim and dive well. Most of them are aquatic, or frequent either fresh-water or salt marshes; but some, as the crakes, are found in dry situations.

RAMA is, in Hindu Mythology, the name common to three incarnations of Vishn'u, of Paras'urâma, Râmachandra, and Balarâma. See VISHN'U.

RA'MADAN, the ninth month in the Mohammedan year. In it Mohammed received his first revelation, and every believer is therefore enjoined to keep a strict fast throughout its entire course, from the dawn—when a white thread can be distinguished from a black thread—to sunset. Eating, drinking, smoking, bathing, smelling perfumes, and other bodily enjoyments, even swallowing one's spittle, are strictly prohibited during that period. Even when obliged to take medicine, the Moslem must make some kind of amends for it, such as spending a certain sum of money upon the poor. During the night, however, the most necessary wants may be satisfied—a permission which, practically, is interpreted by a profuse indulgence in all sorts of enjoyments. The fast of R., now much less observed than in former times, is sometimes a very severe affliction upon the orthodox, particularly when the month—the year being lunar—happens to fall in the long and hot days of midsummer. The sick, travelers, and soldiers in time of war, are temporarily released from this duty, but they have to fast an equal number of days at a subsequent period, when this impediment is removed. Nurses, pregnant women, and those to whom it might prove really injurious, are expressly exempt from fasting. We may add, that according to some traditions (Al-Beidâwi), not only Mohammed, but also Abraham, Moses, and Jesus received their respective revelations during this month. The principal passages treating of the fast of R. are found in the second Surah of the Koran, called 'The Cow.'

RAMAYAN'A is the name of one of the two great epic poems of ancient India, (for, the other, see the article MAHABHARATA). Its subject matter is the history of Râma, one of the incarnations of Vishn'u (q. v., and see RAMA), and its reputed author is *Valmîki*, who is said to have taught his poem to the two sons of Râma, the hero of the history; and, according to this legend, would have been a contemporary of Râma himself. But though this latter account is open to much doubt, it seems certain that Valmîk—unlike Vyâsa (q. v.), the supposed compiler of the *Mahâbhârata*—was a real personage; and, moreover, that the R. was the work of one single poet—not like the *Mahabharata*, the creation of various epochs and of different minds. As a poetical composition, the R. is therefore far superior to the *Marabharata;* and it may be called the best great poem of ancient India, fairly claiming a rank in the literature of the world equal to that of the epic poetry of Homer. Whereas the character of the *Mahabharata* is cyclopædical, its main subject-matter overgrown by episodes of the most diversified nature, its diction differing in merit, both from a poetical and grammatical point of view, according to the ages that worked at its completion—the R. has but one object in view, the history of Râma. Its episodes are rare, and restricted to the early portion of the work, and its poetical diction betrays throughout the same finish and the same poetical genius. Nor can there be any reasonable doubt as to the relative ages of both poems, provided that we look upon the *Mahabharata* in the form in which it is preserved, as a whole. Whether we apply as a test the aspect of the religious life, or the geographical and other knowledge displayed in the one and the other works, the R. appears as the older of the two. Since it is the chief source whence our information of the Râma incarnation of Vishn'u is derived, its contents may be gathered from that portion of the article VISHN'U which relates to *Ramachandra*.

The R. contains (professedly) 24,000 epic verses, or *S'lokas*, in seven books, or *Kan'd'as*, called the *Bala-*, *Ayodhya-*, *Arany'a-*, *Kishkindha-*, *Sundara-*, *Yuddha-*, (or *Lanka-*), and *Uttara-Kan'd'a*. The text which has come down to us exhibits, in different sets of manuscripts, such considerable discrepancies, that it becomes necessary to speak of two recensions in which it now exists. This remarkable fact was first made known by A. W. von Schlegel, who, in Europe, was the first who attempted a critical edition of this poem; it is now fully corroborated by a comparison that may be made between the printed editions of both texts. The one is more concise in its diction, and has less tendency than the other to that kind of descriptive enlargement of facts and sentiments which characterizes the later poetry of India; it often also exhibits grammatical forms and peculiarities of an archaic stamp, where the other studiously avoids that which must have appeared to its editors in the light of a grammatical difficulty. In short, there can be little doubt that the former is the older and more genuine, and the latter the more recent, and in some respect, more spurious text. A complete edition of the older text, with two commentaries, was published at Madras in 1856 (in the Telugu characters, vol. i.—iii.); another edition of the same text, with a short commentary, appeared at Calcutta in two vols. (1860), and a more careful and elegant one at Bombay (1861).

Of the later edition, Signor Gaspare Gorresio has edited the first six books (vol. i.—v., Paris 1843—1850) without a commentary, but with an Italian, somewhat free, translation in poetical prose (vol. vi.—x., Paris, 1847—1858). Former attempts at an edition and translation of the R. remained unfortunately incomplete. The earliest was that made by William Carey and Joshua Marshman, who edited the first two books, and added to the text a prose translation in English and explanatory notes (vol. i.—iii., Serampore, 1806—1810; and vol. i., containing the first book, Dunstable, 1808). Another edition, of an eclectic nature, is that by A. W. von Schlegel; it contains the first two books of the text, and an excellent Latin translation of the first book and twenty chapters of the second (vol. i., parts 1 and 2, and vol. ii., part 1, Bonn, 1846). Various episodes from the R., it may also be added, have at various times occupied sundry editors and translators.

RA'MBLA, a market-town in Spain, in the modern province of Cordova, and 23 m. south of the city of that name, stands on a hill in a district which produces abundantly grain, wine and oil. Some manufactures of coarse pottery, especially of porous water-coolers, are carried on. Pop. (1877) 6160.

RAMBOUILLET, CATHERINE, MARQUISE DE, one of the most accomplished and illustrious women of the 17th c., was born at Rome, of Italian parents, in 1588, and received a refined education under the superintendence of her mother, the Marchese di Pisani. At the age of 12 she was betrothed to a French nobleman, Charles d'Angennes, son of the Marquis de Rambouillet, who succeeded to the family estates and title on the death of his father in 1611. When the youthful marquis first appeared in the assemblies at the Louvre, she was shocked by the gross corruption of morals and manners that prevailed among the mob of courtiers, and almost immediately conceived the idea of forming a select circle for herself, which should meet at her own house—the famous Hôtel de Rambouillet. Madame de R. was admirably fitted for presiding at the reunions which have made her name famous in the literary history of France. Handsome and gracious, but free from coquetry and all personal pretensions, her affability, generosity, and steadfast attachment to her friends, made her an object almost of worship to those who enjoyed her society. The writers of that epoch are unanimous in the expression of their homage. The characteristic feature of the Rambouillet circle was the intercourse, on terms of equality, of the aristocracy of rank and the aristocracy of genius. *There*, for the first time, do we meet with a generous and adequate recognition of the dignity of letters. For fifty years the *salons* of the marquise were hospitably open to the wits, critics, scholars, and poets of Paris, beginning with Malherbe and Racan, followed by that distinguished circle of *beaux esprits* who contributed so much to the formation of the French language and taste—Costar, Sarrazin, Conrart, Patru, Balzac, Segrais, Godeau, Voiture, and Corneille; and closing with the generation who filled up the interregnum from Corneille to Molière. Scarron, Saint-Evremond, Benserade, the Duc de Larochefoucauld, &c.

Many of the literary débuts of celebrated geniuses were made at the Hôtel de Rambouillet. Here Corneille read his first piece, *Mélite*, and Armand du Plessis, afterwards Cardinal Richelieu, sustained a *Thèse d'Amour*, and Boileau preached one of his earliest sermons. But the Hôtel was almost as much renowned for the brilliant and accomplished women who frequented it, as for its crowd of professional littérateurs. The names of Mademoiselle de Scudéry, of Mademoiselle Coligny—afterwards Comtesse de la Suze—and of the Marquise de Sablé, who inspired the

Maximes of Larochefoucauld, are among the most distinguished of their time and country; but above them all, as conspicuous by her splendid beauty as by her faultless grace of manner, the center and idol of both sexes, shone the sister of the great Condé, and the heroine of the Fronde—the Duchesse de Longueville. The combined influence of so many different sorts of *esprit* exercised a profound and lasting influence on the literature and society of the 17th c., and is considered—rightly, as we think—to have developed quite a new art—that of lively, polished conversation, in which France has ever since taken the lead, and has thus placed itself socially in the front of European civilization. It has been customary to say that the *Précieuses Ridicules* of Molière was aimed at the foibles of the Rambouillet coterie. But this notion has been shown to be entirely groundless. The *Précieuses Ridicules* was actually first performed at the Hôtel, and Molière, in the preface to his *Femmes Savantes*, protests against the supposition that he meant to reflect on a circle which he affirmed had every claim to respect. It appears from investigation, that grotesque imitations of the manners and style of the Hôtel, had, in the course of years, become prevalent both in Paris and the provinces, and that it was these, and not their charming prototype, which were exposed to the satire of Molière. Madame de R. died at Paris, 2d December, 1665.—See Röderer's *Mémoire pour servir à l'Histoire de la Société polie en France pendant le dix-septième Siècle;* and Victor Cousin's *Jeunesse de Mde. de Longueville, Mde. de Sablé, &c.*

RAMEAU, JEAN PHILIPPE, an eminent French musician, born at Dijon, in 1683, and son of the organist of the Sainte Chapelle there. He showed a genius for music almost from infancy, and with a view of devoting himself to it as a profession, set out for Italy at the age of 18, but proceeded no further than Milan. After traveling through France, and acquiring a considerable reputation as a performer on the organ, he was appointed organist of the cathedral of Clermont, in Auvergne, and wrote while there his *Traité de l'Harmonie*, a work of some note in musical literature, which was published in Paris in 1722. Removing to Paris, he became organist of Sainte Croix de la Bretonnerie, and published various other treatises connected with the theory of music. In 1733, at the mature age of 50, he produced his first opera, *Hippolyte et Aricie*, the drama of which was written by the Abbé Pellegrin. It created a great sensation, and R. was forthwith elevated to the position of a rival to Lulli as an opera composer, musicians being divided in their partisanship of the two artists. R.'s best opera was *Castor et Pollux*, produced at the Académie Royale de Musique, in 1737; it contains one chorus which has hardly been surpassed in the whole range of theatrical music. Between 1733 and 1760, he composed 21 operas and ballets, as well as numerous harpsichord pieces. His works on harmony acquired for him a deservedly high reputation as a musical theorist; he has been called the Newton of musical science. Louis XV. created for him the office of Cabinet Composer, granted him letters of nobility, and named him a Chevalier de St. Michel. R. died in1764.

RAMESSES, RAMESES, or RAMSES, the name of several Egyptian monarchs, some of whom were known to the Greek and Roman writers and the chronologists; the name signifies 'born of the sun' or the 'nascent sun.' The R. family is supposed to have been of Theban origin, and to have been descended from one of the later queens of the 18th dynasty. The exploits of R. are confounded by the Greek and Roman authors with those of Sesostris (see SESOSTRIS), and mingled in the legend of Armais, the Danaus of the Greeks. R. is said to have had a great army and navy, and at the head of a force of 700,000 men, to have conquered Ethiopia, Libya, Persia, and other eastern nations. Before leaving his kingdom for these distant expeditions, he is said to have appointed his brother Armais or Danaus regent of the kingdom, charging him neither to assume the diadem, nor interfere with the royal harem. R. then proceeded to conquer Cyprus, Phœnicia, the Assyrians and Medes, Armais contravened his orders; and R., informed of this by the high priest, suddenly returned to Pelusium, and resumed the kingdom, expelling his brother, who, fleeing with his daughters, the Danaids, to Argos, established himself in Greece. According to the Roman authors, however, Troy was taken in the reign of Rameses. The walls of the temples of Thebes were said to be covered with inscriptions and scenes recording his conquests and the tributes rendered to him, and these were interpreted to Germanicus by the priests on his visit to Egypt. Such is the account given of a monarch called R. by the classical authors. The following are the principal princes and monarchs of this name, found on the monuments of Egypt.

1. A prince or king represented with the royal families of the 18th dynasty in a sepulchre at Thebes.—2. R. I. chief of the 19th dynasty, who reigned but a short time, and whose name is found on the monuments of Thebes and the Wady Halfa.—3. R. II., or Great, who mounted the throne at a very early age, conquered the Khita or Hittites, and other confederate nations of Central Asia, in his 7th year, and concluded an extraditionary treaty with the Khita in his 21st year. Other nations, European and African, fell under his sway, and his empire extended far south in Nubia, the ancient Ethiopia, which he governed by viceroys. He erected fortresses and temples in foreign lands, and embellished all Egypt with his edifices. He had two wives, twenty-three sons, and seven daughters, and was finally buried in the Biban-El-Melook He is the supposed Sesostris, according to most authors. He reigned 68 years.—4. R. III., chief of the 20th dynasty, the Rhampsinitus of Herodotus, called Meriamoun, or beloved of Ammon, who defeated the Philistines the Mashuash, and the Libyans, carrying on important wars from the 5th to the 12th year of his reign; he also made conquests in the 16th, and seems to have reigned 55 more years. He founded the magnificent pile of edifices of Medinat Habu, embellished Luxor, Gurnah, and other parts of Egypt. Some attribute to him the exploits of the R. of the Greek and Roman writers.—5. R. IV. reigned a short time, and performed no distinguished actions.—6. R. V., of whom inscriptions are found at Silsilis.—7. R. VI., whose tomb at the Biban-El-Meluk contains some astronomical records from which the date of his reign has been calculated at 1240 B.C.—8—12. R. VII., VIII., IX., X., and XI., undistinguished monarchs.—13. R. XII., who reigned above 33 years, in whose reign the statue of the god of Chons was sent from Egypt to the land of the Bakhten, to cure a princess of the royal family of that court, with which R. had contracted an alliance.—14. R. XIII., an unimportant monarch.

RAMESES is also the name of one of the fortresses or treasure-cities built by the Hebrews during their residence in Egypt. The name of this fortress, all important for the date of the Exodus—placed 1491 B.C. by the old chronologers, and 1314 B.C. by Lepsius—is found in the papyri of the British Museum in documents of the age of Meneptah, while R. III. is represented at Medinat Habu in one of his campaigns marching out of the Magdol of Rameses. The situation of Rameses has much puzzled geographers and commentators, and it has been supposed to be Abaris, Baal-Zephon, Heroonpolis, Pelusium, and Abu-Kescheh. Notwithstanding the opposition to dating Fort Rameses in the period of the 19th dynasty, it is now generally admitted to have been constructed at that period. In fact, no fort was ever named by the appellation of a prince, it being the prerogative of the monarch to have the fortress named after him. The evident solution of the difficulty is, that the exodus of the Hebrews took place under a king Rameses, at whatever chronological period his reign may have happened.—A remarkable discovery of royal mummies, papyri, and other relics was made in a pit near Thebes in 1881. Amongst the mummies were those of Rameses I. and Rameses II., which had probably been removed and concealed here on occasion of some hostile invasion.

RAMIE, an East Indian name, often used, for the BŒHMERIA (q. v.) NIVEA.

RAMILLIES, a small village of Brabant, Belgium, 28 miles S.E. of Brussels, is memorable as the place near which one of the most important battles of the War of the Spanish Succession was fought, May 23, 1706. In this conflict, the French forces were under the command of Marshal Villeroy and the Elector of Bavaria, while Marlborough led the troops of the Allies. Villeroy, after a battle of three hours and a half, was defeated, with the loss of almost all his cannon, the whole of his baggage, and 13,000 men in killed and wounded. The great result of this victory was that the French were compelled to give up the whole of the Spanish Netherlands.

RA'MMELSBERG, one of the Harz Mountains, rather less than 2200 feet high, and celebrated for its mines, which yield gold, silver, lead, zinc, copper, sulphur, vitriol, and alum. They have been worked, according to tradition, from the year 968; and their possession was for ages a source of strife between the inhabitants of Goslar (q. v.) and the Dukes of Brunswick.

RAMMOHUN ROY, a celebrated Hindu rajah, was born at Bordnan, in the province of Bengal, between 1774 and 1780. In a sketch of his own life, written in 1832, he states that his ancestors were Brahmans of a high order. At home, he acquired the usual elements of native education, with some knowledge of the Persian language. At Patna, and afterwards at Benares, he studied Sanscrit, and the works written in it, which contain the spirit of Hindu law, literature, and religion. At a very early age, he began to compare the evidence for and against the various religious doctrines held by those around him; nor did he except from this investigation those doctrines in belief of which he himself had been brought up. Finding them all repugnant to his vigorous understanding, he boldly acknowledged this fact both to himself and to the world. The result was a quarrel with his father, his family, and his community. He appears, indeed, to have succeeded in converting the understanding of his mother; but it, in its turn, was overcome by her sentiment. 'You are right,' she said to him, when she was about to set out on a pilgrimage to Juggernaut; 'but I am a woman, and cannot give up

observances which are a comfort to me.' R. R. spent two or three years of his youth in Tibet, where he excited general anger by denying that the Lama was the creator and preserver of the world.

For a long time, he had a strong, and, perhaps, not unfounded dislike to the English; but becoming convinced that their sway was, on the whole, beneficial to India, his views changed, and he applied himself to the study of the English language. For five years, he held the office of Revenue Collector in the district of Rungpoor. In 1803, his father died, but left him no part of his estate. In 1811, however, by the death of his brother, he succeeded to affluence. 'After my father's death,' he says, 'I opposed the advocates of idolatry with still greater boldness.' He published various works in Persian, Arabic, and Sanscrit; the object of the whole being the uprooting of Idolatry. He also issued in English an abridgment of a work called the *Vedant*, giving a digest of the Vedas, the ancient sacred books of the Hindus. Becoming more convinced, as he grew older, of the excellence of the moral theories of Christianity, in 1820 he published *The Precepts of Jesus, the Guide to Peace and Happiness*. It appears from this work, that while he believed in the morality preached by Christ, he not believe in the divinity of the preacher. He rejected the miracles also, and other portions of the gospel held to be fundamental in the various churches of Christendom. The book, therefore, as was to have been expected, met with severe ecclesiastical censure, the grounds of censure being various and conflicting. In April 1831, the rajah visited England. The great question of parliamentary reform was then agitating the country. Of the Reform Bill he wrote, that it 'would, in its consequences, promote the welfare of England and her dependencies; nay, of the whole world.' His society was universally courted in England. He was oppressed with invitations to attend social parties, and political and ecclesiastical meetings. His anxiety to see everything and to please all, led him to overtask himself to such an extent that his health, long failing, at last quite broke down. He died at Bristol, September 27, 1833. The adverse circumstances of his birth were such as might easily have enslaved even his powerful understanding, or still more easily, might have perverted it to selfish ends; but he won his high position by an inflexible honesty of purpose and energy of will.—See Sketch of his Life, written by himself, in the *Athenæum*, No. 310, October 5, 1833; also *Chambers's Edinburgh Journal*, August 2, 1834.

RAMNA'D, a town of British India, in the district of Madura, presidency of Madras, 125 miles north-east from Cape Comorin, and about five or six miles from the shore of Palk's Bay. In the center of the fort is the palace or residence of the zemindar, one of the greatest of his class in the south of India, his extensive possessions containing more than 2000 villages, and nearly 300,000 inhabitants. Pop. about 13,000, of whom 6000 dwell within the fort.

RAMNEGHA'R, or RAMNUGGUR (Town of God), formerly called RASULNUGGUR, a walled town of the Punjab, beautifully situated in an extensive plain on the left bank of the Chenab, 65 miles north-north-west of Lahore. There is here a ferry across the river, which is 300 yards wide, and 9 feet deep; but two miles lower there is a ford, at which the depth is only 3 feet, when the water is at its lowest. The town is surrounded by walls, and contains eight well-supplied bazaars. Pop. stated at 11,000.

RAMNEGHAR, or RAMNUGGUR, a town of British India, N.-W. Provinces, in the district of Benares, and four miles south of the city of that name, on the right bank of the Ganges. Its fort, the residence of the rajah, rises from the banks of the sacred stream by a number of fine ghats or flights of stairs. Pop. (1872) 11,953.

RAMP, a sudden upward curve in the hand-rail of a stair.

RAMP, in Fortification, is a gradual slope by which approach is had from the level of the town or interior area to the terreplein or general level of the fortifications behind the parapet.

RA'MPANT (Fr. literally, 'raging'), in Heraldry, an epithet



Rampant.

applied to a lion or other beast of prey when placed erect on the two hind-legs, with only one of the fore-legs elevated, the head being seen in profile. When the face is turned towards the spectator, the attitude is called *rampant gardant*, and when the head is turned backwards, *rampant regardant*. A lion *counter-rampant* is one rampant towards the sinister, instead of towards the dexter, the usual attitude. Two lions rampant contrary-ways in saltier, are sometimes also said to be counter-rampant.

RA'MPART, forms the substratum of every permanent fortification. See FORTIFICATION. It constitutes the enceinte, and is constructed immediately within the main ditch by throwing up the soil excavated from it. On the front of the rampart, the parapet is raised, and width should be left behind it to allow of guns, wagons, and troops passing freely on the top of the rampart. The height of the rampart is dependent on the relief (height) of the buildings to be defended, and on the positions in the neighborhood which an enemy might assume.

RAMPHA'STIDÆ. See TOUCAN.

RAMPION (*Campanula rapunculus;* see CAMPANULA), a perennial plant, a native of Europe, rare in England, with a stem about two feet high, and a panicle of very pretty pale-blue bell-shaped flowers. The radical leaves are ovato-lanceolate and



Rampion.

waved. The root is white and spindle-shaped, and was formerly much used for the table, under the name of *Rampion* or *Ramps*. The plant is now little cultivated in Britain, but is still commonly cultivated in France for the sake of its roots, which are used either boiled or as a salad, and of its young leaves, which are also used as a salad.

RAMSAY, ALLAN, an eminent Scottish poet, was born in the parish of Crawford, Lanarkshire, October 15, 1686. His father was manager of Lord Hopetoun's mines at Leadhills, and his mother, Alice Bower, was the daughter of a Derbyshire miner. To this maternal descent, we may perhaps trace Allan's peculiar frankness and gaiety of temperament. In his 15th year (by which time he had lost both of his parents), he was put apprentice to a wigmaker in Edinburgh. He had received the ordinary education of a parish school, and could read Horace, as he says, 'faintly in the original.' Up to his 30th year he continued to follow the occupation of a wigmaker; and by this time, he had become known as a poet, having issued several short humorous pieces, printed as broadsides, and sold for a penny each. He had also written (1716—1718) two additional cantos to the old Scots poem of *Christ's Kirk on the Green*, attributed to James I. These two cantos gave such genuine pictures of rustic life, and presented such felicitous scenes of broad humor, that it was obvious their author was destined to become the restorer of Scottish poetry. Patronized by the highest and worthiest of the land, R. now abandoned wigmaking, and commenced business as a bookseller. His shop was opposite 'Niddry's Wynd,' and he placed a sign of Mercury over his door. Subsequently, as his success increased, he removed to the Luckenbooths, and deposing Mercury, set up heads of Drummond and Ben Jonson. He also added to his business a circulating library, the first established in Scotland. From 1718, when he opened shop as a bookseller, down to 1755, when he retired to a villa of his own erection, R.'s career, worldly and literary, was eminently prosperous. He was careful and industrious, determined, he said, to show the world that *poortith*, or poverty, was not 'the poet's lot;' and though he was always courting patronage, he never selected a fool for his patron, nor did his pride and vanity as a poet ever withdraw him from business.

The following are his principal works: *Tartana, or the Plaid*, 1721; a collected edition of his *Poems*, published by subscription in 1721, by which it is said the poet realized 400 guineas; *Fables and Tales*, 1722; *Fair Assembly*, 1723; *Health, a Poem*, 1724; *The Tea-table Miscellany*, a collection of the most choice songs, Scottish and English, 1724, to which a second volume was published in 1725, a third in 1727, and a fourth in 1740; *The Evergreen*, 'being a collection of Scots Poems wrote by the Ingenious before 1600,' published in 1724; *The Gentle Shepherd, a Pastoral Comedy*, 1725,

to which songs were added in 1728; a second collection of *Poems* published by subscription, 1728; *Thirty Fables*, 1730. Of most of these publications, numerous editions were called for, no less than nine of the *Tea-table Miscellany* being issued in nine years. One brief cloud overcast the poet's successful career. He entered into a speculation for the encouragement of the drama, and built a theater in Edinburgh, which was almost immediately shut up by the magistrates, in virtue of the act passed in 1737 prohibiting all dramatic exhibitions without special license. This affair was a serious loss to the poet, and subjected him to the annoyance of attacks from poetasters and morose religionists, such as 'A Looking-glass for Allan Ramsay,' 'The Dying Words of Allan Ramsay,' 'The Flight of Religious Piety from Scotland upon the account of Ramsay's Lewd Books and the hell-bred Playhouse Comedians,' &c. Allan bore all with Horatian philosophy and indifference; but he addressed a poetical epistle to his friend, Duncan Forbes of Culloden, then Lord Advocate, claiming compensation for his losses, or, at least, that he might be 'edged into some canny post.' This request does not seem to have been complied with, but Allan had amassed a decent competency. The last two or three years of his life were spent in cheerful retirement in the quaint but picturesque house he had built on the north side of the Castle Hill, and there he died on the 7th of January 1758. He had the gratification of seeing his only surviving son, ALLAN RAMSAY (born in 1713, died in 1784), fast rising into distinction as a portrait-painter, and esteemed by the most eminent men of his day as an accomplished scholar and gentleman.

This second Allan Ramsay had been carefully educated by his father, and sent to Rome to study art. On his return, being introduced to the Prince of Wales, afterwards George III. he rapidly rose into favor; and in 1767 was appointed principal painter to the king.

The *Gentle Shepherd* of R. is his greatest work, and, indeed, is esteemed as the best pastoral in any language. Its characters are realities not shadowy Corydons or Phyllises, maundering over crooks, or sleeping to the murmur of bees. It contains faithful transcripts of actual life and feeling, such as the poet had witnessed in his youth on the banks of the Clyde and Glengonar. The poetry, too, abounds in graphic expression and touches of homely nature and arch humor, that to Scotsmen are irresistible, while the plot is skilfully constructed, and brings out rustic character, customs, and superstitions. Some of R.'s tales and fables are amusing, but coarse. His songs also are occasionally defective in respect of simplicity and delicacy, though he has made some exquisite additions to our lyrical poetry. In his Jacobite allegory, *The Vision*, he rises into the higher region of inspiration, apparently imitating and certainly rivalling Dunbar. As an editor, he has been censured for tampering with the works of the old bards, retouching, adding, or retrenching at his pleasure. But he also rescued many choice productions of the elder muse from neglect, and awakened in Scotland a taste for its native literature. A complete edition of his poems with a biography was published by Chalmers (1800; new ed. 1874); a fine edition, with the music of the songs, and engravings by David Allan, in 1879. A monument to R. was erected in Edinburgh in 1865.

RAMSDEN, JESSE, a celebrated instrument-maker, was born at Salterhebble, near Halifax, Yorkshire, in 1735. He received a good education, and, after being engaged as a cloth-worker, and become (1762) a working engraver and divider in London, and having married Dollond's (q. v.) daughter, received, as her dowry, a share in his father-in-law's patent for achromatic telescopes. The sextants of his time were very imperfect, being untrustworthy within 5′ of a degree, and R. succeeded in reducing the possible error to within 30″. His skill thus shown, and the cheapness of his instruments (two-thirds of the price charged by other makers), soon created such a demand as tasked his utmost energy to meet. To increase the amount and improve the quality of the work done by his men, he introduced the principle of the division of labor, besides inventing a dividing-machine, which could graduate instruments much more rapidly and accurately than could be done by hand. For this invention, he received from the Board of Longitude a premium of £615. He constructed the theodolite used by General Roy (q. v.), and also telescopes for the observations of Bienheim, Mannheim, Dublin, Paris, and Gotha, and mural quadrants for those of Padua and Vilna, the accuracy of all of which was a matter of admiration and delight among astronomers. He was one of those who strongly recommended the introduction of the mural circle in place of the Quadrant (q. v.), and he constructed two of the former instruments for the observatories of Palermo and Dublin. The minor scientific instruments invented or improved by him are also numerous. He died at Brighton, 5th November 1800, leaving a moderate fortune, a large portion of which was, in accordance with the terms of his will, divided among his workmen. R. was a member of the Royal Society, a Fellow of the Imperial Academy of St. Petersburg, and the possessor of a Copley medal (the gift of the Royal Society).

RA'MSEY, a town in the Isle of Man, lying 16 miles north of Douglas, and which, from the beauty of its situation and the salubrity of its climate, is rapidly becoming a favorite resort of tourists and pleasure seekers. It stands on the margin of a spacious bay, and has a background of lofty and well-wooded hills. The anchorage in the bay is good, and the waters abound in mackerel, herrings, salmon, and other fish. An extensive shipbuilding yard has recently been opened here, which gives occupation to about 300 men. A public promenade and inclosure on the foreshore have been made; and extensive harbor-works erected. Steam-packets run regularly from R. to Liverpool and to Whitehaven, and the town is connected with Douglas by railway. Pop. (1871) 3934.

RA'MSGATE (*Rium's* Gate; *Rium* is the British name of Thanet), a seaport and watering-place in the south-east of the Isle of Thanet, 97 miles east-south-east of London by railway. Anciently, it was a small fishing-village; but it began to increase in importance about the beginning of the 18th c., when a number of its inhabitants opened up a successful trade with 'Russia and the east country.' The recently-built portion of the town consists of well-arranged streets, crescents, and terraces; and the older part is situated in a natural depression or cutting in the chalk-coast, opening out toward the sea, and called in this district a 'gate' or 'stair.' R., as a watering-place, is slightly more aristocratic than Margate (q. v.); and during the season, which lasts from the middle of summer to the end of autumn the charges are very high. At the height of the season, the population of R. is increased to above 20,000. The climate is much more bracing than that of the southern coast, and exercises a salutary influence in cases of scorbutic disorder.

The harbor of R.—40 acres in extent, and enclosed on the east by a splendid pier 3000 feet in length, and on the west by another pier 1500 feet long—serves as a harbor of refuge for the Downs. About 1½ miles west of R. is Osengall Hill, on which a number of Saxon and several Roman graves have been recently discovered, and a large number of most interesting relics, as spear-heads, coins, ornaments in silver, &c., armor, glass and amber beads, &c., found. (See Wright's *Wanderings of an Antiquary*.) Shipbuilding and rope-making are here carried on, and coal is imported. In 1880, 875 vessels, of 112,216 tons, entered the port. Pop. (1871) 14,640; (1881) 22,605.

RAMSHORNS, in Fortification, are semicircular works of low profile in the ditch, which they sweep, being themselves commanded by the main works. They were invented by M. Belidor, a great French engineer, and when used, take the place of *Tenailles* (q. v.).

RA'MSKIN, a species of cake, which consists of grated cheese of some dry kind, such as Parmesan or the white hard English varieties, incorporated with dough as prepared for fine puff-pastry; then rolled out, and cut into shapes, glazed with white of egg, and baked for a quarter of an hour. It is usually eaten hot. This dish is said to have been invented at Croxteth Hall, the seat of Lord Sefton, whence it is sometimes called 'Sefton fancy.'

RAM-TIL (*Guizotia oleifera*), a plant of the natural order *Compositæ*, suborder *Corymbiferæ*, a native of the East Indies and Abyssinia, much esteemed for the bland oil which is obtained from the seeds, and which is employed for the same purposes as olive oil. The R. is extensively cultivated in India, chiefly in Mysore, and to some extent also in Abyssinia.

RAMUS (Latinized form of *La Ramée*), PIERRE, an illustrious French 'humanist,' was the son of a poor laborer, and was born at the village of Cuth, in Vermandois, in 1515. His thirst for knowledge was so great, that twice before he had reached his 12th year, he traveled on foot to Paris, with the hope of getting into some school there, but the misery of want twice drove the brave boy home again. In his 12th year, however, he got a situation as servant to a rich scholar at the Collége de Navarre; and by devoting the day to his master, obtained the night for study, and made rapid progress. The method of teaching philosophy then prevalent dissatisfied him, and he was gradually led to place a higher value on 'reason' than on 'authority,' contrary to the mental habit of his time. His contempt, indeed, for 'authority' blinded him (as is often the case with a young reformer) to what truth 'authority' might contain, and when taking his degree of M.A., in his 21st year, he maintained the extravagant thesis, that 'all that Aristotle had said was false' *quæcunque ab Aristotele dicta essent, commentitia esse*). It says a great deal for the ability he showed on this occasion, that his judges, although themselves Aristotelians, were compelled to applaud him. Immediately after, R. became a teacher in the Collége du Mans, and along with two learned friends opened a special class for reading the Greek and Latin authors, designed to combine the study of eloquence with that of philosophy. His audience was large, and his success as a

teacher remarkable. He now turned his attention more particularly to the science of logic, which, in his usual adventurous spirit, he undertook to 'reform;' and no one acquainted with his system, will deny that many of his innovations were both rational and beneficial. His attempts excited much hostility among the Aristotelians, and when his treatise on the subject (*Dialecticæ Partitiones*) appeared in 1543, it was fiercely assailed by the doctors of the Sorbonne, who managed to get it suppressed by a royal edict, and even barbarously demanded that its author should be sent to the galleys. But R. had (at this time) two powerful friends, Cardinals Charles de Bourbon and Charles de Lorraine, who protected him from personal injury, and through whose influence he was, in 1545, appointed principal of the Collége de Presles, which he raised from a condition of decay to the most splendid prosperity.

In 1551, Cardinal Lorraine succeeded in instituting for him a chair of Eloquence and Philosophy at the Collége Royal; and his inaugural address (*Pro Philosophica Disciplina*, Par. 1551) is reckoned a masterpiece of the kind. He devoted the first eight years of his teaching to the first three of the 'liberal arts' (Grammar, Rhetoric, and Logic), which he called elementary or exoteric, and published three grammars successively, Greek, Latin, and French. He also mingled largely in the literary and scholastic disputes of the time, and on account of his bustling activity, came under the satire of Rabelais. But though R. had innumerable adversaries, he might have defied them all, so great was his influence at court, had his love of 'reformation' not displayed itself in 'religion' as well as in logic. In an evil hour (for his own comfort), he embraced Protestantism. He had long been suspected of a leaning that way, and, as we have seen, his intellect was by nature scornfully rebellious towards the *ipse dixit* of 'authority;' but he had for years decently conformed to the practices of the Catholic cult, and it was only after Cardinal Lorraine, in reply to the Conference of Poissy (1561), frankly admitted the abuses of the church and the vices of the clergy, that he ventured formally to abjure the older faith. The outbreak of the religious wars in France plunged him into the dangers of the time, and he finally perished in the fatal massacre of St. Bartholomew, August 1572. It is believed that he was assassinated at the instigation of one of his most violent and persistent enemies, Charpentier, Rector of the Collége de Presles.

R. holds a most honorable place in the list of intellectual reformers. His assault on scholasticism as a *method of thinking* is vigorous, and, on the whole, well directed; his exposure of its puerile and useless subtleties is thorough, and entirely in accordance with later criticism. In his contempt for the illiterate worship of Aristotle, in his admiration for Plato and of the ancient orators and historians, he ranks (though late) with the scholars of the Renaissance; but in his assertion of 'reason' as the supreme criterion of truth, he must be regarded as the forerunner of Descartes and the modern world. His system of logic, by which perhaps his name is best known, is marked by its lucid definitions, its natural divisions, and its simplification of the rules of the syllogism; but (like every pre-Baconian system) it fails to realize the supreme importance of the inductive method. What strikes one most, however, in R. is not so much his particular achievements, as his universal intellectual activity. He was the first mathematician of his age in France, and wrote treatises on arithmetic, geometry, and algebra, which were text-books for a hundred years; he was among the earliest adherents of the 'Copernican' system of astronomy, and in natural philosophy avowed himself an enemy to hypotheses and abstractions; rhetoric, morals, theology, all engaged his pen, and he seldom handled a subject which he did not to some degree elucidate. His followers were a widespread, and for long a powerful body of thinkers and teachers. France, England, the Low Countries, Germany, Switzerland, Denmark, and even Spain, had their *Ramists*, as they were called, and they have disappeared chiefly because their tendencies are embraced in the broader and more critical methods of modern scientific inquiry. A list of his writings is given in the *Nouvelle Biographie Universelle*, article 'Ramus.' —See Waddington's *Ramus, sa Vie, ses Ecrits, et ses Opinions* (Paris, 1855); E. Saisset's *Les Précurseurs de Descartes* (Paris, 1862); and C. Desmaze's *P. Ramus, Professor au Collége de France, sa Vie, ses Ecrits, sa Mort* (Paris, 1864).

RA'NA and RA'NIDAE. See FROG.

RANCÉ, ARMAND JEAN LE BOUTHELIER DE, the well-known founder of the reformed order of La Trappe (see TRAPPISTS), was born January 9, 1626, at Paris, where he was educated. Having taken his degree in the Sorbonne with great applause, and embraced the ecclesiastical profession, he soon became distinguished as a preacher, and through the favor of Cardinal Richelieu, obtained more than one valuable benefice. He succeeded, while yet a young man, to a large fortune, and for a time, notwithstanding his clerical character, was carried away by the gaiety and dissipation of Parisian life. After a time, however, having forfeited the favor of Cardinal Mazarin, and being deeply moved by the death of a lady, the Duchess de Montazon, to whom he was much attached, he withdrew from Paris, and after a time resolved to sell all his property, to distribute the proceeds among the poor, and to devote himself exclusively to the practice of piety and penitential works. Finally, he resigned all his preferments (of which, by the abusive practice of the period, he held several simultaneously), with the exception of the abbacy of La Trappe, to which convent he retired in 1662, with the intention of restoring the strict discipline of the order. The history of the reforms which he affected will be found under the head TRAPPIST. He lived in this seclusion for 33 years, during which he published a large number of works, chiefly ascetical. The only remarkable event of his literary life was his controversy with Mabillon, in reply to his *Etudes Monastiques*, on the subject of the studies proper for the monastic life. R.'s work is in 4to, 1692. In his youth, he had edited *Anacreon*, in one volume octavo (Paris, 1639), with a dedication to Cardinal Richelieu. He died October 27, 1700.

RANCHE'ROS (from the Spanish *rancho*, comradeship) is the name given in Mexico to a mixed breed of Spanish and Indian blood, who inhabit the country, and may almost be said to live in the saddle from their youth, are splendid riders and hunters, and form the bravest part of the Mexican army—its irregular cavalry. The importance of their services was seen in the wars with the United States. The R. are lank in frame, with brown weather-stained faces and muscular limbs, hardy, temperate, and always ready for the boldest enterprises. They practice polygamy.

RANCI'DITY. See OILS AND FATS.

RANDA'ZZO, a town of Sicily, in the province of Catania, at the base of Mount Etna, and eight miles north-by-west from its summit, on the Cantara. It crowns the summit of a low cliff of lava, and ascends the slope above, with brown battlemented walls and Norman towers, so medieval in its whole appearance, that it has been likened to 'a town of the middle ages preserved as a curiosity.' R. is believed to have been founded by the Lombard adventurers who assisted Count Roger in his conquest of Sicily. Pop. (1871) 7945.

RA'NDERS, a town in Jutland, chief town of the *Amt* or bailiwick of the same name, is situated on the Guden, at its entrance into the Randers-Fiorde, 20 miles from the mouth of the latter in the Cattegat. Though still fortified, it has much declined from its early *prestige* and importance. Brewing, distilling, and the manufacture of gloves, which are in high repute, and of stockings and cloth, are carried on. Pop. (1870) 11,354; (1880) 13,457.

RANDOLPH, JOHN, OF ROANOKE, an American statesman, was born at Cawsons in Chesterfield County, Virginia, June 2, 1773. He was descended from an ancient and wealthy family, and boasted that the Indian princess Pocahontas was one of his ancestors. Educated at Princeton and Columbia Colleges, he embraced the profession of the law, and in 1799 was elected to Congress, where he became distinguished for his eloquence, wit, sarcasm, invective, and eccentricity, and for thirty years was more talked and written of than any American politician. Tall and meagre, peculiar in dress and manners, he was described as a strange mixture of the aristocrat and the Jacobin. He was the Democratic leader of the House of Representatives, but quarrelled with Jefferson, and opposed the war of 1812, and the Missouri Compromise, and stigmatized the Northern members who voted for it as 'Dough-faces.' In 1822 and 1824, he visited England where his eccentricities attracted much notice. In 1825, he was chosen United States' senator from Virginia, and in 1830 appointed Minister to Russia. By his will, he manumitted 318 slaves, and provided for their maintenance in a free state. He died in Philadelphia, June 24, 1833. See *Life of John Randolph*, by Garland (2 vols., New York, 1850).

RA'NELAGH, a village forming part of the suburb of Dublin, is situated two miles south from the center of the city. It consists of one principal street with a square, but is surrounded by villas. The pop. is about 3500.

RANGE, in Gunnery, is the distance between a point on the ground vertically below the muzzle of the piece and the point on the same level at which the projectile touches in its descent. The point-blank range is when the piece is fired in a horizontal position; the range then increases with the elevation; and if the air opposed no resistance, the greatest range would be attained with the piece elevated at an angle of 45°; but in practice this angle is found to be, on an average, a little over 30°. As the resistance of the atmosphere increases as the square of the velocity of the shot, being also in the direct ratio of its front section, while the momentum is as the velocity multiplied by the weight; it follows that a heavy shot should have a greater range than a light one; that of two shots of the same weight, an elongated cylinder of small diameter has a longer range than a spherical ball of greater diameter. On the other hand, from the rapid increase in a duplicate ratio of the resistance, as compared with the initial velocity, the

range only increases to a certain point, in consequence of a more rapid flight of the projectile. The longest range yet attained has been by Sir Joseph Whitworth with a 9-inch rifled gun, with which he sent a bolt a distance of 11,243 yards, or 6 miles 683 yards.

RANGOO'N, the principal seaport and chief town of Pegu (q. v.), is built on the left bank of the Rangoon River, the eastern branch of the Irrawaddi, at the distance of 26 miles from the sea, in lat. 16° 42′ N. and long. 96° 13′ E. R. was founded or rebuilt by the great Alompra in 1755. The British flag was first planted in the town, May 1824, when the Anglo-Indian troops took possession of it at the commencement of the first Burman war. The second Burman war began with the bombardment of R., April 11, 1852, and it was captured April 14, by the united forces of Bengal and Madras. At the close of the contest Pegu was annexed to British India, and R. became a part of the same territory. Pop. (1869) 87,553; of whom 1627 were Christians, 11,997 Mohammedans, 5998 Hindus, 62,054 Burmese, and 5887 others. Pop. (1872) 98,745. A great change has taken place in R. under the dominion of the British, and large sums have been expended on its improvement. Capital roads and streets now intersect every part of the town. The native town is of a very mean appearance, but many substantial buildings of brick or stone have been erected by the European inhabitants. R. possesses a government naval yard, and a patent slip for repairing ships.

R. is a stronghold of Buddhism, and on every side are seen gigantic monuments, that from age to age have been erected by the followers of Gau-ta-ma; pagodas, temples, images, wonderful in their vastness and grotesque splendor. Of these, the most notable is the famous *Shoay Dagon*, or Golden Dagon dagoba, or shrine, the foundation of which is said to have been laid 2300 years ago. It lies about two miles north of the town, on elevated ground, and the area on which it stands is 800 feet square. The dagoba itself is a stupendous mass of solid masonry, tapering gradually from an octagonal base of 1355 feet to a spire of small circumference, which is surmounted by the sacred *tee*, or umbrella of open iron-work. The whole building is one dazzling blaze of gold, and altogether forms a most magnificent object, its magnitude and massiveness being very remarkable. This celebrated monument derives its peculiar sanctity from being the depository, according to Burman tradition, of relics of the last four Buddhs—viz., the staff of Kan-tha-than, the water-dipper of Gau-na-gon, a garment of Ka-tha-pa, and eight hairs from the head of Gau-ta-ma. The shrine is surrounded by numerous temples, containing colossal images of Gau-ta-ma, richly gilt, and sitting in solemn conclave, cross-legged, like so many tailors at a Quaker's meeting.

R., possessing a continuous water-communication with the upper provinces and the Burman kingdom, is very favorably situated for internal as well as for foreign commerce. There are 5 lighthouses on the Burmese coast to guide vessels to the port. Teak-timber and rice are the principal exports by sea, but they also include cotton, cutch, hides, ivory, jade, kerosine, petroleum, precious stones, shell lac, and tobacco. The imports by sea consist of betelnut, cotton twist, cotton piece goods, crockery, cutlery, hardware, silk and woollen piece goods, raw silk, spirituous liquors, and wines. The annual value of exports from R. amounts to above £2,500,000, and this sum is exceeded by the value of the imports. The town is fortified and garrisoned. An English newspaper is published here.

RANK.—*Army rank* is somewhat confusing from its varieties, and from the fact that the same officer may hold at once three different ranks. The first and only rank up to the grade of captain is *regimental* or *substantative* rank. Above this, officers may advance in two ways: first, up to the rank of lieutenant-colonel by substantative or regimental rank; second, up to colonel by obtaining rank in the army, generally called *brevet rank*, and above that by army rank through the several grades of general officers. In his regiment, the officer holds only his regimental rank, whatever his brevet rank may be; but among officers of the army generally he takes precedence according to his brevet rank. In describing an officer who has brevet rank, his regimental rank is placed first—as, Captain and Brevet-lieutenant-colonel Brown, which means that the officer named Brown, who holds rank in a regiment as captain, has for his services been promoted in the army to be lieutenant-colonel. Officers of the Foot-Guards have higher rank in the army. See FOOT-GUARDS. Another class of rank is relative rank, which attaches to certain offices. Thus, Captain Brown aforesaid, in addition to regimental rank as captain, and army rank as lieutenant-colonel, may possibly hold a staff appointment which confers on him the relative rank of colonel. *Local rank* is a common expedient for advancing comparatively junior officers to important duties, a higher rank than that properly held in the army being assigned to an individual within certain geographical limits, as in the East Indies, the Crimea, &. *Temporary rank* is similarly limited by time, and is conferred usually for the period during which some appointment is held, as the officer acting as Director of Ordnance ranks as major-general while so employed. *Honorary rank* carries neither duty nor emoluments; it is commonly given to the amount of one step to an officer who has served the time necessary for retirement; thus, a captain, after thirty years' service, may retire (on the pay of captain) with the honorary rank of major. Officers who have quitted the army are also allowed to retain as honorary the last rank they held.

Navy rank has no irregularities; it is plainly what it professes to be. The marines rank with corresponding grades in the army; and their and the army rank, as compared with the navy, will be shown under RELATIVE RANK (q. v.).

RANK AND FILE, the body of soldiers constituting the mass of the army, and including corporals, bombardiers, and privates. Rank and file means literally the lines of men from side to side, and from front to back—a rank being a row of men standing side by side, and a file of soldiers a line of men standing one behind another. The strength of a force is reckoned by its rank and file; the non-commissioned and commissioned officers forming the supernumerary ranks charged with the direction of the mass.

RANKÉ, LEOPOLD, one of the most distinguished modern historians of Germany, was born at Wiehe in Thuringia, 21st December 1795, and educated for a schoolmaster. In 1818, he was appointed Rector of the gymnasium at Frankfurt-on-the-Oder; and in 1824 published at Berlin his first work, *Geschichte der Roman. und German. Völkerschaften von* 1494—1535. It attracted considerable notice; and in the following year he was called to Berlin as Extraordinary Professor of History at the university, where his lectures soon began to be numerously attended. About this time, his attention was directed to the historical value of the reports sent home by the Venetian ambassadors at the different European courts during the 16th and 17th centuries, and the result of his studies and investigations among these was his *Fürsten und Völker von Südeuropa im* 16 *und* 17 *Jahrh.* (Berl. 1827), in which the affairs of Turkey and Spain are specially handled. Immediately after the publication of this work, he commenced a four years' tour through Europe, for the purpose of examining the archives of the different nations.

The fruit of his varied researches partly appeared in his *Serbische Revolution* (Berl. 1829), *Verschwörung gegen Venedig im J.* 1688 (Berl. 1831), and *Vorlesungen zur Geschichte der Ital. Poesie* (Berl. 1837); but a much greater and more valuable performance than any of these was *Die Röm. Päpste, ihre Kirche und ihr Staat im* 16. *und* 17. *Jahrh.* (3 vols., Berl. 1834—1836; 3d ed. Berl. 1844—1845), a work which, on account of its important conclusions regarding the character and policy of the papacy, many of which it may be said to have almost placed beyond controversy, was not only received with unbounded applause in Germany, but was translated again and again in Holland, England, France, and America, and may be regarded as one of the most widely-circulated and influential histories of modern times. It was followed up by his *Deutsche Geschichte im Zeitalter der Reformation* (6 vols. Berl. 1839—1847), considered in Germany his most finished and thorough production, and in the composition of which he was enabled to avail himself of many documents never before published or made use of. In a still higher degree than in his earlier writings, we find displayed here his skill in grouping events together in a vivid and intelligent manner, placing them before the eye of the reader in their whole significance, with all their causes, relations, and consequences. R.'s next effort, *Neun Bücher Preuss. Geschichten* (1847—1848), remodelled and re-issued in 1875 under the title *Genesis des Preussischen Staates*, may be regarded as continuing his history of Protestantism, and was worked up from the Prussian historical archives, opened to literature for the first time.

The stormy period of 1848 found him in the Frankfurt parliament; but he did not acquire any distinction in that arena of babbling and incompetent patriots, and soon betook himself again to more familiar and more valuable labors. His *Franz. Geschichte vornehmlich im* 16 *und* 17 *Jahrh.* (1852–57) is an admirable work, full of new information and enlightened views; and his *exposé* of the reign of Louis XIV. is put, even by French critics, on a level with that of Voltaire. Still later are his *Englische Geschichte vornehmlich im* 16 *und* 17 *Jahrh.* (1859–67, Eng. trans. 1875); *Die Deutschen Mächte und der Fürstenbund;* and his memoir of *Hardenberg* (1877). A collected ed. of his works was begun in 1874. R. became ordinary professor in 1834, and was ennobled in 1866. He has trained a numerous body of historical students.—R. has three brothers, FRIEDRICH HEINRICH RANKE (born 1797), KARL FRIEDRICH RANKE (born 1802), and ERNEST RANKE (born 1814), who have also risen to eminence as churchmen and scholars.

RANKING AND SALE is, in Scotch Law, an action whereby the land or heritable property of an insolvent person is sold, and the proceeds divided among the creditors. The main object is to sell the property in spite of the debtor, and have the proceeds

distributed among the creditors, for which purpose it is necessary to arrange or rank the creditors according to their respective legal priorities. The sale takes place in the Parliament House at Edinburgh, one of the macers acting as auctioneer. If no offerers appear, the sale is adjourned, and the upset price is lowered.

RANKNESS, an excessive luxuriance of growth in vegetables, a condition as unfavorable as its extreme opposite to their health and to the productiveness of crops. It is often caused by injudicious manuring, and is most frequent in moist seasons. The decay of mushrooms in pastures, as in Fairy Rings (q. v.), sometimes produces a rankness of grass which causes all animals to refuse it; such herbage abounding to an unusual degree in Chlorophyll (q. v.), but being very deficient in those qualities which render herbage most palatable and nutritious to cattle. Rankness in grain-crops is attended with a diminished production of grain, the flowers often proving abortive, and with a much increased liability to the attacks of parasitic fungi. In fruit-trees, it displays itself, even when the soil is only a little too rich, in a tendency to the production of shoots and foliage, instead of blossoms and fruit, and is to be counteracted by withholding manure, by root-pruning, or by cutting away portions of the bark. In wall-trees, deep cuts may even be made into the wood, although in standards this would involve a danger of destruction by the next storm.

RA'NNOCH, Moor and Loch. The Moor, in the north-west extremity of Perthshire, with a mean elevation of about 1000 feet above the sea-level, is a wild waste, 28 miles long and 16 miles broad, and is one of the largest and most desolate and dreary moors in Scotland. Its surface is for the most part a broad, silent, and featureless tract of bog, heath, and rock, girdled by distant and gloomy mountains. In its western part is Loch Lydoch, which winds amid flat and dismal scenery. Stretching eastward from the Moor is Loch R., about 9 miles long by from 1 to 2 miles broad. It is surrounded by mountains, contains two islands, and is drained of its surplus waters by the Tummel, a tributary of the Tay.

RA'NSOM—corrupted from the Latin *redemptio*—is the price paid by a prisoner-of-war, or paid on his behalf, in consideration of his being granted liberty to return to his own country. In early times, when armies received little or no regular pay, the soldier looked for his reward in the booty he might capture, and this booty included the bodies as well as the chattels of the vanquished. The conqueror had the option of slaying his prisoner; but for his profit, he would make him his slave, or sell him into slavery. The transition would be natural to accepting compensation from the prisoner himself, and setting him at liberty. In feudal warfare, the ransoms formed a large portion of a soldier's gains; those for persons of low degree belonging to the individual captors; but those for princes, or great nobles, to the king. Ransoms were sometimes of large amount, more than the immediate family of the captive could pay. His retainers were then required by feudal usage to contribute; as in the case of redeeming King Richard I, for £100,000, when twenty shillings was assessed on every knight's fee, and the clergy subscribed liberally. David Bruce of Scotland was ransomed for 100,000 marks, and King John of France for £500,000, payable in instalments.—In modern warfare, where the fighting is performed by professional soldiers, pecuniary ransoms are scarcely ever resorted to, freedom being granted to prisoners in exchange for others of corresponding rank captured on the opposite side.

RA'NULA is a term applied to an encysted tumor, containing a glairy fluid, and lying under the tongue. The ordinary method of treating such tumors is by free incision or by cutting out a piece of the sac; and if this is not sufficient to effect a cure, the interior should be touched with nitrate of silver, or a small seton should be passed through it, with the view of destroying it by suppuration. The name of the tumor is due to the supposed frog-like form which the swelling assumes.

RANUNCULA'CEÆ, a natural order of exogenous plants, mostly herbaceous, rarely shrubs, and generally natives of cold damp climates. Some are found within the tropics, but almost exclusively in very elevated situations. The number of known species is about 1000. They occur in all quarters of the globe, but most abundantly in Europe. The leaves are generally much divided, and have dilated sheathing stalks. The calyx is of 3—6 deciduous hypogynous sepals; the corolla of 3—15 hypogynous petals, in one or more rows, sometimes assuming very remarkable forms, as in larkspur, aconite, and columbine; rarely absent, in which case the sepals are gaily colored. The stamens are usually numerous; the carpels are numerous, one-celled, sometimes united into a single many-celled pistil; the ovary with one or more ovules. The fruit either consists of dry achenia, or is berry-like or follicular.—Acridity is the prevailing character of the order, and the leaves of some species readily produce blisters; but this property disappears when they are dried or heated. Many are narcotic and poisonous; some are used in medicine, as aconite and hellebore. The seeds of *Nigella sativa* were formerly used instead of pepper. The fruit of the May Apple or Wild Lemon (*Podophyllum peltatum*) of North America may be eaten, but is very acid.—Many of the order produce flowers of great beauty, as some species of *Ranunculus* (q. v.), *Anemone* (q. v.), *Larkspur* (q. v.) *Pæony* (q. v.), *Columbine* (q. v.), *Clematis* (q. v.), &c.

RANU'NCULUS, a genus of plants of the natural order *Ranunculaceæ;* having five sepals; five petals, with a nectariferous pore at the base of each petal, often covered with a scale; many stamens situated on a receptacle, and germens accumulated into a



Garden Ranunculus.
(From a drawing by Holland.)

head. The species are numerous, herbaceous plants, mostly perennial. Some of them adorn meadows with their yellow flowers, familiarly known as *Buttercups;* others, known by the name of *Crowfoot*, are troublesome weeds in gardens and pastures. Many, as the Spearworts, are found chiefly in moist places, and some are altogether aquatic, covering the surface of ditches, ponds, and rivers, where the water is shallow, with a carpet of verdure exquisitely studded with beautiful white flowers.—One species, the Asiatic R., or Garden R., exclusively the R. of florists, a native of the Levant, has been cultivated in Europe for almost 300 years. From clusters of small tubers it sends up several bipartite leaves, and an erect branched stem, with terminal flowers, which, in the cultivated varieties, are often double or semi-double, yellow, white, red of various shades, or of mixed colors, very brilliant, and from an inch and a half to two inches and a half in diameter. The cultivated varieties are extremely numerous. The R. is propagated by seed, by offset tubers, or by dividing the clusters of tubers. The roots are often taken up in summer, after the leaves die, and kept in a dry place till the beginning of the ensuing winter or spring. Protection by frames and glasses, shading from strong sunshine, and other such means, are employed in order to increase the beauty of the flowers.

The R. loves a free and rich soil.—Double-flowered varieties of some other species, with taller stems and smaller white or yellow flowers, are cultivated in flower-gardens, sometimes under the name of *Bachelors' Buttons.*—The acridity of many species of R. is such that the leaves, bruised and applied to the skin, produce blisters; and those of *R. sceleratus*, a pretty common British species, are said to be used by beggars to cause sores, in order to move compassion. *R. thora*, a Swiss species, is of extreme acridity, and hunters were accustomed, in former times, to poison darts and arrows with its juice. Water distilled from the leaves of *R. flammula*, a British species, with rather tall stem and ovato-lanceolate leaves, common by the sides of ditches, &c., is an active and powerful emetic, producing almost immediate vomiting, and capable of being used with great advantage in cases of poisoning.—Yet the leaves of *R. ficaria*—sometimes called *Pilewort* and *Lesser Celandine*, a very common British species, adorning hedge-banks with bright yellow flowers in spring—are capable of being used as a pot-herb. Pastures in which *R. acris*, *R. repens*, &c., are very abundant, are injured by them, and they ought to be diligently grubbed out; they are particularly supposed to give an unpleasant taste to milk and butter; but it is thought not improbable that a moderate mixture of these plants with the other herbage, is even advantageous, and that they may act as a condiment. Their acridity is lost in drying, and they are not injurious to hay. The small tubers of Pilewort, or Lesser Celandine, are used for the cure of hæmorrhoids; but their acridity also disappears when they are boiled, and they are then a pleasant article of food.

RANZ DES VACHES (in German, *Kuhreigen*), a name applied to certain simple native melodies of the Swiss Alps, which are usually sung by the herdsmen, and played by them when driving their herds to and from the pasture, on an instrument called the *Alphorn*, consisting of a wooden tube somewhat bent, about three feet long, widened out into a bell, and bound by a pitched cord. The associations of pastoral life recalled by these airs to the Swiss in foreign countries, have been said to produce that unaccountable longing for home, or *nostalgia*, which has been remarked among the Swiss soldiers abroad. The bands of the Swiss regiments in foreign service have, on this account, to be prohibited from playing the Ranz des Vaches. The Emmenthal, Entlebuch, the Bernese Oberland, the Grisons, Appenzell, and other pastoral districts of Switzerland, have each their respective Ranz des Vaches. A collection of Ranz des Vaches, along with other Swiss melodies (*Sammlung von Schweizer Kuhreigen und Volksliedern*), was published at Bern in 1818; and these airs are also to be found in the *Allgemeines Schweizer Liederbuch*, 1851. The Ranz des Vaches of Switzerland are ruder in their character than the mountain melodies of the Tyrol, with which they are sometimes confounded.

RAPA'LLO, a maritime town of Northern Italy, province of Genoa, and 17 miles east of the city of that name, with 5350 inhabitants. It was first called Tigulia. Its only object of interest is the Sanctuary of the Madonna, on the Monte Allegro, erected in 1557. R. is a thriving commercial town, and has manufactures of wax and of soap, and of laces in thread and in cotton; it has fisheries of coral and tunny.

RAPE, or COLESEED (*Brassica napus;* see BRASSICA), a biennial plant much cultivated both on account of its herbage and its oil-producing seeds. It is a native of Europe, and perhaps of England; but it is hard to say where it is truly indigenous and where naturalized. It is so nearly allied to *Brassica rapa* (Turnip), *B. campestris* (Swedish Turnip, Colza, &c.), *B. oleracea* (Kale, Cabbage, &c.), and *B. præcox* (Summer Rape), that botanical distinction is difficult, particularly as to some of the cultivated varieties. Dr. Lindley gives the following synoptical view of the most characteristic differences of these species, in Morton's *Cyclopædia of Agriculture:*

Leaves bright green.....*B. rapa.*
Leaves glaucous—
  Leaves hispid when young.....*B. campestris.*
  Leaves never hispid—
    Siliques spreading.....*B. napus.*
    Siliques erect—
      Calyx erect.....*B. oleracea.*
      Calyx spreading.....*B. præcox.*

The root of R. is slender, or in cultivation sometimes becomes carrot-shaped (see NAVEW), but it never becomes turnip-shaped. The stem is taller than that of the turnip, or Swedish turnip, and the foliage more luxuriant. The cultivation of R. is very general in many parts of the continent of Europe, from which it



Rape (*Brassica napus*):
a, silique.

seems to have been introduced into England at least as early as the 16th c.; and in the 17th c., if not sooner, large quantities of oil were made from its seeds, chiefly in the fenny and other alluvial districts of the east of England, where also it has long been most extensively employed for feeding sheep. On the continent, it is not unusual to sow R. in order to *green-manuring*, ploughing its herbage into the soil, a mode of enriching land much more common in some parts of Europe than it is in Britain.

R. delights in a rich alluvial soil, and is particularly suitable for newly reclaimed bogs and fens, in which the turnip does not succeed well; but it is also extensively cultivated in the chalk and oolite districts of the south of England. The mode of cultivation does not differ much from that of turnip, and similar manures are used. In rich soils, R. sometimes attains a height of three or even four feet, so that the sheep turned in are hidden beneath the leaves, and seem to eat their way into the field. They eat the stalks even more greedily than the leaves. A too exclusive feeding on R. is, however, apt to produce diseases, which a sprinkling of salt, a supply of hay, &c., are found useful in preventing. When R. is cultivated for seed, it is sown in autumn. When the seed is ripe, R. is cut with the sickle; and after a short time allowed for drying, the seed is thrashed out, when the haulm is often burned, a wasteful practice, as its decay affords more abundant and useful manure, and indeed cattle are fond of it as food. *Rape-cake*, the mass of seeds from which oil has been obtained by crushing, is used for feeding oxen and sheep, but is very inferior to linseed-cake, and some other kinds of oil-cake. Ground into dust, it is a very valuable manure. *Rape-oil* is extensively used for machinery and for lamps; but the oil and cake so called are not exclusively obtained from this plant, nor are the names *Colza-oil* and *Rape-oil* used to discriminate the produce of different plants, although in some parts of Europe the name Colza is given to varieties of *Brassica campestris* and *B. oleracea*, which are cultivated in the same way as rape. *B. præcox* is also cultivated in some places, being sown in spring, and reaped in autumn. The seeds of other cruciferous plants are also crushed indiscriminately with these, and the oil and cake sold by the same names. See OILS.—The name *Rape* is from the same root as Ger. *reps*, and Lat. *rapa* (a turnip); *Cole-seed* and *Colza* from the same as *kale.*

RAPE is the crime of having carnal knowledge of a woman against her consent and by force. The essence of the offence is that force be used, and it is immaterial what is the age of the woman, and whether she is single or married, chaste or unchaste. The only difference caused by the habitual unchastity of the woman is that in such a case it is less easy to satisfy the jury that the element of consent was wanting. The two elements of rape are the carnal knowledge and the force used. As to the element of resistance on the part of the woman, or force on the part of the man, several niceties often occur in the application of the law, from the great variety of circumstances attending this crime. With regard to an idiot woman, it has been held that it is not necessary to prove resistance on her part, and that the crime may be committed though she made no resistance. If consent be extorted by fear and threats, or where several men join together, and resistance is useless, this is the same as using violence to overpower the woman. Where the woman is stupified by drink, so that the power of resistance is annihilated, it is the same as knocking her down. In a case, however, where force is used in the first instance, but the woman afterwards in some degree consents, the crime of rape will not be committed, though the evidence may establish the crime of assault. Some difficult cases have occurred with reference to married women who have been beguiled by men personating their husbands, and so been in a certain sense, cheated out of their consent. But it has been repeatedly decided by a majority of the court, both in England and Scotland, that such an offence was not rape.

One of the important circumstances attending the crime of rape is the mode of proof, and in this respect it differs from other crimes. It is held to be all but essential, as a corroboration of the woman's story, that if her cries of resistance were not heard, at all events she should have, immediately after the offence, complained on the first opportunity to her friends or relations. It is not allowed to give in evidence the particulars of such complaint, but merely the fact that she made a complaint against some person. Unless this important particular be proved, her evidence is looked upon with great suspicion, and may be discredited by the jury, unless there were peculiar circumstances to account for the want of such complaint. One of the common defences to a charge of rape is the unchastity of the woman, the object being to render it unlikely that she did not consent, and hence it is in practice considered a proper question for the prisoner's counsel to put to her, whether she had not had connection with the prisoner before or with other men; but at the same time she is cautioned by the judge that she is not bound to answer such questions unless she likes. If, however, she denies the accusation, witnesses may be called to contradict her on that point.

The crime of rape is felony by the law of England, and is punishable by penal servitude for life, or for not less than three years, or by imprisonment not exceeding two years, with or without hard labor. Of late, attempts have been made to add flogging or corporal punishment to the other punishment, but bills having that object have been thrown out of parliament. There are several other crimes in the same category as rape, but punishable under separate enactments. Thus, the crime of having carnal connection with a girl under the age of ten years is felony, and punish-

able like rape. Whoever has carnal connection with a girl who is between the age of ten and twelve years, is guilty of a misdemeanor, and liable to penal servitude for three years, or imprisonment for two years with hard labor. Consent of the girl in these two cases is immaterial. The forcible abduction of women is divided into two offences. Wherever a woman of any age has property, and is forcibly taken away with intent to marry or carnally know her, the offence is felony punishable by penal servitude of three to fourteen years, or two years' imprisonment. Again, if a girl, though having no property, is under the age of twenty-one, and is fraudulently allured or taken away out of the possession of her parents or guardians, with intent to marry or carnally know her, this is felony, punishable as in the preceding case. In order to the commission of the latter offence, an improper motive is necessary on the part of the man, but the consent of the girl is of no consequence.

RAPHAEL, or RAFFAELLO SANTI or SANZIO, called by his countrymen *Il Divino*, 'the Divine,' is ranked by almost universal opinion as the greatest of painters. He was born at Urbino in 1483, and in 1497, on the death of his father, Giovanni Santi, who was his first instructor, he was placed under Pietro Perugino, the most distinguished painter of the period, who was then engaged on important works in the city of Perugia. In 1504, R. visited Florence, and improved his style by studying composition and expression in the works of Masaccio, and color and effect in those of Fra Bartolomeo. He seems to have lived in Florence till 1508, when he went to Rome, on the invitation of Pope Julius II. His celebrated frescoes in the Vatican and numerous important works were then commenced. Julius died in 1513; but his successor, Leo X., continued R.'s services, and kept his great powers constantly in exercise. The works of R are generally divided into three classes: his first style, when under the influence of Perugino's manner; his second, when he painted in Florence from 1504 to 1508; and his third style, which is distinguishable in the works executed by him after he settled in Rome. Each of these styles has its devoted admirers. Those who incline to art employed in the service of religion, prefer the first manner, as embodying purity and religious feeling. His last manner, perfected when the taste for classical learning and art was strongly excited by the discovery of numerous valuable works of the classic period, is held by many connoisseurs as correctly embodying the highest art; while his middle or Florentine style is admired by some as exemplifying his powers, freed from what they deem the rigid manner of Perugino, and untainted by the conventionalism of classic art. In all these different styles, he has left works of great excellence. 'The Coronation of the Virgin,' in the gallery of the Vatican, and 'The Sposalizio,' or Marriage of the Virgin, in the Brera Gallery at Milan, belong to the first period. The 'St. Catherine,' in the National Gallery, London; 'The Entombment, in the Borghese Gallery, Rome; 'La Bella Jardinère,' in the Louvre, to his second period. While the 'St. Cecilia,' at Bologna; the 'Madonna di San Sisto,' at Dresden; 'The Cartoons,' at Hampton Court; 'The Transfiguration;' and all the Vatican frescoes, except 'Theology, or the Dispute on the Sacrament,' the first he executed on his arrival from Florence, are in his third manner, or that which peculiarly marks the Roman school in its highest development. R. died at Rome on April 6, 1520, the anniversary of his birthday.

RAPHA'NIA, or ERGOTISM, is a disease which was much more prevalent some centuries ago than it is at present. It is defined as 'a train of morbid symptoms, produced by the slow and cumulative action of a specific poison peculiar to wheat and rye, and which gives rise to convulsions, gangrene of the extremities, and death' (Aitken's *Science and Practice of Medicine*, 1858, p. 332). It has been described under various names. From the 10th to the 14th c., it was known as *St. Anthony's Fire*, a title which has been since associated with erysipelas. It was then described as epidemic gangrene. The name *Raphania* was first given to it by Linné, who thought the morbid symptoms were dependent upon the mixture of *Raphanus Raphanistrum*, or jointed charlock, with the wheat used as food. It was suspected, as early as the end of the 16th c., that the disease was due to the development of a fungus on the grain, and this fact is now established beyond doubt, although some writers hold (like Linné) that this morbid state is also produced by the admixture of poisonous plants, especially *Lolium temulentum*, or darnel, being mingled with the grain. Although rye is the ordinary seat of the poisonous fungus, wheat, rice, and other grains are liable to be similarly affected, and to produce similar results. For an account of the fungus, see ERGOT.

There are two forms of the disease—the spasmodic and the gangrenous. The spasmodic form begins with tingling or itching of the feet and hands, and sometimes of the head. Violent contractions of the hands and feet, giving rise to intense pain in the joints, are a common symptom. The head is much affected, the patient complaining of drowsiness, giddiness, and indistinct vision. If coma or epileptic convulsions supervene, there is little hope of recovery. The appetite is usually enormous; spots like those of purpura appear on the face, and there are seldom any signs of improvement for some weeks. The gangrenous form begins with extreme lassitude, and is accompanied by some febrile disturbance. The extremities are painful, cold, almost insensible, and not readily moved; and after a varying time, gangrene supervenes.

With regard to treatment, the first thing to do is to replace the poisonous flour by easily digested, nourishing, wholesome food. The pain must be relieved by opiates, the blood purified by the administration of chlorate of potash, and the general tone of the system improved by tonics, such as the preparations of iron, bark, &c. In the spasmodic form, warm baths and gentle friction would probably prove serviceable. Whatever be the form of treatment adopted, the mortality in the gangrenous form is usually 90 per cent. The spasmodic form is much less destructive to life.

RA'PHIDÉS are crystals found in the interior of the cells of plants. The word is the plural of the Greek *raphis*, a needle, and was originally used to denominate crystals of an acicular form, which are often collected together in bundles. But crystals of various forms are found in the cells of plants, consisting chiefly of phosphate or of oxalate of lime. In many kinds of plants, they very much abound, and often in a particular manner in particular parts of plants. They are very minute, and are found in such delicate tissues as the petals of the Pelargonium.

RA'PIDAN. See RAPPAHANNOCK.

RA'PIER is said to have had distinct meanings at different times, and in ancient fencing to have been a long cutting broadsword; but for the last century at least, the rapier has been a light, highly-tempered, edgeless, thrusting weapon, finely pointed, and about 3 feet in length. It was for long the favorite weapon in duelling, and was worn by every gentleman. At present, it is worn only on occasions of court ceremonial, and answers no other purpose than to incommode the wearer. In war, a rapier could never have been of any service.

RAPIN DE THOYRAS, PAUL DE, a French historian of England, was descended from a Protestant Savoyard family, which settled in France in the 16th c., and was born at Castres, in Languedoc, March 25, 1661. He studied at the Protestant college of Saumur, and passed as advocate in 1679, but had no liking for the profession; and when the Edict of Nantes (1685) forced him to leave France, he sought employment first in England (where he was unsuccessful), and afterwards in Holland, where he enlisted in a corps of volunteers at Utrecht, formed by his cousin-germain, Daniel de Rapin. With his company, he followed the Prince of Orange to England in 1688, was made ensign in the following year, and distinguished himself by his bravery at the siege of Carrickfergus, the battle of the Boyne, and the siege of Limerick, where he was shot through the shoulder by a musket-ball. In 1693, he was appointed tutor to the Earl of Portland's son, with whom he traveled in Holland, Germany, and Italy, after which he took up his residence at the Hague; but in 1707, withdrew with his family to Wesel, in the duchy of Cleves, where he devoted the remaining 17 years of his life to the composition of his great work. The severity of his labors is believed to have shortened his days. He died May 16, 1725. R.'s *Histoire d'Angleterre* was published at the Hague in 8 vols., the year before his death. It was undoubtedly, as Voltaire has said, the best work on English history that had until then appeared: full, minute, careful in citing authorities, clear, rapid and accurate in narration, methodical in the arrangement of its materials, comparatively impartial in spirit, and yet betraying on the part of the author an honorable reverence for law and liberty. R. begins with the invasion of Britain by the Romans, and ends with the death of Charles I. The work was continued to the death of William III. by David Durant (Hague, 2 vols., 1734). The best edition of the *Histoire* in its augmented form is by Lefebvre de Saint-Marc (Hague, 16 vols., 1749 *et seq.*). The original was translated into English by the Rev. Nicholas Tindal, M.A. (Lond. 15 vols., 1725—1731), and subsequently by John Kelly, barrister (in 2 vols. fol.).

RAPP, JEAN, Count, a French general, was born at Colmar, in the department of Haut-Rhin, France, 27th April 1773. He was intended for the church, but his taste for a military life led him to enrol himself (1788) in the mounted 'chasseurs' of the French army. R. distinguished himself by dashing gallantry in Germany and Egypt, and on the death of Desaix at Marengo, he became aide-de-camp to Napoleon. His brilliant charge at Austerlitz upon the Russian Imperial Guard, which put the latter to a complete rout, was rewarded with the grade of general of division (24th December 1805). But R. joined to the utmost bravery and coolness, a quick and unerring judgment, which enabled him not only fully to comprehend Napoleon's plans, and execute to the spirit the duties intrusted to him, but also at times to amend and

even disobey his orders with the happiest results. The latter was the case at Lobau, where R.'s disobedience decided the battle in favor of Napoleon; and for this service, he was named a Count of the Empire (1st August 1809). He opposed the Russian expedition with the utmost earnestness, but, notwithstanding, accompanied the Emperor throughout the whole of it, adding on many occasions to his own reputation and the glory of the French arms. His obstinate defence of Danzig for nearly a year against a powerful Russian army, placed him in a high position among military men; and his chivalrous and considerate treatment of the unfortunate inhabitants during the siege was so warmly appreciated by them, that they presented him with a magnificent sword enriched with diamonds. The Russians, contrary to the articles of capitulation, sent R. and his garrison prisoners to Russia, and he did not return to France till July 1814. On reaching Paris, he was well received by Louis XVIII.; and in March 1815 was one of those appointed to oppose the return of Napoleon, but deserted, along with his troops, to his old master, and was appointed commander-in-chief of the army of the Rhine (16th April), and peer of France (2d June). After Waterloo, R. again submitted to Louis, but retired to Switzerland for two years, returning in 1817, and receiving a full pardon in the following year. He was re-created a peer of France (5th March 1819), and held various offices about the court; but broken in health by constant hard service and numerous severe wounds, he died at Paris, 8th November 1821. A volume of Memoirs (1823, in 8vo) has been published under his name.

RAPPAHA'NNOCK, a river of Virginia, formed by the union of the North fork and the Rapidan, which rise in the Blue Ridge of the Alleghany Mountains, and flow eastwardly to their point of union, 40 miles above Fredericksburg, where the falls afford water-power. The river is navigable from this point south-east to Chesapeake Bay, which it enters by a broad estuary, 70 miles long. The R. and the Rapidan were the scenes of some of the most sanguinary battles of the War of Secession, at Fredericksburg, Chancellorsville, and the Wilderness.

RAPPAREE', a wild Irish plunderer, so called from his being generally armed with a *rapary*, or half-pike. The term was in common use in the 17th century. See *Notes and Queries*, August 17, 1861.

RAPPEE', a coarse-grained species of SNUFF (q. v.). The word is of French derivation, and arose from this species of snuff being manufactured from dried tobacco by means of the *râpe* or *raspe*, an instrument by which the thin parts of the leaf were cut from the veins and fibres, the latter alone being used in the manufacture of rappee.

RA'PPEN, a small Swiss coin, made of an alloy of copper and tin, forming the $\frac{1}{100}$th part of the modern Franc (q. v.), and therefore equivalent to the French centime. The old Swiss franc (= about 1*s.* 2*d.* sterling) was also divided into 100 rappen. The rappen was first coined at Freiburg, and took its name from the head of a raven (Ger. *rabe*, pronounced in some parts *rape*) impressed upon it.

RAPTO'RÉS. See ACCIPITRES.

RARATON'GA. See COOK ISLANDS.

RAS (= Heb. *rosh*), an Arabic word, signifying 'head,' 'promontory,' occurs in the names of many capes on the Arabian and North African coasts, and also in Sicily and Malta; as Rasigelbi (corrupted from Rasi-calbo) 'the dog's cape,' on the north coast of Sicily; Ras-el-Abyad, 'white cape,' on the coast of Palestine; Ras Bab-el-Mandeb, 'cape of the gate of tears,' at the Strait of Bab-el-Mandeb; Ras-el-Jezriah, 'cape of the peninsula;' Ras-el-Had, the eastern point of Arabia.

RASHES, affections of the skin, characterized by a red superficial efflorescence, diffused or in patches, disappearing under pressure, and usually ending in desquamation. To this division of cutaneous disorders belong Rubeola (or Measles), Scarlatina (or Scarlet Fever), Erysipelas (or St. Anthony's Fire), Erythema, Roseola (or Scarlet Rash), and Urticaria (or Nettle Rash). Of these rashes, Rubeola, Scarlatina, and Erysipelas are rather to be regarded as fevers or blood diseases, than as cutaneous diseases, in the true sense of the word.

RASHI (i. e., Rabbi Solomon [Shelomo] Izaaki, or Ben Izaak, often erroneously called Jarchi), the greatest Jewish commentator and exegete, was born about 1040, in Troyes, in France. The range of his studies was as extraordinarily wide as were his early developed faculties brilliant, and his industry and perseverance enormous. Philology, philosophy, medicine, astronomy, civil and canonical law, exegesis, were the chief branches of his learning; and to a rare proficiency in them, he united a complete mastery over the whole range of Scripture and the Talmudical sources. In order further to perfect himself for his gigantic task he traveled for seven years, visiting the academies of Italy, Greece, Germany, Palestine, Egypt, where he sat at the feet of the great masters of the age, collecting their sayings and legal decisions. His chief work—and one universally recognized as the principal work of all Scriptural exegesis—is his Commentary to the whole of the Old Testament. Up to this day, it has not been superseded by any other, although in the province of philology and antiquities, investigation has been much furthered since his time. R.'s style is extremely brief and concise, yet clear and pregnant; obscure and abtruse (as it has been pronounced by some) only to those who lack the necessary preliminary knowledge.

According to the fashion of its day, it is replete with allegorical or rather poetical illustrations, gathered from the wide fields of the Midrash within and without the Talmud; and many a passage is thus preserved to us, which, in the disordered state of those manuscripts, would probably otherwise have been lost. This Commentary—entirely transplanted into Latin by Breithaupt, and partly also into German—was the first book ever printed in Hebrew (Reggio, 1474), and has since been reprinted with almost every complete edition of the Hebrew Bible. Of his numerous other works is first to be mentioned his Commentary to 23 treatises of the Talmud, supplemented after his death by his grandson, Samuel ben Meier; further, a Commentary to the Pirke Aboth; the *Pardes*, treating of Laws and Ceremonies; a Collection of Legal Votes and Decisions; a Commentary to Midrash Rabbah; a Book of Medicine; a Poem on the Unity of God, &c., &c. He died about 1105; and such was his piety and surpassing eminence, that later generations wove a shining garland of legends around his head. The confusion of R. with two Jarchis, who lived long after him, has not hitherto been properly accounted for. They bore that surname because they were born at Lunel, Jerach being the Hebrew for moon, *Lune* in French.

RASK, RASMUS CHRISTIAN, a distinguished Danish philologist, was born at Brendekilde, near Odense, in the island of Fünen, 22d November 1787, studied at Copenhagen, and in 1808 published his first work, *Vejledning til det Islandske eller gamle nordiske Sprog* (Rules of the Icelandic Language or the Ancient Language of the North). During the years 1807—1812, he occupied himself with drawing up grammatical systems for most of the Germanic, Slavic, and Romanic tongues, and in comparing them with those of India. He then visited Sweden, where he commenced to study Finnish; and in 1813 proceeded to Iceland, where he lived for two or three years, perfecting his knowlege of the language, the history, and the sagas of the inhabitants. On his return to Copenhagen, he was appointed sub-librarian to the university; and in 1818 published a splendid work, *Undersaegelse om det gamle nordiske eller Islandske Sprogs Oprindelse* (Researches concerning the Origin of the Icelandic or Ancient Language of the North), which led Grimm to his famous discovery of the displacement of consonants in the Teutonic languages.

Previous to this, however, he had resolved to visit Asia; and after spending a year (1817) in Stockholm, where he published his admirable *Angelsaksik Sproglaere* (Anglo-Saxon Grammar), and the first critical and complete edition of the two great monuments of Scandinavian mythology, the *Snorra Edda* and the *Edda Saemundar*, he went to St. Petersburg, where he devoted himself for two years, with intense eagerness, to the study of the oriental languages, principally Sanscrit, Persian, and Arabic, but not failing to acquire, at the same time, a competent knowledge of Russian and Finnish. Thus equipped, he proceeded to Astrakhan, where he stayed six weeks, to study the language of the Tartars, and then commenced a journey through the country of the Turkomans, the Caucasus, Persia (where he added the Mongol and Mantchu dialects to his already enormous linguistic acquisitions), Hindustan (cultivating in the last-mentioned country the society of learned Brahmans, and visiting all their great schools), and finally Ceylon, where he made himself acquainted with Cingalese and Pali, and wrote his *Singalesisk Skriftlaere* (Colombo 1822). In 1823, R. returned to Copenhagen, laden with learning and rare manuscript treasures, of which the greatest part was presented to the university. In 1825, he was appointed Professor of 'Literary History,' and in 1828, of Oriental Languages. Next year, he was made chief custodier of the university library; and in 1831, Professor of Icelandic. But his immense labors had exhausted his energies, and he died 14th November 1832, at the early age of 45, a victim of hard work. Besides the productions already mentioned, R. wrote *Frisisk Sproglaere* (Cop. 1825); *Den gamle Aegyptiske Tidsregning* (The Ancient Egyptian Chronology, 1827); *Denaeldeste Hebraiske Tidsregning* (The Oldest Hebrew Chronology, 1828); besides grammars of several languages, and a great number of miscellaneous articles in the learned journals of the North, which were collected after his death, and published (Cop. 3 vols. 1834—1838), together with a life by Petersen.

RASKO'LNIK (Russ. *separatist*), the name of a variety of sects in the Russian Church, which date from an early period, and must be regarded rather as a general designation of dissenters from the established church of Russia, than as a description of

any specific form of doctrinal belief. Such dissent is traceable from the very earliest period of the distinct organization of the Russian Church. A monk, named Andrew, in 1003; another, called Demitry (Demetrius), in the 12th c.; an Armenian monk, named Martin, who was burned as a heretic at Constantinople in the end of the same century; Leo, Bishop of Rostow in the beginning of the 14th, and Strigolnik and Nikita towards its close—are all mentioned as having originated or propagated heresies of various kinds. A still more remarkable and more formidable organization—a form of Crypto-Judaism—was introduced in the 15th c. by a concealed Jew, called Zacharias, who succeeded in gaining many followers. One of these, called Zosima, is particularly noticeable, as having obtained much popularity, and even managed to have himself elected metropolitan of Moscow. His sect, which studiously concealed itself wherever this concealment seemed necessary, was condemned by a synod (1490), and repressed with great rigor; but it continued to maintain a concealed and precarious footing, and is said to possess disciples even to this day, especially in the government of Irkutsk, under the name of Selesnewschschina. A sect, whose leading principles were borrowed from the German reformers, was founded in 1553 by Matthias Baschkin; but it was condemned at a synod in Moscow, and does not appear to have taken much hold on the people.

But it is from the middle of the 17th c. that—the separation of the sects from the national church having become more tangible, from its involving nonconformity with the established worship—the designation of R. finds its fullest application. At that period, a complete revision of the ancient Slavonic liturgical and ritual books, which had suffered grievously from the ignorance, and probably also from the heterodoxy of transcribers, was undertaken by the Patriarch Nikon. See PHILIPPINS. The revised books were introduced into the churches by the authority of the czar as well as of the patriarch; but many of the clergy and people resisted the innovation, and refused the new liturgies. Foremost among the recusants, or non-conformists, were those who had already been sectaries upon other grounds; but all differences were to some extent merged in this common ground of protest, and all were known under the common appellative Raskolniks.

In later Russian history, the Raskolniks are sometimes called by the name, which they themselves affect, of Starowierzi ('Men of the Old Faith'), or Prawaslawnüje ('orthodox'). Each sect has its specific doctrinal peculiarities; but most of them follow certain common observances, in which lies their tangible difference from the national church. They cross themselves with the first and middle finger, and not with the first three fingers; they use only the unrevised service-books; they repeat Halleluiah only twice; in church ceremonies, they turn from left to right, and not from right to left; they use seven and not five altar-breads in the Eucharistic offering; they pay worship only to ancient pictures, or those painted by themselves; they use an eight-pointed instead of the ordinary cross; they attend only their own churches, and hold no communion of worship with the members of the national church; they never shave or cut their hair, and adhere strictly to the old Russian costume.

They may be divided, in general, into two classes—those which have popes (priests), and those who do not recognize the priestly order. The former are in every respect more moderate and more free from fanaticism than the Raskolniks who discard the ministry of priests. Their priests, however, have often been outcasts of the orthodox church, who betook themselves to the rival communion. The most notable among the Raskolniks of this class are those called the Peremasanowschtina, who re-ordain all popes joining their communion; the Jewlewschtschina, who are said to permit freedom of divorce and exchange of wives; Dositheowschtschina, so called from their founder, a monk named Dositheus; and Tschernobolzi, whose chief distinction consists in refusing to take an oath, and to say the prayer for the emperor prescribed in the liturgy. Of the popeless Raskolniks, the chief are the Philippins (q. v.), the Pomorænians or Rebaptizers, the Theodosians—an offshoot of the Pomorænians—and a sect of mystic spiritualists with strong Protestant and rationalistic leanings, called Duchoborzen. A curious development of the R. movement is found in the Samokrischtchina (Self-baptizers) and the Samostrigolschtschina (Self-ordainers), among whom each one administers baptism to himself, each priest ordains himself, and each monk or nun performs the ceremeny of their own consecration without the interposition of the regular ministry. It may be added, in conclusion, that with a considerable proportion of these various sectaries, there is found largely mixed up with religious fanaticism an element of communism and of disaffection towards the reigning dynasty, or, more properly, towards the established order of things. The latter may be in part explained by the rigorous measures of repression under which the Raskolniks have suffered for many successive generations. The former is an ordinary accompaniment of the sectarianism of the poor, and is especially frequent amongst sectaries of the present class.

RA'SPBERRY (*Rubus Idæus*), the most valued of all the species of Rubus (q. v.). It has pinnate leaves, with 5 or 3 leaflets, which are white and very downy beneath, stems nearly erect, downy, and covered with very numerous small weak prickles; drooping flowers, and erect whitish petals as long as the calyx. The wild R. has scarlet fruit, and is found in thickets and woods throughout the whole of Europe and the north of Asia. It is common in Britain. The R. has long been in cultivation for its fruit. There are many cultivated varieties, with red, yellow,



Raspberry (*Rubus Idæus*).

and white fruit, much exceeding the wild kind in size. The stem in a wild state is 3—4 feet high; in cultivation, 6—8 feet or upwards. Some of the cultivated varieties are also more branching than is common in a wild state, the stem of the wild plant being simple or nearly so. The root is creeping, perennial; the stems only biennial, bearing fruit in the second year, woody, but with very large pith. Plantations of raspberries are most easily made by means of suckers. The R. loves a light rich soil, and is rather partial to a shady situation. The tall kinds are unsuitable in situations much exposed to winds, as the stems are easily broken. The rows are generally about 4 feet apart, the plants 3 to 4 feet apart in the rows. The young stems are thinned out to allow free access of air to those which are left. Stakes are often used to support the stems, or they are variously tied together. The fruit is used for dessert; for jams, jellies, &c.; for making or flavoring many kinds of sweetmeats; and mixed with brandy, wine, or vinegar, for the preparation of *R. Syrup*, *R. Vinegar*, &c. Different preparations of it are used in medicine in cases of fever, inflammation, &c. R. vinegar is a particularly grateful and cooling drink in fevers. Raspberries, fermented either alone or along with currants and cherries, yield a strong and very agreeable wine, from which a very powerful spirit can be made. —Some of the other species of *Rubus*, most nearly resembling the R., produce also agreeable fruits. *R. odoratus* is a highly ornamental shrub, a native of Canada and the northern states of America, is frequent in gardens both in Europe and America, but rarely produces its fruit in Britain.

RASPBERRY VINEGAR, a culinary preparation, consisting of raspberry juice, vinegar, and sugar. It is best made by putting carefully gathered and very ripe raspberries into jars, and when as full as they will hold of the fruit, fill up the jar with good vinegar; after eight or ten days, pour off the vinegar, and let the fruit drain for some hours. The mixture of vinegar and juice thus obtained is added to another quantity of fruit, and treated in the same way. This is sometimes repeated a third time, and then the liquid is gently boiled for about five minutes with its own weight of refined sugar. Added to water, it forms a most refreshing summer drink, and is a useful cooling drink in sickness.

RA'STADT, a town and fortress in Baden, stands on the river Murg, 3 miles from its junction with the Rhine, and 15 miles south-west of Karlsruhe. It is a station on the Baden Railway. Steel wares, weapons, and tobacco are manufactured. From 1725 to 1771, the town was the residence of the Markgrafs of Baden-Baden. From 1840 till 1836, the fortress of R. was occupied by the troops of the Germanic Confederation. R. is memorable for two congresses—the former in 1714, when a treaty of peace, which brought the war of the Spanish Succession to a close, was signed between Marshal Villars and Prince Eugene; and the latter in 1799. On the breaking up of the congress of 1799 without any definite result, the three French plenipotentiaries set out for Strasbourg on the evening of April 19; but they had scarcely got beyond the gates of R., when they were attacked by a number of Austrian hussars; two of the three were slain, and the third sabred, and left for dead in a ditch. The papers of the legation were carried off, but no further spoil was taken. This flagrant violation of the law of nations roused the indignation and horror not only of

France, but of all Europe. The instigator and conductor of the assault were never known. Pop. (1880) 12,356. R. is now officially spelt *Rastatt*.

RAT, the popular name of all the larger species of the genus *Mus*. See MOUSE. Two species are particularly deserving of notice, the only species found in Britain, or, indeed, in any part of Europe, and both very widely distributed over the world: the BLACK RAT (*M. rattus*) and the BROWN RAT (*M. decumanus*). Extremely abundant as these animals now are, their introduction



Black Rat (*Mus rattus*); Brown Rat (*Mus decumanus*).

into Europe—which, if at all through human agency, was unintentionally so—took place within recent times. Neither of them was known to the ancients. Both appear to be natives of the central parts of Asia, where other nearly allied species are also found. The black rat found its way to Europe about the beginning of the 16th c.; the brown rat first appeared at Astrakhan in the beginning of the 18th c., and reached Britain and the western countries of Europe about the middle of the century. The Jacobites of Britain were accustomed to delight themselves with the notion that it came with the House of Hanover, and chose to call it the *Hanoverian Rat*. It also received the name of *Norway Rat*, from a belief, unquestionably erroneous, that it was introduced from Norway, a country which it did not reach until long after it was fully established in Britain.

These two species are like one another, and very similar in their habits. The brown rat is the larger and more powerful of the two, and has waged war against the other with such success as to cause its total, or almost total, disappearance from many places where it was once very abundant; so that in many parts of Britain, where the black rat was once plentiful and troublesome, it would now be difficult, perhaps impossible, to obtain a single specimen. Rats, when pressed by hunger, do not scruple to devour the weaker even of their own kind. The extirpation of the black rat does not, however, always follow from the introduction of the brown rat, each probably finding situations more particularly suited to itself. In their native regions, they exist together; and in some parts of Europe the black rat is still the more plentiful of the two. Both infest ships, and are thus conveyed to the most distant parts of the world, some of them getting ashore at every port, and establishing new colonies, so that they are now common—and particularly the brown rat—almost wherever commerce extends.

The black rat is nearly seven inches and a half in length, exclusive of the tail, which is almost eight inches long. The brown rat attains a length of more than ten inches and a half, with a tail little more than eight inches long. Besides its larger size and comparative shortness of tail, it differs from the black rat in its smaller ears and less acute muzzle, as well as in its lighter color and shorter hair. The tails of both are covered with a multitude of rings of small scales.

Both species are extremely prolific, breeding at a very early age, several times in a year, and producing from 10 to 14 at a birth. The excessive increase of their number, where abundant food is to be found, and there are few enemies to interfere with them, is thus easily accounted for. They sometimes multiply amazingly in ships; and perhaps nowhere more than in the sewers of towns. But in the latter situation, they really render good service to the promotion of public health, acting as scavengers, and devouring animal and vegetable substances, the putrefaction of which would otherwise be productive of pestilence. Such, indeed, seems to be the great use of the rat in the economy of nature; and it is perhaps worthy of notice, that the visits of the plague to Western Europe and to Britain have ceased from the very time when rats became plentiful. The brown rat, inhabiting sewers, is generally larger, fiercer, and of coarser appearance than the same species in houses or barns. Rats are also often found inhabiting burrows in dry banks, near rivers, &c. They feed indiscriminately on almost any kind of animal or vegetable food; they make depredations in fields of grain and pulse, from which they often carry off large quantities to be stored in their holes; they devour eggs; they kill poultry, partridges, &c.; they make most unwelcome visits to dairies and store-closets; and they multiply enormously in the vicinity of slaughter-houses and knackers' yards, which afford them great supplies of food. Their strong rodent teeth enable them to gnaw very hard substances, such as wood and ivory, either for food, or in order to make their way to more tempting viands.

They are creatures of no little intelligence. Many curious stories are told of the arts which they employ to attain desired objects, of the readiness with which they detect the approach of danger, and the skill with which they avoid it. Their sense of smell is very acute, and the professional rat-catcher is very careful that the smell of his hands shall not be perceived on the trap. They are very capable of being tamed, and have in some instances proved interesting pets.

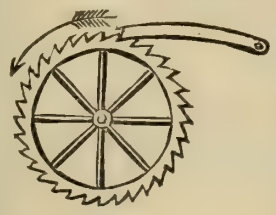
The flesh of rats is eaten, but only by rude tribes, or when food is scarce. The skin is used for making a fine kind of glove-leather.

The name rat is often popularly given, not only to the species nearly allied to these, but to other species of the *Muridæ*, now ranked in different genera, some of which are noticed in other articles.

RAT, WATER. See VOLE.

RATAFI'A, the generic name of a series of cordials, prepared usually by mixing an alcoholic liquor with the juice of some fruit or some flavoring material, and sugar or syrup. The name is of French origin, and is said to have been given in consequence of the former habit of preparing a choice drink to be used at the ceremony of *ratifying* a treaty. A favorite flavoring for ratafias is the almond—hence, bitter almonds, cherry, peach, apricot, plum, and other similar kernels, are much used, and hence small almond-flavored cakes are called ratafia cakes; but many other flavors are used, as orange flowers, gooseberries, raspberries, aniseed, angelica stalks; chocolate; black currants, coffee, &c.

RATCH, or RATCHET, in Machinery, is a small piece of metal, so placed with one end on a pivot, that the other can fall into the teeth of a wheel, as in the fig. Being perfectly free to move up and down, its own weight makes it drop into tooth after tooth as the wheel revolves. But, as will be seen from the peculiar shape of the teeth, which have the form of an inclined plane on one side, and a perpendicular face on the other, the wheel can only revolve in the direction of the arrow.



Ratch.

RATE, or ASSESSMENT, is a money payment levied upon the owners or occupiers of real property, in respect of some benefit to such property, or in discharge of some legal liability attaching to it. The power of rating proprietors or tenants of lands is a power not existing by the common law of England, except for the repair of the parish church or of the parish highways; for poor rates, county rates, &c., are all authorized by some statute or statutes. A rate is in the nature of a local tax, and therefore so far contrary to the law, that clear authority must always be shown for levying it. Hence, whenever a statute prescribes the conditions under which a rate may be imposed, it invariably states by whom the rate is to be made, and how it is to be enforced, and what appeal is to be allowed in case of an individual being aggrieved. These conditions must all be strictly complied with to the letter, otherwise the party rated can raise objections, and resist the rate. It may be said to be a general rule, that all rates must be so entitled that the parties rated are informed even by its heading whence the authority is derived. It is almost an invariable rule that the payment of rates is enforced in a summary way by justices of the peace, and this is one of the chief functions performed by justices. The mode in which this is practically done is by the party who has power to rate, or the agent or collector, applying to the justices for a summons, calling on the ratepayer to pay it. If payment is refused or neglected, application is next made for a distress-warrant to enforce payment, which means, if the payment is not made forthwith, or within a short specified time, the constable may seize the goods and chattels of the ratepayer, and sell them to make up the amount; and if there are no goods to seize, the party may be imprisoned for a specified time. As a general rule, imprisonment is only allowed after all means of recovering the rate by distress or seizure of the goods have failed. Owing to the strictness with which the machinery of rating must be carried on as directed by the statute, the ingenuity of the ratepayers, whetted by the natural indisposition of mankind to pay taxes, constantly prompts them to detect flaws in the proceedings, and litigation in various shapes is thereby produced throughout the country. As a new rate is almost invariably made every year, and sometimes every half year, constant opportunities for displaying this spirit of resistance are afforded.

RA'TEL (*Mellivora*), a genus of quadrupeds of the Bear family, *Ursidæ*, nearly allied to the Gluttons (q. v.), from which it differs in having one false molar less in each jaw, and the upper tubercular teeth slightly developed. The general aspect is similar to that of the badgers, but heavier and more clumsy. Two species are known, one of which, the CAPE R. (*M. Ratel* or *Capensis*), inhabits the south of Africa, and is said to feed much on bees and their honey, its thick fur protecting it against their stings; the



Ratel (*Mellivora Ratel*).

other inhabits the north of India, prowls about by night, is a voracious devourer of animal food, and often scratches up recently interred bodies from their graves. The Cape R. is about the size of a badger; gray above, black below. It is easily tamed, and is amusingly active in confinement, continually running about its cage, and tumbling strange somersaults to attract the attention of spectators, from which it seems to derive great pleasure.

RATEL-I-COUM, a Turkish sweetmeat, which has become common in confectioner's shops under several names, but chiefly that of 'Lumps of Delight.' Its composition is starch and syrup, sometimes colored. It is imported in the form of small cakes, about an inch thick, and one or two inches square, and evidently cut from a mass. These pieces have been sprinkled with powdered white sugar, to prevent them from sticking together in the small boxes in which they are packed.

RA'THENAU, or RATHENOW, a town of Prussia, in the province of Brandenburg, on the right bank of the Havel (here crossed by a stone bridge), 45 miles west-north-west of Berlin. It consists of two portions, one old, and surrounded by walls, and the other new. Weaving, spinning, and brick and tile making are carried on, and there are three factories for making optical instruments. Pop. (1880) 11,394.

RATHKEA'LE, a market and post-town of the county of Limerick, Ireland, situated on the river Deel, 17 miles south-west of Limerick. R. is a place of some inland commerce, but possesses no manufactures of any note. It is remarkable as a chief center of the Palatine settlers introduced into Ireland soon after the close of the Jacobite war. Several of the families still remain in the district. The population in 1861 numbered 2761, and in 1881 had decreased to 2549.

RATHLI'N, ISLAND OF, an island 6½ miles in length by 1½ miles in breadth, in the barony of Carey, county of Antrim, Ireland, 6½ miles distant from the coast at Ballycastle, lat. 54° 36′ N., long. 9° 15′ W., supposed to be the Ricinia of Ptolemy, and Ricnia of Pliny, and called variously by later writers Rachri, Raghlin, and Ragheren, or Ragh Erin, fortress of Ireland. R. has been known in history since the days of the first religious migrations of the Irish monks under Columba; it was the scene of more than one struggle in the Danish wars, and it afforded shelter, after his defeat in Scotland, to Robert Bruce. In 1558, the Scottish colony which then inhabited the island was attacked by the Lord-deputy Sussex, and expelled from the island with such slaughter, that in 1590 R. was said to be entirely uninhabited. The geological formation of R. is basalt with limestone, and on the east side the basalt takes a columnar form, similar to that of the Giant's Causeway on the Irish, and of Staffa on the Scottish shore. The soil is light, but in the sheltered valleys productive. Formerly, a considerable industry existed on the island in the manufacture of kelp; but since the cessation of that trade (see KELP) the population, which in 1841 amounted to 1039, had, after a lapse of 30 years, been reduced to less than half that number.

RA'TIBOR, a town of Prussia, in Upper Silesia, stands on the left bank of the Oder, 44 miles south-south-west of Oppeln. It is a growing town, and a station on the Breslau and Vienna Railway. Pop. (1880) 18,373, who are employed in the grain and timber trade and in the manufacture of tobacco.

RATIFICA'TION is a legal term used in the law of Scotland to denote the acknowledgment made by a married woman apart from her husband, and before a justice of the peace, that a deed executed by her is voluntary, and made with full knowledge of its legal effect. In this sense, the term corresponds to what is technically called in England an acknowledgment by a married woman. With regard to minors, the term is also technically used to denote the kind of confirmation or approval given by a person arrived at majority to acts done by him during minority, and which has the effect of conclusively establishing the validity of the act, which would otherwise be voidable.

RATING OF MEN, in the Navy, signifies the grade in which the man is entered on the ship's books; as, rated a petty officer, rated an able seaman, &c.

RATINGS of ships are classifications by which certain allowances, the complement of officers, and other arrangements, are regulated. This rating is for merely official and administrative purposes, and gives no idea of the force of the ships. The classification at present is as follows: 1. Rated ships. *First-rates*—all ships carrying 110 guns and upwards, or 1000 men and upwards. *Second-rates*—one of the Queen's yachts; all ships above 80 guns and under 110, or with crews of from 800 to 999 men. *Third-rates*—the Queen's other yachts; vessels bearing the flag or pendant of any admiral-superintendent or captain-superintendent of the Royal Dockyards; all ships of 60 to 80 guns, or carrying 600 to 799 men. *Fourth-rates*—all frigate-built ships carrying from 410 to 600 men. *Fifth-rates*—all ships of from 300 to 400 men. *Sixth-rates*—all other ships bearing captains. 2. Sloops—comprising all vessels bearing commanders, and having the principal armament on one deck in broadside ports, 3. Gun-vessels—all vessels having commanders, and carrying their principal armament on one deck amidships. 4. All other ships and smaller vessels commanded by lieutenants.

RA'TIO. See PROPORTION.

RATION, in the Army and Navy, is the allowance of provisions granted to each officer, non-commissioned officer, soldier, or sailor. The army ration at home is ¾ lb. of meat, and 1 lb. of bread ('best seconds') if in barracks, or ¾ lb. of meat with 1½ lb. of bread if in camp. If a grocery ration is also issued, 1½*d.* for each such ration is deducted from the pay of the recipient. When men are not supplied with rations, an allowauce of 6*d.* per diem is granted. Abroad, the ration is 1 lb. of bread, or ¾ lb. of biscuit, and 1 lb. of fresh or salt meat, except at certain stations, where, for climatic reasons, a different ration is specially provided. The bread ration may be increased during operations in the field, though not above 1½ lb. of bread or 1 lb. of biscuit. During active operations, the officer commanding may direct the issue, in addition to the above, of wine, spirits, or any other article of subsistence equivalent thereto. The stoppage for this foreign ration is 1*d.* The families of soldiers accompanying them abroad are allowed the following rations: the wife (married under regulation), half a ration; each legitimate child under 7, a quarter ration; from 7 to 14, a third part of a ration. When officers receive a colonial allowance in lieu of rations in kind, each is subjected to a daily stoppage of 2½*d.* A ration of forage at home consists of 10 lbs. of oats, 12 lbs. of hay, and 8 lbs. of straw for each horse. Cavalry soldiers receive this without stoppage; but their officers suffer a deduction of 8½*d.* per ration. Staff-officers and mounted officers of infantry provide their own forage, and are granted a pecuniary allowance of 1*s.* 10*d.* per day to enable them to do so.

The full navy ration consists of the following articles: Daily—1½ lb. of ship-biscuit, or 1½ lb. of soft bread, ½ pint of spirit, 2 oz. sugar, 1 oz. chocolate, ½ oz. tea; 1 lb. fresh meat, and ½ lb. of fresh vegetables, when these are procurable; otherwise, 1 lb. salt pork, with ½ pint split peas, or 1 lb. of salt beef, with 9 oz. flour, ¾ oz. suet, and 1½ oz. of currants or raisins. On alternate salt beef days—2 oz. preserved potatoes. Weekly—½ pint oatmeal, ½ oz. mustard, ½ oz. pepper, ½ pint vinegar.

The sailor's ration is issued free of any stoppage.

RA'TIONALISM (Lat. *ratio*, reason) strictly signifies that method of thought which in matters of religion not only allows the use of reason, but considers it indispensable. The term has now, however, acquired a wider meaning, and stands in opposition to *Supranaturalism*, or the belief in that which either transcends, or, as others view it, contradicts, both nature and reason as, for example, miracles. To comprehend rightly the struggle between Rationalism and Supranaturalism, in modern Protestant theology, one must look at it from a historical point of view. The German and Swiss divines, in maintaining their polemic against Roman Catholicism (after the original enthusiasm of the Reformation had cooled down), took their stand on the absolute authority of the Bible as a purely divine book, containing no admixture of error of any kind, either in form or substance—the very vowel-points of the Hebrew (an innovation long posterior even to Christianity) being expressly held to be inspired. This, the oldest and most stringent kind of Protestant orthodoxy, gradually fell to pieces, partly on account of its unscientific character, and partly because it was demonstrated that the Bible itself put forth no pretensions to such infallibility. The first con-

cessions to Rationalism were the admissions that the biblical writers differed in regard to their style and literary merit; next (as a logical inference from the foregoing), that they exercised a certain amount of independent power in the composition of their works.

But gradually other points were assailed, some of which have been surrendered, while others are still tenaciously held, as that, in matters of physical science, the sacred writers spoke according to the conceptions and belief prevalent in their age, and not according to any supernatural enlightenment; that, on historical points, their information might be either erroneous or defective, or both; that they might err in anything except religious doctrine or sentiment; finally, that they might err in such too, and that the Bible is not the 'Word of God,' but only contains that 'Word,' which it is the province of human reason to discover, and to separate from whatever accretions of fable, myth, symbolism, or error have grown over it through the agency of man or the lapse of time. This is properly the theological Rationalism of modern times, and is held in Germany, France, Holland, England, and America by many divines, who, nevertheless, look upon themselves as essentially Christians in their creed. But as most investigators that proceed so far, take yet a further step, and deny the presence of any element other than human in the Bible, or that there is any satisfactory evidence of the truth of its alleged supranaturalism, the word Rationalism has, in vulgar parlance, come to be synonymous with infidelity. It may also be added that the term Rationalism is also employed in a restricted sense to denote the method of substituting for the miraculous and supernatural in Scripture, something considered reasonable—e. g., the miracle of the crossing of the Red Sea is explained by the hypothesis that the Israelites crossed when the tide was out, while Egyptians hurriedly pursuing them, were taken in the returning waters. The leader of this school was *Paulus* (q. v.), whose system after a time, gave way to the more scientific mythical theory of Strauss (q. v.).

RA'TIOS, PRIME AND ULTIMATE. There can be little doubt that Newton discovered by means of fluxions, of which he was in possession at a very early age, the greater part of that extraordinary series of theorems regarding motion, &c., which he first published in the *Principia*. He had, however, a great partiality for the synthetic form of demonstration, employed with such success by the Greek geometers; and the consequence was that, in the *Principia*, he avoided entirely the use of analysis by fluxions, and invented for synthetical applications, the closely allied method of Prime and Ultimate Ratios. The fundamental idea involved in fluxions, prime and ultimate ratios, and the differential calculus, is the same, that of a *Limit* (q. v.).

To give an idea of the nature, as well as to show the origin of the name, of the method, we may take a very simple case. Let a particle be projected in the direction AP; it will move uniformly in that line for ever, unless deflected from it by some external force. See MOTION, LAWS OF. Suppose that gravity alone acts upon it, then (see PROJECTILES) it will describe a parabolic path, AQ, to which AP is the tangent at A; and the line PQ, which joins the disturbed and undisturbed positions of the particle at

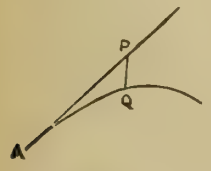


Fig. 1.



Fig. 2.

any instant, is vertical. Now, the lengths of AP and AQ are not, in general, equal, but they are more and more nearly equal as both are smaller; and, by taking each small enough, we may make the *percentage* of difference between them as small as we choose. In other words, their *prime ratio*, just at A, is unity. Again, the inscribed square is less than a circle; the octagon greater than the square, but less than the circle; the regular polygon of 16 sides greater than the octagon, but less than the circle; and so on, constantly doubling the number of sides. But it can be shown that the difference of area between the polygon and the circle may be made as small a percentage of the area of the circle as we please, by making the sides of the polygon numerous enough. Hence, the *ultimate ratio* of the areas of the circle, and inscribed polygon with an indefinitely great number of equal sides, is unity.

The basis of the method, which is implicitly involved in the foregoing illustrations, is Newton's *First Lemma:* 'Quantities, and the ratios of quantities, which tend constantly to equality, and may be made to approximate to each other by less than any assignable difference, become ultimately equal.' In other words, if we can make the *percentage* of difference of two quantities as small as we choose, we must produce ultimate equality.

From this, in his second and third Lemmas, Newton proves the fundamental principle of the integral calculus as applied to the determination of the areas of curves, by showing that if a set of parallelograms, as in the figure, be inscribed in any curvilinear space, the percentage of difference between the sum of their areas and that of the curve may be made as small as we please by diminishing indefinitely the breadth of each parallelogram, and increasing their number proportionally.

Next, he shows how to compare two curvilinear spaces, by supposing them filled with such parallelograms, each of the first bearing to one of the second a constant ratio.

Next, that the homologous sides of similar *curvilinear* figures are proportional.

The sixth Lemma is merely a definition of continuous curvature in a curve, as distinguished from abrupt change of direction.

The seventh, eighth, and ninth Lemmas are of very great importance. The general principle involved in their proof is this—to examine what occurs in indefinitely small arcs, by drawing a magnified representation of them such as always to be on a finite scale, however small the arcs themselves may be. Thus, to show that the chord of a small arc is ultimately equal to the arc—of which we have in Trigonometry (q. v.) as a particular case, the ultimate equality of an arc and its sine—he proceeds somewhat as follows: Let AB be an arc of continued curvature, AC the tangent at A. Produce the chord AB till it has a *finite* length, A*b*. Describe on A*b*, as chord, an arc similar to AB. This, by a pre-

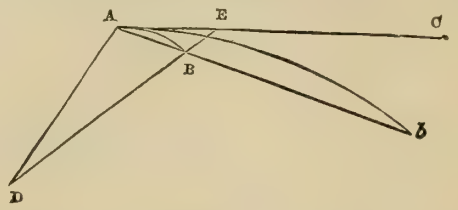


Fig. 3.

vious lemma, will touch AC at A. Now, as B moves up to A, let the same construction be perpetually made, then *b* will approximate more and more closely to AC (because the arc AB is one of continuous curvature), and the magnified arc will constantly lie between AC and A*b*. Hence, ultimately, when A*b* and AC coincide in direction, the arc A*b* (which is always between them) will coincide with A*b*. Similarly, AD being any line making a finite angle with AC, draw DBE cutting off a finite length from AD; this process enables us to prove that the triangles AED, and the rectilinear and curvilinear triangles ABD, are all ultimately equal.

Finally (and this is the step of the greatest importance in the dynamical applications), if the lines AD, DE, D'E' be drawn under the above restrictions, the ultimate ratio of the curvilinear or

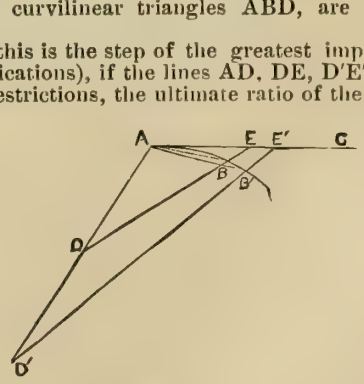


Fig. 4.

rectilinear triangles AEB, AE'B' is that of the squares of corresponding sides. From this, in the ninth and last Lemma, it is easily shown that the spaces described under the action of a finite force have their prime ratios as the squares of the times; whence we pass at once to the ever-memorable investigation of the *Principia* regarding the orbits described under the action of various forces.

The method of prime and ultimate ratios is little used now (except in Cambridge, which does honor to itself in making part of the *Principia* a subject of study), as the differential and integral calculus help us to the required results with far greater ease. But to the true student of natural philosophy, the synthetic method of Newton is of very great value, as it shows him clearly at every step the nature of the process he is carrying out, which is too apt to be lost sight of entirely in the semi-mechanical procedures common to all forms of symbolical reasoning.

RA'TISBON. See REGENSBURG.

RA'TLINES, or RATLINGS, are steps in the ladders by which sailors ascend from the deck to the mast-heads. They consist of thin cords fastened horizontally across the shrouds at an easy step apart, thus forming a convenient ladder. To prevent the ratline slipping, it is commonly tied to the shroud in a peculiar knot commonly called a clove-hitch.

RAT-SNAKE (*Coryphodon Blumenbachii*), a serpent of the family *Colubridæ* (see COLUBER), which is often kept in a state of domestication in Ceylon, on account of its usefulness in killing rats. Like the rest of its family, it is destitute of poison-fangs. It is capable of being rendered very tame, and displays considerable intelligence.

RAT-TAIL MAGGOT, the larva of a dipterous insect, *Eristalis tenax*, of the family *Muscidæ*. It inhabits mud, and breathes by means of tubes attached in telescope fashion to the tail, which terminates in a brush of hairs, and is always held up to the surface of the water, being elongated when the depth of water increases. The perfect insect is very like a bee.

RATTA'N, RATAN, or ROTTANG (*Calamus*), a genus of palms very different in habit from most of the order; having a reed-like, slender, often jointed, and extremely long stem, sometimes even 1000 feet or upwards in length. The name R. is extended to others of the same tribe of palms, having the same general habit, although constituted by botanists into different genera. The stem, which is very smooth, and hard and silicious externally, is either erect, or ascends and descends among trees; often laying hold as it ascends by means of hooked prickles, the extremities of the midribs of its leaves, which are scattered at considerable intervals along its whole length, and envelop it by their sheathing stalks, and then descending in graceful festoons to climb again a neighboring tree. Sometimes, however, there are no leaves scattered along the stem. Sir James E. Tennent says, in his work on Ceylon : 'I have seen a specimen 250 feet long, and an inch in diameter, without a single irregularity, and no appearance of foliage other than the bunch of feathery leaves at the extremity.' The leaves are always pinnate, and very beautiful. The fruit is a dry berry, covered with imbricated scales, and generally one-seeded.

The species are very numerous, all natives of the East Indies. A few species are found in the southern parts of India; but they abound along the southern foot of the Himalaya, in Chittagong, Silhet, Assam, the south-east of Asia, and many of the islands of that region. They are all very useful, are much employed in their native countries, for making plaited work, ropes, &c., and are very largely imported into Britain and other parts of the world, generally under the name of *Cane*, and chiefly in order to be used for plaited or wicker work.—Bridges of great strength are made, in some parts of the East, of the stems of these palms. They are twisted into ropes in some parts of the East, which are used for binding wild elephants, and for other purposes requiring great strength; the vessels of Java, Sumatra, and neighboring regions, are very generally furnished with cables made of them, which are extensively manufactured at Malacca; and the Chinese make ropes of rattans by splitting them longitudinally, soaking them, and attaching them to a wheel, which is kept in motion, whilst new rattans are added, one by one, to increase the length of the rope.—The species called *Calamus rudentium*, which has very long stems, is much employed in rope-making. Many species probably furnish the canes of commerce, one of which, *C. verus*, a native of India, is only about 20 feet in length.

The elegant walking-canes called *Malacca Canes* are believed to be the produce of *C. scipionum;* the plant, however, does not grow in Malacca, but in Sumatra.—Small stems of R. are used as a substitute for whalebone in umbrellas.—The fruit of some species of R. is a delicate article of food; and the young shoots, variously dressed, are equal to the finest of vegetables.—A very fine kind of *Dragon's Blood* (q. v.) is obtained from a species of R. (*C. Draco*), and particularly from the fruit, on the surface of which it appears as a resinous exudation. Various methods are employed for collecting it.

The canes of commerce are usually imported in bundles of 100 canes, each cane from 15 to 20 feet in length; from 200,000 to 300,000 of these bundles are annually imported into Britain.

RA'TTANY, or RHATANY (*Krameria triandra*), a half-shrubby plant of the natural order *Polygaleæ*, a native of the cold sterile table-lands of the Andes in Peru and Bolivia. It is called *Ratanhia* in Peru. It is valued for the medicinal properties of the root, which are shared more or less by other species of the same genus, also natives of South America. The dried root is a powerful astringent, and a useful tonic; and is employed in mucous discharges, passive hæmorrhages, and cases of relaxation and debility. It is also used as a tooth-powder, often mixed with orris-root and charcoal. R. root is imported from different parts of South America, but chiefly from Lima. It is extensively imported into Portugal in order to communicate a rich red color to wines. The peculiar properties of R. root are supposed to be chiefly owing to an acid called *Krameric Acid*.

RATTAZZI, URBANO, an Italian statesman, was born in the middle ranks of life, at Alessandria (Piedmont), in 1810. He was an advocate at Casale, where, in 1847, he was President of the Agricultural Committee. After the proclamation of the constitution in 1848, he was elected member for Alessandria, and began his political career as a democrat. His knowledge, eloquence, and liberal principles raised him to the ministry, and his first act was to write to the bishops, threatening to have them arrested, if they should preach against liberty. He resisted his chief, Gioberti, who wished to send Piedmontese soldiers into Tuscany and Rome, to prevent the occupation of these places by the Austrians and French; urged Charles Albert into a new war with Austria, and after the defeat of Novara, was obliged to retire from the ministry. After Napoleon's *coup d'état*, the liberty of Piedmont was threatened, and Cavour, R., and their parties joined together to defend it. This union was called *connubio*. R. took the portfolio of Minister of Justice in the Cavour Ministry in 1854, and presented the bill for the abolition of convents. The priests were up in arms against him, and he was strenuously opposed by the Catholic party. After the Mazzinian movement in 1857, being accused of weakness in suppressing it, he retired. After the peace of Villafranca, he returned to the ministry. He did not wish to accept definitively the annexation of the Duchies, because he knew that the price of it was Savoy and Nice, which he was unwilling to give up; and being, as is alleged, secretly undermined by Cavour and Sir James Hudson, he fell. In 1862, R. was intrusted with the formation of a new ministry. His policy was an attempt to secure the development of Italian liberty and unity by peaceful and diplomatic means. He opposed Garibaldi's expedition against Rome in that year, so that its result was the disaster at Aspromonte. His ministry failed to secure the confidence of parliament, and he accordingly resigned at the end of the year 1862. He returned to office in 1867, but had to resign the same year. He died June 5, 1873.

RA'TTLESNAKE (*Crotalus*) a genus of serpents of the family *Crotalidæ*, distinguished from the rest of that family by the rattle at the end of the tail. They are also characterized by having only one row of plates under the tail. The genus is subdivided by many authors according to the scales and shields with which the head is covered in different species. All the species are American, and are much dreaded for their deadly venom, although they seldom assail man, unless molested, and the rattle often gives timely warning of danger. The R. is often found at rest in a coiled form, with the rattle somewhat erected from the center of the coil; and when it begins to be irritated, the rattle shakes. Rattlesnakes are generally rather sluggish in their movements, but they are most active and most dangerous in the warmest weather, their bite being more formidable at such a time as well as more readily inflicted. The effects of the bite are various, according not only to the condition of the serpent, but also according to the constitution of the person bitten, and the place into which the fangs have been inserted, the worst case being when the poison immediately enters a large vein, and so is carried at once to the most vital parts. Death to human beings has been known to ensue in a few minutes, whilst in other cases, hours or days have elapsed, and sometimes the sufferer recovers. Almost all animals show what may be deemed an instinctive dread of the R., and a great unwillingness to approach it. Hogs and peccaries, however, are so far from regarding it with dread, that they kill and eat it, finding safety from its venom probably not in any peculiarity of constitution, but in their thickness of skin, and the thickness of the layer of fat under the skin. Rattlesnakes are viviparous, and exhibit attachment to their young. It is said of them, as of the viper, that on the appearance of danger, the mother receives her young ones into her mouth and gullet, or stomach, ejecting them again uninjured when the danger is past, but the same doubt attaches to the story as in the case of the viper. The power of Fascination (q. v.) has not been more frequently ascribed to any kind of serpent.

The rattle is a very peculiar appendage. It consists of a number of thin horny cells, jointed together; each, except the terminal one, of a conical form, and in great part covered by that next to it, against the sides of which its apex strikes when the rattle is shaken, so as to produce a rustling or rattling noise. It is generally believed that the number of joints in the rattle increases with the age of the serpent, one being added at each casting of the skin. One species of R. (*Crotalus horridus*), sometimes called the CARCAVELA, is found in the warm parts both of North and South America. Its muzzle is covered by three or four pairs of plates. Its scales have a sharp elevated keel. It attains the length of eight feet, although it is seldom found of so great a size. Its color is yellowish-brown above, with a broad dark streak on each side of the neck, and a series of broad lozenge-shaped spots on the back.—Another species, *Crotalus* or *Uropsophus*

durissus, extends further northward, as far as the southern shores of the great lakes. It is of a pale brown color, with a dark streak across the temples, and dark spots on the body, often assuming the form of bands; the keel of the scales not so strongly developed, and the muzzle with fewer shields than in the former



Rattlesnake (*Crotalus horridus*).

species, which it resembles in size. A third species, *Crotalus* or *Crotalophorus miliaris*, having the head completely covered with large shields, is also common in many parts of North America, and is as much dreaded as either of those already named, notwithstanding its much smaller size, because the sound of its rattle is so feeble as not readily to attract attention. It is of a brownish-olive color, with brown spots on the back and sides, the belly black.—In the colder countries which they inhabit, rattlesnakes spend the winter in a torpid state, retiring for that purpose into holes, or hiding themselves among moss.

RATZ BOSZORMENY. See Böszormeny.

RAUCH, Christian Daniel, one of the most distinguished German sculptors, was born at Arolsen, the capital of the principality of Waldeck, in 1777. He early began the study of sculpture; but on the death of his father, in 1797, he was obliged to go to Berlin, where he became valet to Frederick-William II., king of Prussia. On the death of that prince, R. determined to follow the bent of his inclination for the fine arts. In this he was assisted by the new king Frederick-William III., who afforded him facilities for designing and modelling statues, and recommended him as a pupil in the Academy of the Fine Arts. A statue of Endymion and a bust of Queen Luise of Prussia executed at this time, convinced the king of R.'s abilities, and he gave him the means of proceeding to Rome for his further improvement. R. spent six years in that city, working at his profession with much assiduity, to render himself worthy of the friendship of Thorwaldsen and Canova. At Rome, he also enjoyed the friendship of William Humboldt, at that time Prussian minister there.

Among his works at this time were bassi-rilievi of 'Hippolytus and Phædra,' a 'Mars and Venus wounded by Diomedes,' a colossal bust of the king of Prussia, and busts of Raphael Mengs and the Count de Wengersky. In 1811, he was called by the king of Prussia to Berlin to execute a monumental statue of Queen Luise. This great work obtained for R. a European reputation. It is placed in the mausoleum of the queen in the garden of Charlottenburg. R. was not, however, quite satisfied with this triumph of his art, but commenced a new statue of the queen, which he finished 11 years afterwards, and which is allowed to be a masterpiece of sculpture. It is placed in the palace of San Souci, near Potsdam. R. after this, lived principally at Berlin, but occasionally visited Rome, Carrara, and Munich. He labored indefatigably in his profession, and by 1824, had executed 70 busts in marble, of which 20 were of colossal size.

R.'s principal works, besides those above mentioned, are—two colossal bronze statues of Field-marshal Blücher, one of which was erected, with great solemnity, at Breslau in 1827; a bronze statue of Maximilian of Bavaria, erected at Munich in 1835; and statues of Albert Dürer, Goethe, Schiller, and Schleiermacher, erected in various places in Germany. His greatest work is the magnificent monument of Frederick the Great, which adorns Berlin. The model for this statue was designed by R. in conjunction with Professor Schinkel, the architect, in 1830; and after 20 years' labor, the statue was finished in 1850, and was inaugurated with great pomp in May 1851.

In his works, R. has the merit of having surmounted the difficulties which modern costume opposes to the ideal representation of personages of the present age; and while he preserved the salient points of his model, he possessed the art of sacrificing the less important details to the exigences of the beautiful. He died at Dresden on December 3, 1857.

RAU'HÉS HAUS is the name of a great institution founded and hitherto managed by Wichern at Horn, near Hamburg, in connection with the German Home Mission (*Innere Mission*). It is partly a refuge for morally neglected children; partly a boarding-school for the moral and intellectual education of children of the higher classes; lastly, a training-school for those who wish to become teachers or officials in houses of correction, hospitals, &c., in promotion of the objects of the Home Mission. The first foundation of this model institution—for such it has become for Germany as well as for France—was laid by a wealthy citizen of Hamburg, who made over to it a piece of land. It was opened on November 1, 1831, by Wichern with 12 morally neglected children. By the addition of new houses, the whole has, however, been very much enlarged, and has of late almost grown into a colony. A printing-office, a bookbinder's shop, and bookselling form part of the institution. Recently, about 100 neglected children (one-third are girls) received their education in the establishment. They live in families of 12, each family being under the paternal superintendence of a young artisan, who employs the children according to their capabilities, partly in indoor, partly in outdoor, manual labor. The watching and care of these children devolve on assistants, who also take part in the instruction, of the institution with a view to prepare themselves for the work of the Home Mission in other institutions. These instructors receive board and clothing, but no salary.

In connection with the R. H., there was founded in 1845 a kind of conventual institute for the education of young men, with a view to become heads or superintendents of similar institutions. Entrance into this institution is limited to the age of 20—30. Besides religious belief and good character, freedom from military duties, bodily and mental health, some scholastic acquirements, and a knowledge of some craft or of agriculture, are required. The boarding-school was established in 1851, and at the same time a seminary was founded, in which 12 brethren of the R. H. are especially prepared for school-work.

RAUMER, Fried. Ludw. Georg von, a noted German historical writer, was born on May 14, 1781, in Wörlitz, near Dessau; studied law and political economy at Halle and Göttingen; filled different law appointments (1806—1811); and in the last-mentioned year was named Professor at Breslau. In 1819, he was called to Berlin as Professor of History and Political Economy. Among his writings may be mentioned—*Sechs Dialoge über Krieg und Handel* (1806); *Das Brittische Besteuerungssystem* (Berl. 1810); *The Orations of Æschines and Demosthenes de Corona* (Berl. 1811); *CCI Emendationes ad Tabulas Genealogicas Arabum et Turcarum* (Heidelb. 1811); *Handbuch merkwürdiger Stellen aus den lat. Geschichtschreibern des Mittelalters* (Handbook of Remarkable Passages in the Latin Historians of the Middle Ages, Bresl. 1813); *Vorlesungen über die alte Geschichte* (Lectures on Ancient History, 2 vols. Leip. 1847); *Geschichte der Hohenstaufen und ihrer Zeit* (History of the Hohenstaufen dynasty and their Time, 6 vols. Leip. 1823—1825); *Ueber die geschichtliche Entwickelung der Begriffe von Recht, Staat und Politik* (On the Historical Development of the Ideas of Law, State, and Politics, 2d ed. Leip. 1832); *Prussian Municipal Law* (Leip. 1828); *Briefe aus Paris und Frankreich*, 1830 (2 vols. Leip. 1831); *Briefe aus Paris zur Erläuterung des Geschichte des 16th und 17th Jahrh.* (2 vols. Leip. 1831); *Geschichte Europas seit dem Ende des 15 Jahrh.* (History of Europe from the End of the 15th Century, vols. 1—8, Leip. 1832—1850); *England*, 1835 (2 vols. Leip. 1836); *England*, 1841 (3 vols. Leip. 1842); *Beiträge zur Neuern Geschichte aus dem Brit. Museum*, &c. (5 vols. Leip. 1836—1839); *Italie: Beiträge zur Kenntniss dieses Landes* (2 vols. Leip. 1840); *Die Vereinigten Staaten Von Nordamerika* (2 vols. Leip. 1845); *Antiquarische Briefe* (Leip. 1851); *Handbuch zur Geschichte der Literatur* (1864—1866). He also edited the *Historisches Taschenbuch*, &c. The unfavorable reception of an oration of R. in honor of King Frederick II. compelled him, in 1847, to resign the secretaryship of the Academy of Sciences at Berlin. R. was a member of the Frankfurt parliament, where he belonged to the right center. Subsequently he became ambassador at Paris, and then member of the first chamber at Berlin. In 1853, he became Professor Emeritus at the university of Berlin. He died in June 1873.

RAUMER, Karl Georg von, brother of the preceding, was born April 9, 1783, in Wörlitz, studied from 1801—1805 at Göttingen and Halle, then at the Mining Academy at Freiberg, and was appointed Professor of Mineralogy at Breslau University in 1811. He took part as a volunteer in the War of Liberation (1813—1814), was translated in 1819 to the university of Halle; and finally, in 1827, was appointed Professor of Mineralogy and Natural History in the university of Erlangen, where he died in 1865. R. obtained a wide reputation by his geographical and geological writings, among which are *Geognostiche Fragmente* (Geognostic Fragments, Nürnb. 1811); *Der Granit des Riesengebirges* (The Granite of the Riesengebirge, Berl. 1813); *Das Gebirge Niederschlesiens* (The Mountains of Lower Silesia, Berl. 1819); *A B C Buch der Krystallkunde* (The A B C of Crystallography, 2 vols. Berl. 1817; sup-

plem. 1821). His interest in literary and scholastic education is evinced in his valuable *Geschichte der Pädagogik* (History of Pedagogy, 4 vols. Stuttg. 1846—1855). Other works are his *Lehrbuch der allgemeinen Geographie* (Manual of Universal Geography (Leip. 1848); *Palestine* (Leip. 1850); *Beschreibung der Erdoberfläche* (Description of the Earth's Surface, 6th ed. 1866); and *Kreuzzüge* (1840—64). His autobiography appeared after his death, 1866.

RAUPACH, Ernst Benj. Sal., a German dramatist, born on May 21, 1784, in Straubitz (Silesia), received his education in the Gymnasium at Leignitz, studied theology at Halle, was for ten years tutor in Russia, held lectures at St. Petersburg University, and was subsequently (1816) appointed there Professor of Philosophy, German Literature and History. R. left Russia in 1822, and died at Berlin, March 18, 1852. Among his early plays, the following are noteworthy—*The Princes Chawansky* (1818); *Die Gefesselten* (The Enchained, 1821); *Der Liebe Zauberkreis* (The Magic Ring of Love, 1824); *Die Freunde* (The Friends, 1825); *Isidor und Olga* (1826); *Rafaele* (1828); *Die Tochter der Luft* (The Daughter of the Air), after Calderon (1829). Among his comedies may be mentioned —*Critic und Anticritic; Die Schleichhändler* (The Smugglers); *Der Zeitgeist* (The Spirit of the Time); *Das Sonnett;* and the farces; *Denk an Cäsar* (Remember Cæsar), and *Schelle im Monde.* Of his posthumous works, the principal are—*Jacobine von Holland* (1852); *Der Kegelspieler* (The Player at Nine-pins); the tragi-comedy, *Mulier taceat in Ecclesia* (1853); and *Seed and Fruit* (1854). R.'s writings display great knowledge of stage-effect, a happy talent for the invention of new and interesting situations, a power of vivid dramatic diction, and a fine play of verbal wit.

RAVAILLAC, François, a native of the French province of Angoulême, where he was born in 1578, has acquired an obnoxious reputation as the murderer of Henri IV. of France. In early life, R. was in turn clerk to a notary and master of a school; but having fallen into debt, he was thrown into prison, the confinement and restraint of which preyed upon his health, and produced hallucinations of mind. Under the influence of this mental excitement, he renounced all secular pursuits; and on his release from prison, after having served for a time in the order of the Feuillants, he fell under the influence of the Jesuits, through whose instrumentality it is believed that his insane hatred of the Huguenots, as the enemies of the church, was directed more especially against Henri of Navarre, their former leader. Having resolved to assassinate the king, he eagerly watched his opportunity, and on the 14th of May 1610, as the king was passing in his coach through the narrow street of Laferronnerie, got upon the right hinder-wheel of the carriage at the moment that its further advance was hindered by a heavy wagon in front of it, and leaning forward, he plunged a knife into the breast of the king. The first blow glanced aside, but at the second thrust, the knife entered the heart. R. escaped in the confusion, but being soon captured with the knife still in his hand, he admitted his guilt; and having been formally tried and condemned, he was put to the torture; and suffered death on May 27, in the Place de Grève, under circumstances of great cruelty, his body being torn asunder by horses. R. refused to the last to acknowledge whether he had had instigators or abettors, and hence the widest scope was given to conjecture, suspicion being in turn directed to the queen, Marie de' Medici, and her favorites, the Concini, to the Duc d'Epernon, and to the Spanish court and their Jesuit advisers, but there is no good ground for such suspicions. M. Henri Martin (*Histoire de France*) and M. Poirson (*Histoire de Henri IV., tome II.*) have examined the particulars of the process instituted against R. with scrupulous impartiality, and have come to the conclusion that the real cause of the crime was fanaticism degenerated into monomania.

RAVAN'A (from the causal of the Sanscrit *ru*, cry, alarm, hence literally he who causes alarm) is the name of the *Râkshasa* (q. v.) who, at the time of Râma, ruled over Lankâ or Ceylon, and having carried off Sîtâ, the wife of Râma, to his residence, was ultimately conquered and slain by the latter. Râvan'a is described as having been a giant with ten faces, and in consequence of austerities and devotion, as having obtained from S'iva a promise which bestowed upon him illimited power, even over the gods. As the promise of S'iva could not be revoked, Vishn'u evaded its efficacy in becoming incarnate as Râma, and hence killed the demon-giant. See under Vishn'u and Rakshasa.

RA'VELIN, in Fortification, is a triangular work of less elevation than the main defences, situated with its salient angle to the front before the curtain, which with the shoulders of the adjoining bastions, it serves to protect. It is open at the rear, so as to be commanded by the curtain, if taken, and is separated from that work by the main ditch, while in its own front the ditch of the ravelin intervenes between itself and the covert-way. The guns of the ravelin sweep the glacis, and perform a very important function in commanding the space immediately before the salient angles of the two next bastions, ground which the guns of the bastions themselves cannot cover. The bastions, on the other hand, flank the ravelin. In the fortifications of Alessandria, designed by Bousmard in 1803, the ravelins are placed in front of the glacis. See the diagrams in art. Fortification.

The original name of the ravelin was *rivellino*, which indicates a derivation from *vegliare*, to watch, the ravelin having probably been at first a watch-tower, answering to the still earlier barbacan.

RAVEN (*Corvus corax*) a species of Crow (q. v.), remarkable for its large size. It is more than two feet in length from the tip of the bill to the extremity of the tail. The bill is thick and strong, compressed at the sides, the mandibles sharp at the edges; the upper mandible curved at the tip, and exceeding the lower in length. The base of the bill is surrounded with feathers and bristles. The tail is rounded, but the middle feathers are considerably the longest. The wings are long—extending from tip to tip to 52 inches—the fourth quill feather being longest. The color is a uniform black, with more or less of metallic lustre, which is particularly conspicuous in the elongated throat-feathers of the male, and is wanting in the whole plumage of the female and young.



Raven (*Corvus corax*).

The R. is a bird of wide geographic distribution. It is found in almost all parts of the northern hemisphere, but most abundantly in the more northern and the mountainous parts of it. In other parts of the world, and within the northern hemisphere itself, however, other closely allied species have probably been often mistaken for it. There are several species of crow very similar to the R. in color, size, and habits.

The R. is generally to be seen either solitary or in pairs. It is one of the most thoroughly omnivorous of birds. It feeds on fruits and nuts in forests; it picks up worms or molluscs; it sucks eggs; it kills young hares, or even lambs; it rejoices in carrion, and not unfrequently attacks weak or sickly beasts, almost invariably choosing their eyes as its first point of assault. It generally makes its nest of sticks, coarse weeds, wool, hair, &c., in rocky places, on a narrow ledge of a precipice, or in some similar situation. Ravens are occasionally captured when young, and become interesting pets, being remarkable for their impudence and cunning, their look of sage thoughtfulness, their inquisitiveness, their mischievous propensities, which prompt them to destroy everything that can be destroyed, and always as if the fact of its destruction afforded them pleasure, their thievishness, their love of glittering things, and their power of imitating human speech, which is almost equal to that of parrots. The R. is celebrated for its longevity, and instances are on record of ravens which have certainly lived for seventy or eighty years.

The R. has been generally reckoned a bird of ill-omen, probably on account both of its color and its extremely harsh croaking voice, which may sometimes be heard in fine weather as if coming from the sky, the R. being a bird of powerful wing, and often soaring very high in the air.

RAVE'NNA, an important city of Central Italy, 43 miles east-south-east from Bologna, and 4½ miles from the Adriatic; lat. 44° 24′ N., long. 12° 12′ E. Pop. (1881) of the commune, 60,573; of the town proper, 12,100. It is situated in the midst of a well-watered, fertile, and finely-wooded plain. R. is surrounded by old bastions, and by walls where may still be seen the iron rings to which the cables of ships were formerly fastened; the sea is now at the distance of about 4 miles from the city. The streets are wide; the squares are adorned with statues of the popes, and the houses have a gloomy appearance. R. is an ancient city, rich in monuments of art. The cathedral, built in the 4th c., was almost wholly rebuilt in 1734; it has five naves, supported by 24 marble pillars. Of the other 14 churches and other architectural antiquities several date from the 5th and 6th centuries. San Francesco possesses the tomb of Dante, erected in the 15th cent.

ury. The library of R. contains 50,000 volumes. It has an archæological museum, and many educational institutions. R. has manufactures of silk, and its trade is facilitated by a canal to the sea.

R. was probably of Umbrian origin; it was at least an Umbrian city when it passed into the hands of the Romans. Augustus made it a first-class seaport and naval station; 400 years later, the Emperor Honorius took refuge there, and made R. the capital of the empire. The city was taken by Odoacer, then by Theodoric and by Totila; the latter was conquered by Narses, who made it the residence of the exarchs in 553. In 1218, it became a republic. In 1275, Guido da Polenta conquered it, and there established his court, where he received Dante. R. was afterwards taken by the Venetians, who kept it till 1509. Under Charles V., it passed into the hands of the popes.

Under the walls of R., a great battle was fought in 1512 between the French and the Spaniards, in which Gaston de Foix purchased victory with his life.

RA'VENSBURG, a town in Würtemburg, and capital of a bailiwick of the same name, in the Circle of the Danube, is pleasantly situated in a fertile and romantic valley, the Schussenthal, at the foot of a hill planted with vines. The principal industries are spinning wool and flax, weaving woollen fabrics, linen, and stockings, bleaching, making paper, playing-cards, furniture, wood-work, sawing wood, &c. Pop. (1880) 9383.

RAVENSCROFT, THOMAS, an eminent English musical composer. He was born in 1592, received his musical education in St. Paul's choir, and had the degree of Bachelor of Music conferred on him when only 15 years of age. In 1611, appeared his *Melismata, Musical Phansies, &c.*, a collection of 23 part-songs, some of them of great beauty; and three years later, he brought out another collection of part-songs under the title of *Brief Discourses*, with an essay on the old musical modes. Turning his attention to psalmody, he published, in 1621, a collection of psalm-tunes for four voices, entitled *The Whole Book of Psalms, composed into Four Parts by Sundry Authors to such Tunes as have been and are usually sung in England, Scotland, Wales, Germany, Italy, France and the Netherlands.* This was the first publication of its kind, and all similar works of later date have been largely indebted to it. Among the contributors to this collection were Tallis, Morley, Dowland, and all the great masters of the day; the name of John Milton, the father of the poet, appears as the composer of York and Norwich tunes; while St. Davids, Canterbury, Bangor, and many others which have since become popular, are by R. himself. Each of the 150 Psalms has a distinct melody assigned it. Two collections of secular songs similar to the *Melismata*, and entitled *Pammelia* and *Deuteromelia*, have been assigned to R.; but it is probable that only a few of these songs were composed by him, while he may have revised and edited the whole. A selection from the *Melismata, Brief Discourses, Pammelia*, and *Deuteromelia* was printed by the Roxburghe Club in 1823. R. died about 1640.

RAVIGNAN, GUSTAVUS FRANCIS XAVIER DELACROIX DE, a celebrated preacher of the Jesuit order, was born at Bayonne, December 2, 1795. He studied in the Lycée Bonaparte at Paris, and having embraced the legal profession, and obtained his degree, was named auditor of the Cour Royale at Paris, and afterwards, in 1821, received an appointment in the Tribunal of the Seine. The prospect thus opened for him, however, soon lost its attractions, and in 1822 he formed the resolution of relinquishing his career at the bar, and entering the church. Having spent some time in the College of St. Sulpice, he soon passed into the novitiate of the Jesuits at Montrouge, and thence to Dole and St. Acheul for his theological studies, at the termination of which he was himself appointed a professor. On the expulsion of the Jesuits from France in 1830, R. withdrew to Freiburg in Switzerland, where he continued to teach in the schools of his own order; but after some time he was transferred to the more congenial duty of preaching, first in several of the Swiss towns, and afterwards in Savoy, at Chambery, at St. Maurice, and other places. At length, in 1835, he appeared in the pulpit of the cathedral of Amiens. In the following year, he was chosen to preach the Lenten sermons at the church of St. Thomas d'Aquin in Paris; and finally, in 1837, was selected to replace Lacordaire (q. v.) at Notre Dame, in the duty of conducting the special 'conferences' for men which had been opened in that church. For ten years Père de R. occupied this pulpit with a success which has rarely been equalled, and his 'conferences' are regarded as models of ecclesiastical eloquence. In 1842, he undertook in addition to preach each evening during the entire Lent; and it is to the excessive fatigue thus induced that the premature breakdown of his strength is ascribed. To the labors of the pulpit, he added those also of the press. He published an Apology of his order in 1844; and in 1854 a more lengthened work with the same view, *Clement XIII. et Clement XIV.*, 2 vols. 8vo, which was intended as a reply to the *Life of Clement XIV.*, by the Oratorian Father Theiner. These, with some occasional sermons and 'conferences,' constitute the sum of the publications issued during his life. In 1855 he was invited by the Emperor Napoleon III., to preach the Lent at the Tuileries. On the 26th February 1858 he died in the convent of his order at Paris, in his 63d year. His Memoirs have been published by his brethren, and a collected edition of his works and remains has been for some time in progress.

RAVINA'LA. See TRAVELER'S TREE.

RAWAL PINDI, a large, walled town of the Punjab, in the doab between the rivers Indus and Jhelum. It contains a large bazaar, and carries on an active transit-trade between Hindustan and Afghanistan, but is not otherwise noteworthy. Pop. (1868) 19,222.

RA'WICZ, a town of Prussia, in the government of Posen, close to the Silesian frontier, 64 miles south of Posen by railway. It is surrounded by walls. Spinning, weaving, brewing manufactures of tobacco and leather, and a considerable trade, are carried on. Pop. (1880) 12,260.

RAWLINSON, SIR HENRY, K.C.B., oriental scholar and diplomatist, was born at Chadlington, Oxfordshire, in 1810, and educated at Ealing, Middlesex. He entered the East India military service in 1826, and served in the Bombay presidency until 1833, when he was appointed to assist in reorganizing the army of the Shah of Persia. He had early devoted himself to eastern languages and antiquarian researches, and when stationed at Kermanshah, in 1835, he began to study the cuneiform (q. v.) inscriptions of Persia. He announced his cuneiform discoveries in 1837—1838 to the Royal Asiatic Society of London, and published his travels in Susiana in the *Geographical Society's Journal*. He also made a translation of the Behistun inscription, a most important event in the history of the study of the old Persian languages. After residing as political agent at Candahar (1840—1842) and Bagdad (from 1843), he returned to England with the rank of Consul-general in 1855. In January 1858, he was elected M.P. for Reigate, but vacated his seat in September, on being appointed a member of the Council of India. In 1859, he proceeded to Teheran as envoy-extraordinary and minister-plenipotentiary to the court of the Shah. He was returned to parliament as member for Frome, and retained his seat till the general election of 1868. In 1871, R. became president of the Royal Geographical Society, an office which he retained until June 1873.

R. is the author of a large number of most valuable papers on geography, archæology, history, and modern politics, chiefly connected with Persia and the surrounding countries. The greater number of these have been read to learned societies, but others have appeared in periodical publications. He is also the author of a work entitled *England and Russia in the East* (1875). R. has not confined his attention to eastern subjects, and his addresses to the Geographical Society, and on geography and history generally to the Midland Institute at Birmingham on October 6, 1873, show how varied and extensive his acquirements are. R. was admitted as corresponding member of the Institute of France in 1837, and in 1852 was made Chevalier of the Order of Merit by the king of Prussia.—RAWLINSON, REV. GEORGE, brother of the preceding, graduated at Oxford, and was elected a fellow and tutor of Exeter College. Appointed Bampton lecturer in 1859, he published his lectures in the following year under the title of *Historic Evidence for the Truth of Christian Records*. Other works of R.'s are an edition of Herodotus, in which many of his brother's discoveries are incorporated; *The Five Great Monarchies of the Ancient World—Chaldæa, Assyria, Babylonia, Media, and Persia; Manual of Ancient History*, 1869; the *Sixth Oriental Monarchy—Parthia* (1873); and the *Seventh Oriental Monarchy—the Sassanians* (1875).

RAY (*Raia*), a Linnæan genus of cartilaginous fishes, belonging to the order *Plagiostomi* (q. v.) of Müller, and now divided into a number of genera, which form the family *Raiidæ* of many naturalists, and the suborder *Raiæ* of some. The true rays have a flat body; the pectoral fins are large and fleshy, appearing as lateral expansions of the body, and along with it forming a circular disc or a rhomboid, to which is attached a rather long and slender tail. The pectoral fins are prolonged till they meet in front of the snout, and backwards till they join the ventral fins. The eyes look upwards and the spout-holes or spiracles are also directed upwards. The gill-openings, which are five in number, are on the under side of the body, where also the mouth is situated. The gills are close behind the mouth; and towards the tail are the stomach, intestines, and other viscera, in a circular cavity. The males are furnished with claspers. The eggs are large, resembling those of sharks, but more rectangular in form; thin horny cases, with projections at each of the four corners, having such a resemblance to a hand-barrow, that on some parts of the English coast they receive the name *Skate-barrows*. They

are also familiarly known as *purses*, and are very often to be seen cast up by the waves upon the beach.

Rays live mostly near the bottom of the sea, and where the bottom is sand or mud. When disturbed, they glide in an undulating manner, and defend themselves against assailants by lashing with the tail, which is generally armed with spines, and in some species—called *Sting Rays* (q. v.), the family *Trygonidæ* of some naturalists—carries a single long and strong spine, notched on both sides, a formidable weapon, which is used somewhat as a saw. Rays are very voracious; they devour fishes, molluscs, and crustaceans. Many of the rays are popularly called SKATE. All of them are edible; some, however, are much better than others; and whilst, on some parts of the British coast, they are regularly used for food and brought to market, on other parts of the coast, they are rejected, and are thrown out to rot on the beach. Of British species two of the most common are the Thornback (q. v.) and the Homelyn (q. v.). Another is the Common Skate, also called the Blue Skate or Gray Skate (*Raia Batis*), which is better than either the Thornback or Homelyn as an article of food. The Long-nosed Skate (*R. mucronata*) and the White Skate (*R. oxyrhynchus*) are also common. The skates sometimes attain a very large size, more than eight feet in breadth.—*Torpedo* (q. v.) *Cephaloptera* (q. v.), &c., are genera of rays.

RAY (or, as he himself occasionally spelt it, WRAY), JOHN, an eminent naturalist, was born at Black-Notley, near Braintree, in Essex, 29th November 1627. He went to Cambridge University, where, after having finished his course, he was elected a Fellow, and appointed Greek lecturer, and afterwards mathematical tutor in Trinity College; but after a time began to devote himself entirely to the study of natural history. Accompanied by a kindred spirit Francis Willughby, a friend and former pupil of his own. R. traveled over most of the United Kingdom, collecting and investigating botanical and zoological specimens; and in 1663, they started on a tour through the Low Countries, Germany, Italy, and France, with a similar object, Willughby taking the zoology under his charge, leaving R. the botany. In 1667, R. was elected a Fellow of the Royal Society, to whose *Transactions* he occasionally contributed valuable papers. In 1672, his friend Willughby, with whom R. had lived ever since he had left the university, died, leaving him guardian to his two young sons (the younger of whom was afterwards raised to the peerage as Baron Middleton), an office which R. discharged, and then, after several changes of residence, settled down in his native village, where he died, January 17, 1705.

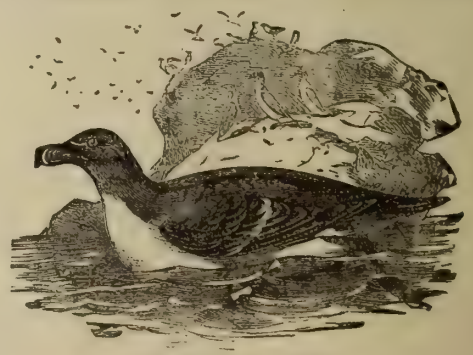
As a botanist and zoologist, R. ranks very high, being distinguished for his patience, acuteness, and sagacity; and in knowledge he seems to have been far in advance of his time, as the new method of classification of plants which he proposed, though little appreciated or adopted by his contemporaries and immediate successors, was eagerly laid hold of by Jussieu and others, under whose hands it became the foundation of what is now known as the 'Natural System' of classification. R.'s zoological works are considered by Cuvier as the foundation of modern zoology. In zoology, as in botany, R.'s works are remarkable for the precision and clearness of the classification which he adopts, his divisions in the former subject being founded on the structure of the heart and the organs of respiration. The chief of his works on botany are *Methodus Plantarum Nova* (1682, 2d edition, revised and amended by himself), in which he details the principles of his new method of classification of plants; *Catalogus Plantarum Angliæ* (1670), the basis of all the subsequent floras of this country; and a second (1677), third (1690), and fourth (1696) edition of which was published by himself; *Historia Plantarum* (3 vols. 1686—1704), a compilation, including descriptions of all the species which were then known. His zoological works include the *Synopsis Methodica Animalium Quadrupedum et Serpentini Generis* (1693), and three posthumous volumes on Birds, Fishes, and Insects, published by Dr. Derham. He was also the author of some theological works. His friend Willughby having collected the materials for an extensive work on the animal kingdom, left to R. the task of arranging and classifying them, and the work accordingly appeared in 3 vols., the *Ornithologia* in 1676, with an English translation by R. in the following year, and the *Historia Piscium* in 1686 (2 vols.). In these volumes were described a large number of species of birds and fishes, which had escaped the observation of previous naturalists.

RAYNOUARD, FRANÇOIS, JUSTE MARIE, a French poet and philologist, was born at Brignoles, in Provence, September 8, 1761. He studied at Aix, and came to Paris to cultivate literature at the age of 23, but soon went back to the south, and joined the bar at Draguignan, where he acquired a high reputation. In 1791, he was elected a member of the Legislative Assembly; but after the fall of the Girondins, whose opinions he shared, he was thrown into prison, and fortunately forgotten. Released from confinement after the fall of Robespierre, he resumed his profession of advocate, and in the course of five or ten years, acquired a modest competency. He then returned to Paris, and devoted himself anew to literary pursuits. His first poem, *Socrate au Temple d'Aglaure* (Par. 1803), was followed by the tragedies, *Eléonore de Bavière* and *Les Templiers*, the latter of which was brought on the stage in 1805, and met with unbounded success. Two years later, R. was chosen a member of the Academy, of which he became perpetual secretary in 1817. He had been made a member of the imperial legislative body in 1806, and Napoleon, it is said, even meditated appointing him to the presidency, but could not get over R.'s brusque manner and fearless independence of spirit. The principal dramas which he wrote during the *régime* of Napoleon, besides those already mentioned, are *Scipio*, *Les Etats de Blois*, *Don Carlos*, *Charles I.*, *Debora*, *Jeanne d'Arc à Orleans*. Towards the fall of the Empire, his attention was turned to linguistic studies, particularly to the study the Provençal language and literature; and his researches into the origin, grammatical rules, and transformations of the Romance tongue, led to many valuable discoveries, though his theories as to the relation of the language of the troubadours to the other tongues derived from Latin, have been shown to be erroneous (see ROMANIC LANGUAGES). His chief writings in this department are—*Eléments de la Grammaire Romane* (Par. 1816); *Choix de Poésies Originales des Troubadours* (Par. 6 vols. 1816—1821); *Grammaire comparée des Langues de l'Europe Latine dans leur Rapports avec la Langue des Troubadours* (Par. 1821); *Observations Philologiques sur le Roman du Rou* (Rouen, 1829); *Influence de la Langue Romane* (Par. 1835); and *Lexique Roman, ou Dictionnaire de la Langue des Troubadours* (Paris, 6 vols., 1838—1844). R. died at Passy, near Paris, October 27, 1836.

RAZOR, the sharp-bladed instrument used for shaving the beard, has been in use from very ancient times; it is alluded to by Homer, and shaving was in fashionable use by the Greeks and Romans (see BEARD), as a mark of civilization. Razors are almost universally metal blades, made exceedingly sharp; but an exception to this is found in some of the razors used by savage nations, as, for instance, the Tahitians, who use pieces of shells and sharks' teeth, upon which they grind very fine edges, sufficiently sharp to remove the beard. The Chinese and Japanese, who shave the head as well as the chin, use razors similar to the European, except that they rarely have handles. The steel of which they are made is of a remarkably fine quality.

The manufacture of razors, in Great Britain, is chiefly carried on in Sheffield, which place also supplies a large export trade. Great care is exercised in choosing the steel for making the blade, but notwithstanding this, there is scarcely an article made by cutlers which is so uncertain in quality when used. Nearly 20 operations are required to produce a razor; nevertheless, such is the perfection to which manufactures are brought by a division of labor, and the application of machinery, that the razors supplied to the army (at the contract-price of 4½*d*. each) cannot be surpassed for quality.

RAZOR-BILL, or RAZOR-BILLED AUK (*Alca torda*), a species of Auk (q. v.), also called the Black-billed Auk, very common on the coasts of Britain, and of all the northern parts of



Razor-Bill (*Alca torda*).

the Atlantic Ocean, frequenting lofty precipices, from which its eggs are taken, with those of guillemots, &c., by persons who are let down by ropes for that purpose. The eggs are esteemed a delicacy; and the flesh of the bird itself is much used for food. Great numbers of razor-bills are annually killed for the sake of their feathers, particularly on the coast of Labrador, where they are extremely abundant. The R. is about 17 inches long, from the extremity of the bill to that of the tail. It is a very fierce bird, and if seized, will lay hold of the hand in return, and submit to be choked ere it will let go. The egg is about three inches long. The bird lays one or two, upon ledges of rock or in fissures.

RAZOR-FISH, or RAZOR-SHELL. See SOLEN.

RAZOR-STROP, an article used for the purpose of sharpening razors. It usually consists of a piece of wood, an inch and a half broad, and 10 or 12 inches long, upon each side of which is glued a piece of leather; one of the pieces of leather is usually dressed with a composition of carbonate of iron and grease, which is used first, and the sharpening is finished on the undressed leather of the other side. A leathern strop is frequently used without fixing on wood. In the West Indies, razor-strops are commonly made of pieces of the wood of *Yucca gloriosa*, *Eriodendron anfractuosum*, *Agava vivipara*, *Ochroma lagopus*, and *Anona palustris*, all of which contain minute deposits of silica in their cellular structure, which render them very efficient for the purpose. Species of *Boletus* are used in Britain.

RÉ, ILE DE (*Rex insula*), is a small island on the coast of the French department of Charente Inférieure, opposite the city of La Rochelle, from which it is separated by the Pertuis Breton. It is about 18 miles long, and 4 miles broad. It contains 5600 inhabitants, most of whom are engaged in fishing. The island is skirted by high cliffs, and strongly fortified by four forts. It has several good harbors and two light-houses; but there are neither springs nor wood on the island, and next to fishing, the culture of the vine constitutes the chief occupation of the islanders. Brandy made from the wines of Ré, and sea-salt, are the principal articles of the trade on the island. St. Martin, which ranks as the capital of Ré, is a well fortified little town with a good harbor, is the chief seat of the trade, and has (1872) 1916 inhabitants. Oyster-farming has of late become an important branch of industry. See OYSTER.

REA'CTION, a term used in reference to the political history of a nation; to designate that tendency, often showing itself, to recoil from the effects of reform or revolution, and to seek a restoration of the previous state of things, or even of one still more antiquated and despotic. The causes that lead to reaction are various. Sometimes it springs, partly at least, from mere disappointment at the smallness of the *visible* results of those changes advocated with so much eloquence, and waited for with so much enthusiasm and hope. The inconsiderable imagination of the people expects a millenium to follow every important change; and when, after the event, men find they are still in the old world of imperfections, hardships, and sorrows, they are prone to believe that they have been deluded, and are only too willing to lend an ear to the insidious misrepresentations of those who are opposed to all progress. But more frequently political reaction springs from immature, or injudicious, or extravagant revolution. The times are not yet ripe (as in the first Italian revolts), or the leaders are unfit (as in the German and Hungarian struggles of 1848—1849), or excesses are committed (as in the great French outbreak of 1789), and so a revolution is nipped in the bud, or overthrown on the battle-field; or, inflamed with sanguinary thirst of revenge, it goes mad in a 'reign of terror,' and exhausting itself in unprofitable frenzies, falls at last an easy prey to any bold and unscrupulous adventurer whom the crowd may elect out of desperation and disgust of anarchy, and whose rule is as absolute as any that preceded it. A reaction, may thus, in certain cases, be useful, in so far as it teaches reformers and revolutionists the point beyond which nature forbids them to go; but its agents are almost invariably base in character, odious in their principles, and selfish in their projects. Religious reactions exhibit the same characteristics as political ones, and proceed from the same causes.

REACTION is the term employed in Medicine and Surgery to indicate the process of recovery from a state of collapse. The subjects of Collapse, Reaction, and the general effects of Shock upon the system, are considered in the article on SHOCK.

READE, CHARLES, D.C.L., one of the more distinguished novelists of the day, was born in 1814. He is the youngest son of the late John Reade, Esq., of Ipsden House, Oxfordshire. He received his college education at Oxford, and so distinguished himself as to secure a Fellowship. In 1843, he was called to the bar as a member of Lincoln's Inn; but his legal studies may be presumed to have been merely nominal, and in no long time it became obvious that his chosen career was that of literature. The books by which he first became known as a writer of distinct mark and promise were his *Peg Woffington* and *Christie Johnstone*, both full of talent, though as yet somewhat crude and immature. In 1856, he fairly established his reputation in the novel in 3 vols., *Never too Late to Mend*, the first of a series of novels each illustrating some social or public evil. Among his subsequent works are a tale in one volume, *The Course of True Love*, remarkable for a rare nicety and subtlety in the delineation of its leading female character; *White Lies* (3 vols. 1858); *The Cloister and the Hearth; Hard Cash* (1863); *Griffith Gaunt* (1866); *Put Yourself in His Place* (1870); *A Terrible Temptation* (1871); *A Simpleton* (1873); and *A Woman Hater* (1877). He is besides the author of several dramas, which have had success on the stage; the most general favorite, perhaps, being that entitled *Masks and Faces*. Mr. R. is by common consent a writer of marked ability. He has much of the true talent of the *raconteur*, along with considerable dramatic instinct, and from all his later novels, a sense of general intellectual vigor is strongly borne in upon the reader; while a certain wayward crotchetiness and odd aggressive eccentricity from time to time cropping out, serve rather to give to his writing some relish and sting of individuality, than seriously to mar its effect.

REA'DING, a flourishing municipal and parliamentary borough of England, capital of Berkshire, stands on the left bank of the Kennet, 1½ mile above the junction of that river with the Thames, and 36 miles west of London by the Great Western Railway. It is irregular in plan, though recently it has been improved in this respect. The tongue of land immediately above the confluence of the rivers, is the chief business part of the town. The church of St. Lawrence, with a tall flint tower, still shows traces of its original Norman character; and the Benedictine Abbey, now a mere shell, was founded in 1121, and was at one time the third in size and wealth in the country. Of the numerous educational establishments, the free grammar-school, to which are attached two fellowships at St. John's College, Oxford, and two scholarships, has an endowment of £50 per annum. R. is an important mart for corn and other agricultural produce, carries on manufactures of silks, silk-ribbons, &c., and has extensive iron-works and a large biscuit factory. Pop. (1871) 32,324; (1881) 42,050.

READING, a city of Pennsylvania, U.S., on the left bank of the Schuylkill River, 58 miles north-west from Philadelphia, pleasantly situated on an ascending plain, and supplied by a mountain behind it with streams of pure water. R. has regular streets, public offices, several newspapers, blast-furnaces, rolling-mills, foundries, manufactories of steam-engines and machinery, cottons, woollens, nails; also flour and saw-mills, with a large trade in coal. Pop. (1870) 33,930; (1880) 43,280.

READING AND SPEAKING. Reading is the delivery of language from writing; speaking is the utterance of spontaneous composition. Reading is merely mechanical when words are intelligibly but unimpressively delivered; and it is oratorial in effect when the sentiment proper to the utterance is expressed by pauses, tones, emphasis, &c. Recitation from memory is another form of reading, the matter being delivered from a mental transcript. This mode is highly favorable to oratorical effect, but it is limited in application, and untrustworthy where exactness of phraseology is important. Speaking from spontaneous composition is the highest form of oratory. The qualities requisite for these are very different.

To read well involves a perfect understanding of the construction of sentences, and ability to analyse complex forms of composition, and discriminate between essential and expletive words; it also involves a nice perception of the qualities of modulation, and their relation to expressiveness, together with ability to regulate the voice so as exactly to suit the sound to the sense. The study of the art of reading is thus valuable as a means of improvement in composition, as well as for its influence in refining the taste, and exercising all the faculties of perception, expression, and adaptation.

In good reading, the thoughts of the writer must first be taken into the reader's mind, and then delivered as the writer himself might have uttered them immediately on their conception. Children, when set to read language above their comprehension, are of necessity merely mechanical readers; and in this way they acquire habits of unintelligent reading, which are seldom perfectly thrown off in after-life. In silent reading, or the perusal of language for our own information, we gather the sense as we proceed, and correct misapprehensions by reflection; in reading aloud for the information of others, we must perfectly comprehend the matter before we utter it, so as to avoid misleading the hearer. A practised reader can, no doubt, exercise sufficient prevision at the time of reading, by keeping his eye in advance of his utterance, to read any ordinary composition fairly at first sight; but for public reading this would be insufficient. Whatever is to be read in public should first be well studied in private. The reader thus knowing definitely what he has to express, will give forth no uncertain sounds, and his manner will have the freedom of memoriter delivery, without the disadvantage of its constraint upon the mind. His whole attention will be concentrated on the object of his reading, the effective *conveyance* of the matter and spirit of the composition. The presence of the book before him will be necessary chiefly to give confidence, and prevent the possibility of rambling. The eye, assisted by memory, will take in clauses and even sentences at a glance, so that it may be freely raised during utterance.

If the eye of a reader is fixed on the book, he seems to be perusing it for his own information; but if he looks his hearers in the face, as, with due preparation, he should be able to do, his delivery may have all the qualities of spontaneous oratory, and be to the hearers speaking rather than reading. This effectiveness is rarely exemplified, because the requirements for public reading are so little understood, and so habitually neglected in our

systems of education. The tameness, monotony, and rythmical singsong so generally associated with reading, have created a prejudice against the use of 'paper' in pulpit addresses, in consequence of which, in some churches, the practice of reading sermons is discountenanced, while in others it is positively interdicted. The quality of sermons, as compositions, is seriously impaired under such circumstances; but the cure for bad reading—against which the prejudice is directed—is *good* reading. All men cannot be orators, but all may be taught to read oratorically; and were students systematically trained in this art, the services of the church would be rendered far more attractive and influential. In the absence of this training, preachers are the most ineffective of public speakers; and discourses prepared to be delivered from memory are among the meanest species of literary compositions.

The chief points of difference between ordinary reading and the utterance of spontaneous composition, are the uniform force and time, and continuative tones of the former, as contrasted with the reflective breaks and varying modulations and emphases of the latter. The speaker feels what he wishes to say, and he conveys with definiteness the felt relation of each word to the idea which is dominant in his mind. Expletive and explanatory phrases are given parenthetically; ellipses, interpolations between grammatically related words, similes, quotations, and all other elements of rhetorical style, are indicated by changes of modulation; and the *point* of every sentence is made unmistakably apparent. The reader sees all the parts of a sentence level to his eye, and he is apt to deliver them with a corresponding indiscriminativeness of manner; either without variety of time, tone, and stress, or with mere alternation of force and feebleness, or the equal indefiniteness of emphasis on every phrase.

The first requisite for effective reading is a clear conception of the author's intention, together with such a command of the voice as may enable the reader to express that one meaning to the exclusion of all other possible meanings. For every cluster of words is like a many-sided crystal, which may be made to throw light from any of its facets, according as one or another of them is present uppermost. The most prominent word in the utterance of a sentence is not necessarily the most important grammatical word, but that which is new in reference to the context; and such words as are already before the mind—whether directly stated, inferentially included in former expressions, or otherwise implied—are pronounced with subordinateness of manner. Thus, in the following lines:

> The quality of mercy is not strained,
> It droppeth as the gentle rain from heaven
> Upon the place beneath. It is twice blessed:
> It blesseth him that gives and him that takes.

If the first line were read independently, it would be emphasized as follows:

> The quality of *mercy* | is not *strained;*

but if read in connection with the preceding context, the emphasis would be different. Thus:

> *Portia.* Then must the Jew have mercy.
> *Shylock.* On what compulsion must I? Tell me that.

'Mercy' and the 'compulsion' of mercy being thus already before the mind, the chief point in Portia's reply will now be:

> The quality of mercy *is* not strained,
> It droppeth, &c.

But, as to 'drop' is the natural characteristic of 'rain,' and as rain always falls 'from heaven,' and necessarily 'upon the place beneath,' these implied words will be pronounced subordinately, thus:

> It droppeth as the *gentle rain* from heaven
> Upon the place beneath.

Bearing in mind, further, that mercy is of necessity 'blessed,' the reader will proceed:

> It is *twice* blessed:

and as the object of the speech is to *solicit* mercy, he will give prominence to the word that advances the suit. Thus:

> It blesseth him that *gives*, and him that takes.

On this principle, the reader shows that he has, in his own mind, performed the writer's process of thought, and so made the language which he interprets virtually his own. But in order to express with definiteness the thoughts and sentiments thus adopted, the reader must have the *instrument* of expressiveness perfectly under control. His voice should have no more predisposition to any particular tune than the flute or violin of a musician. Tones have an inherent value, which is above and independent of language, so that assertive construction may be made to convey interrogative meaning, and interrogative language may have assertive or imperative force. The modulations of the voice unravel all the complexities of composition, separating words from their immediate context, or connecting them with others from which they are most widely separated in the sentence. Thus, in the following lines:

> Slowly and sadly we laid him down,
> From the field of his fame fresh and gory,

the clause 'fresh and gory,' is, by relative modulation, shown to refer to 'him' in the preceding line, and not to the nearer words 'fame' or 'field.' So, also, in the following passage: 'And they came with haste, and found Joseph and Mary, and the babe lying in a manger.' Here the series, 'Joseph and Mary | and the babe' is divided by a modulation of the voice, so as to show that the last word 'babe' is alone the grammatical antecedent to the clause 'lying in a manger.' From such illustrations it will be obvious that good reading involves close thinking, and that the governing qualities of tone demand accurate appreciation and careful culture.

The tones of the speaking voice are all more or less *inflected*, in which respect they differ essentially from singing tones, which are level, and only varied in pitch. The term 'modulation,' as understood by elocutionists, has reference to the general pitch of the vocal inflections in a passage. The inflections themselves are all either rising or falling. The rising turn of voice carries on the hearer's attention to what is to *follow*—the falling turn directs attention to what has gone *before;* the former asks, or appeals to the hearer—the latter affirms or enjoins from the speaker; the former is negative—the latter is positive. Simple inflections rise or fall directly from their accentual pitch to their termination, and the range of the inflection may have any extent, from less than a semitone to more than an octave. The strongest rising tones are expressive of interrogation, incredulity, or entreaty, and the strongest falling tones of affirmation, assurance, or command. Compound inflections unite the two vocal movements—falling before a rising termination, and rising before a falling termination—with one accentual impulse; and the effect of this opposition of tone is to add to the expressiveness of the termination a suggestion or *inference* in accordance with the expressiveness of the commencing turn. Thus: 'Not ŏne,' with compound rising tone, implies 'but more.' 'Even ône,' with compound falling tone, implies 'and not more.'

The emphatic force of tones depends on their accentual pitch in relation to that of preceding tones, as well as on the extent and the direction of the inflection. The amount of possible variety in these degrees is exceedingly great, but the peculiar expressiveness of individual modes of inflection is definite, traceable to systematic principles, and of limited extent, depending principally on three qualities—

1. Rising or falling accent as well as termination; as
   Cónstánt, Cònstànt.
2. Rising or falling accent with opposite termination; as
   Cŏnstánt, Cônstànt.
3. Accent higher or lower than preceding pitch; as
   díe? To To drêam.
   To slèep. sléep? Perchance to

These three sources of vocal variety the student of elocution should have under ready and perfect control.

The art of elocution has received comparatively little attention in modern times. The value of a good delivery is certainly not less now than it was among the orators of ancient Greece and Rome; but the assiduity with which the art was cultivated by the latter, and the estimation in which it was held by them, present a strong contrast to the negligence and apathy of modern speakers in regard to delivery. This fact is not easily accounted for; the influence of elocution being such, that an inferior address well delivered never fails to create a stronger impression on an audience, than the most masterly composition that lacks the graces and enforcements of effective utterance and action.

The model for effective reading is to be found in the ordinary style of animated conversation. The speaker's tones are not governed by the laws of punctuation, or by formal grammatical periods. Every clause in a sentence is, to the speaker, a period. The most complex sentence is only an aggregation of correlative sentences, each of which is a separate act of thought, and should be delivered as such in reading, as it always is in speaking. Modulation will show the relation of each part to the whole, but inflection should at the same time show each part to be in itself complete, as the statement of a distinct though subordinate fact or circumstance.

The rules which some elocutionists have laid down for the reading of sentences, are clearly at variance with this natural principle of intonation, and they lead to an artificiality of manner which is at best a pedantic tune. The formal arrangements of inflections

which have been gravely prescribed for 'simple' and 'compound,' 'commencing' and 'concluding' serieses, 'penultimate' and 'ante-penultimate' clauses, &c., have done much to discourage students from paying proper attention to the art of elocution, and have almost justified the denunciations of some authors, who have declared elocution to be altogether unworthy of study. Thus, Archbishop Whately, in his disgust at the jerking alternations of ups and downs prescribed in elocutionary rules, counsels students to have nothing to do with rules, but simply to be 'natural.' To be natural, however, is to follow those laws or principles which undoubtedly are to be deduced from the operations of the voice in spontaneous speaking; and these must be studied by all who would be 'natural' in practising the art of reading. In elocution, as in painting and in every art, the highest attainment of the finished artist is to be natural.

Nature and art are not opposites; the former is the *end* of the latter; the latter the *means* to the former. To be natural does not 'come by nature,' but by art; and 'art itself is nature.' Elocution, therefore, is none the less 'natural' that it must be studied as an art; and the study of this art is not justly to be contemned, whatever condemnation may be due to the errors of elocutionists.

To acquire a natural style of reading, the chief point to be attended to is the logical clausing of sentences, so as to present, with separate completeness to the hearer's mind, every fact and every associated circumstance, whether principal or subordinate. Punctuation is not a sufficient guide for this purpose; it will sometimes even mislead. Thus, in the following sentence from Macaulay's *Essay on Milton:* 'Even when a system has been formed, there is still something to add, to alter, or to reject'—the logic of the sentence is not brought out by the punctuation. The reader should make a modulative break after the word 'something,' where no comma is placed, and he should, notwithstanding the separating commas, unite the three subsequent clauses by a modulative tie, to show their expletive nature, and the equal relation of each of them to their common antecedent. Thus: 'There is still *something* | to add, to alter, or to reject.'

In the following sentence from the same Essay, no comma occurs, but the reader will nevertheless divide the period into at least three modulative clauses: 'The blaze of truth and liberty | may at first dazzle and bewilder | nations which have become half blind in the house of bondage.' Here the first section contains the *subject* of the sentence, the second the *predicate*, and the third the *object*, with its dependent clauses. It is to be observed that the object 'nations' is separated from its governing verb 'bewilder,' only because the former is itself the governing antecedent to a new but subordinate sentence.

These illustrations are sufficient to show that the clausing of sentences for effective reading is dependent on a different principle from that which regulates punctuation.

Nor is any particular mode of vocal inflection necessarily associated with any of the marks of punctuation. This is particularly to be noted in connection with the sign of interrogation. The position of this mark, too, at the end of a period often misleads readers into an unnatural tone. The interrogative part of the sentence may not extend beyond a single clause, and this may be followed by many clauses within the same period. The mark of interrogation would therefore be better placed at the beginning of a sentence. But, as above shown, interrogative language may sometimes require for its just expression any one of all the tones in the gamut of speech. Thus: 'Will you?' if pronounced with a simple rising tone, this question asks or appeals; and with an extended range of inflection, it expresses doubt or surprise. But the form of words does not necessitate the rising tone. Thus: 'Will you?' If pronounced with a simple falling turn, the question expresses desire or expectation on the part of the speaker; and with an extended range of inflection, it conveys more or less of authoritative injunction.

The same question may legitimately, also, take either of the compound forms of inflection. Thus: 'Will you?' If pronounced with a compound rising turn, it infers some cause of opposition or hindrance; and with an extended range of inflection, insinuates more or less of threatening or penalty. With a compound falling tone, thus: 'Will you?' it suggests more or less of defiance and contempt, according to the pitch of the commencing turn, and the extent of the concluding inflection.

The principles of vocal expression, clausular pronunciation, emphasis, &c., as above sketched, apply equally to speaking as to reading; but it is in connection with the latter chiefly that they require to be studied, as they are generally applied instinctively in spontaneous speaking, even by those who are most enslaved by vicious habits in reading. The management of the voice, however, should be more than an instinct to the orator; and there is much in the philosophy of vocal expression that will be studied with equal advantage by both speakers and readers.

Extemporaneous speaking is greatly assisted by a good habit of elocution, and it is at the same time strongly conducive to the formation of such a habit. The deliberate utterance which weighs every phrase, gives the mind time to revolve its ideas, and choose the most effective words for their expression; and the evolution of a continuous train of thinking in coherent sentences compels deliberation and guarded delivery. But while the grandest triumphs of oratory are thus to be achieved, the requisites for success are such that great orators must ever be few in number. The ancient rhetoricians describe their model speaker as one who is accomplished in all knowledge, and esteemed for every virtue, and who has devoted more than the average duration of human life to laborious preparation; for they held that the oratorical faculty could not attain its full development and influence until hoary hairs had added the venerableness of age to a reputation for learning, sagacity, and unimpeachable morality.

Speaking from memory admits of the application of every possible element of effectiveness, rhetorical and elocutionary; and in the delivery of a few great actors, the highest excellence in this art has been exemplified. But speaking from memory requires the most minute and careful study, as well as high elocutionary ability, to guard the speaker against a merely mechanical fluency and thoughtlessly rhythmical utterance. This mode of delivery is therefore only appropriate to special efforts, for which due preparation can be made. Otherwise, memoriter delivery—as of sermons composed and learned at the rate of one or two every week—is altogether incompatible with excellence either of matter or of manner.

That the art of reading, which is on all accounts worthy of the highest position among the exercises of students for the oratorical professions, should be so utterly neglected in our systems of education, is a reproach to the enlightenment of our age; and it is especially a scandal to our universities, in which the examples of the famous orators of antiquity, and the lessons of their experience, are so fully known, yet practically dishonored.

RE'AL is a phrase much used in the law of the United Kingdom in combination with various other terms. In the law of England and Ireland, real property or real estate, or realty, constitutes one of the great subdivisions of all property, consisting of what is popularly known as land and houses, which are not legal terms; personal property or personalty, includes all the other kinds of property, as goods and chattels, money, &c. The same or a similar distinction pervades the laws of all countries. In the Roman law, things were divided into movable and immovable. In the law of Scotland, the division is into heritable and movable. The division into realty and personalty comes into operation in the event of the death of an owner of property, especially when he dies intestate, in which case his realty goes to the heir-at-law, and the personalty to his administrators or executors. See SUCCESSION. A division also exists in England of actions into real and personal actions, the object of the former being to recover real property, and of the latter to recover damages, or the possession of personal property; while there is also a class of actions called mixed actions, which partake of the nature of both. With regard to chattels, there is also a subdivision into real chattels and personal chattels, the former consisting of contracts and interests affecting real estate, such as leases and mortgages, while personal chattels include corporeal movables. Then there is a division of assets into real assets and personal assets, the former being the real estate, so far as it can be made according to the rules of law liable for the debts of the deceased. In Scotland, the word is also frequently used technically, though not in the same sense as in England. Thus, real actions in Scotland mean actions the object of which is to recover possession of the property itself, whether heritable or movable, and a real right is a right to the property itself in a like sense. A real burden, in the law of Scotland, means the right to a sum of money, or other obligation, so secured on land that the land cannot be sold or alienated except as subject to the burden, and until the burden is discharged.

RE'AL, a silver coin and money of account in Spain, Mexico, and other old Spanish possessions. It is the $\frac{1}{10}$th part of the piastre (*peso duro*), or $\frac{1}{4}$th of the *peseta*, the franc of the new Spanish decimal system, and has a value, varying with the exchange, of about $2\frac{1}{2}d$. Of the old Spanish reals now disused, the *real de plata* was the $\frac{1}{8}$th of the piastre or *peso duro* (see PIASTRE); and the copper-real or *real de vellon*, was the $\frac{1}{80}$th part of the piastre. The real was first coined in Spain in 1497, and has since that time frequently varied in value. At the present day, in Mexico, Peru, and the Central American Republics, the piastre is divided into 8 reals, and silver coins of one real are current, while in Colombia, it is divided into 10 reals, and silver reals and half-reals are coined. The real is also a money of account in Portugal, being the equivalent of 40 reis; and in Batavia, it is the name of a weight for gold and silver articles corresponding to 17 dwts. 14 grains troy weight.

REA'LGAR, a mineral consisting of about 70 parts of arsenic and 30 of sulphur. This native sulphuret of arsenic is of a very

brilliant scarlet color, generally translucent, but sometimes transparent; and occurs in the vicinity of volcanoes, and in many igneous rocks; massive, disseminated, or crystallized. Its crystals are prisms, sometimes needle-like. It yields to the pressure of the nail.

RE'ALISM. See NOMINALISM.

REAL PRESENCE, in the Eucharist, a doctrine forming an article in the belief of the Roman, the Greek, and other Eastern churches, and of some bodies or individuals in other Christian communions, according to which it is held that, under the appearance of the Eucharistic bread and wine, after consecration by the priest, Christ himself is really and substantially present, body and blood, soul and divinity. The word *really* is used in opposition to 'figuratively;' and the decree of the Council of Trent, which is the authoritative expositor of the Roman Catholic belief, conjoins with that word the terms 'truly' and 'substantially,' the former being used in order to exclude the notion of a barely *typical* representation, such as is recognizable in the Paschal Lamb and the other Messianic types of the Old Law; and the latter for the purpose of meeting the view ascribed to Calvin, that Christ, as apprehended by the faith of the believer, was, for such believer, rendered virtually present in the Eucharist, and that his body and blood were received in virtue and efficacy, although not in corporeal substance. The belief of the Roman and Eastern churches as to the reality of the presence, was shared by Luther, who, however, differed from Catholics as to the mode; and has always been followed also by one school of divines in the Anglican Church, whose doctrine became very prominent in the time of Laud, and has been revived in the late Tractarian movement. But between Catholics and all the non-Catholic schools of whatever class, one marked difference exists. According to the former, the presence of Christ in the consecrated Eucharist is *permanent;* so that He is believed to be present not alone for the communicant who receives the Eucharist during the time of his communion, but also remains present in the consecrated hosts reserved after communion. On the contrary, all the Lutherans, and almost all Anglicans, confine their belief of the presence to the time of communion, and all, with hardly an exception, repudiate the worship of the reserved elements, as it is practised by Catholics.

The question as to the reality of Christ's *presence* in the Eucharist is quite distinct from that which regards the *mode* of the presence, for which see TRANSUBSTANTIATION.

REAM, a certain quantity of paper, consisting of 20 quires, each quire containing 24 folio sheets. A *printer's ream* should consist of 21½ quires. The word appears to be derived from the Saxon *ream*, a band, and was probably applied in consequence of the bundle of paper being held together by a band.

REAPING, the act of cutting corn, has been performed from time immemorial with an instrument called a reaping-hook or sickle. The sickles in use among the ancient Jews, Egyptians, and Chinese appear to have differed very little in form from those employed in Great Britain. The reaping-hook is a curved instrument of about a foot and a half in length, tapering from a breadth of about two inches at the but-end, where it is fixed into a wooden handle. The edge is sometimes serrated, but, as a rule, it has long been made plain and sharp like a knife. In reaping, the harvester takes the corn in his left hand, and then with the hook cuts the stalks as close to the ground as possible; but when a grass crop has been sown down with the grain, the stubble is often left rather longer, in order to preserve the young grass The corn is placed handful by handful in a band usually made of the corn, and when as much has been cut as will form a sheaf, it is tied up by the 'bandster.' The most expert reapers slash down the corn with the hook in the right hand, using the left merely to keep the corn from falling, until sufficient to make a sheaf has been cut, when the reaper places his hook under the corn, and supporting it with his left arm, deposits it all at once in the band. A bandster (one to every *three* or *four* reapers) binds the grain, and sets it up in stooks of generally 12 sheaves. It was surprising to see women of sixty years and upwards, handling the 'hook' with great dexterity, accomplishing their 20 and sometimes 24 stooks of 12 sheaves each per day. After such a day's work, these women appeared much fatigued, but a night's rest seemed to set them on foot, vigorous as ever. They divested themselves of much of their clothing, and really worked hard for their money.

In the principal corn-growing districts of Scotland, a great proportion of the reaping by hand was at one time done by laborers from Ireland, who undertook the work at from 8*s*. to 15*s*. per acre, with board and lodging in addition. Their fare was of the simplest kind—consisting in the majority of cases, of porridge morning and evening, and bread and beer for dinner; their lodging at night was the barn or some outhouse, the farmer providing coarse blankets for covering. The quantity of porridge consumed at each meal by those people was sometimes astonishing—no less, as has been proved by actual weighing, than 5 lbs., with 1½ lbs. of milk besides. In England, most of the corn was cut by piecework, at prices varying from 10*s*. to 18*s*. per acre. On the stronger lands of the midland and southern counties, the stubble is sometimes left knee-high, and afterwards at leisure cut by the scythe, or with a long hook, at a cost of 2*s*. per acre. In Yorkshire, Derbyshire, Oxfordshire, and on many of the lighter soils in other counties, the operation of fagging or hacking, to be afterwards noticed, was preferred as being more expeditious than reaping. A good hand cut down from one-third to one-half of an acre of wheat, and often consumed, during his long day's labor, two gallons of good ale.

The scythe in some counties, more than thirty years ago, was preferred to the sickle. The most common varieties were: the Hainault scythe—an importation from Belgium—the cradle scythe, and the common scythe fitted with a cradle. The Hainault scythe consists of a blade about 2 feet 3 inches long, having a handle 14 inches long. This the mower holds in his right hand, while in his left he carries a hook, with a handle of about equal length. 'The reaping,' says the late Mr. Henry Stephens, in his *Book of the Farm*, 'is done by pressing the back of the hook with the left hand against the standing corn, in the direction of the wind, and by cutting with the scythe close to the ground against the standing corn with a free swing of the right arm,' the hook keeping the cut corn from falling until a sufficient quantity to form a sheaf has been cut. This operation was practised in many parts of England, and especially on the lighter soils, under the name of fagging or hacking, the reaper sometimes using in his left hand, instead of the hook, a stout crooked stick from 2½ to 3 feet long. Beans and oats were the crops most generally fagged.

The cradle scythe is composed of a blade about 3½ feet long, attached to a principal helve or sned about 4 feet long, into which another helve of about 2½ feet in length is tenoned, thus making two handles. The cradle or bow is a piece of wood joined to the heel of the blade, into which are inserted three or four wooden teeth, in a line with the blade, the object of which is to secure the grain being laid evenly in one direction. As skill at the working of the scythe, however, increased, the cradle or bow was discarded in many cases. By the scythe, corn can be cut at a rather less cost per acre than with the hook; but the work is not so neatly done. As nice a stubble will be left by a good hand with the scythe, and often nicer than by the hook, but the sheaves are not, as a rule, so tidy after the scythe, though they will stack rather earlier. Of a fair working crop, an adept at the scythe would cut 2 or 2½ acres per diem. The average area cut per day with the scythe does not exceed 1½ acres. In fact, if the crop is heavy, that extent is a very hard day's work. Those who contract for cutting the crops by the scythe, obtain the services of the best men, and thus generally get about 2 acres per day reaped, and reaped very well too. In the midland and southern counties of England, the scythe, long in general use, was of larger size, and had only one long shaft, on which were fixed two handles. In Bedfordshire, Hertfordshire, and some of the eastern counties, the whole of the cutting, until the introduction of reaping-machines, was done by these scythes. The harvest operations then, from the cutting of the crop to the thatching of the ricks, cost from 18*s*. to 25*s*. per acre.

The process of reaping with either the sickle or the scythe is, however, both tedious and expensive; and hence, during the last three-quarters of a century, many attempts have been made to accomplish the work by machinery—attempts which, in the course of the last twenty years, have been crowned with complete success Reaping by machinery, however, is no modern invention. Pliny the elder, who was born in the 1st c. of the Christian era,

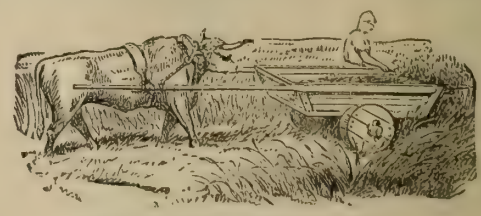


Fig. 1.—Ancient Reaping-machine.

found a reaping-machine in Gaul. He says: 'In the extensive fields in the lowlands of Gaul, vans of large size, with projecting teeth on the edge, are driven on two wheels through the standing corn by an ox yoked in a reverse position. In this manner the ears are torn off, and fall into the van.' Palladius, about four centuries later, found a similar appliance for reaping corn in Gaul. He gives a more detailed but similar description of the machine. The annexed cut, copied from Mr. Wooderoft's *Appendix to the Specifications of English Patents for Reaping-machines*, represents what is conceived, from the descriptions, to have been the form of this ancient reaper.

In modern times, the idea of a mechanical reaper appears to have originated with a Mr. Capel Lloft, who, in 1785, suggested a machine something after the pattern of the ancient one above described. Between that time and the Great Exhibition of 1851, in London, from which the general use of mechanical reapers may be said to date, the patents taken out for reaping machines were very numerous. Among the most promising of these may be mentioned those of Mr. Gladstone of Castle-Douglas; Mr. Smith of Deanston; Mr. Kerr, Edinburgh; Mr. Scott of Ormiston; Mr. Dobbs, an actor in Birmingham; Mr. Mann of Raby, near Wigton; and the late Rev. Patrick Bell of Carmylie, Scotland. In 1826, Mr. Bell constructed an efficient and simple machine, which long continued in use, and several features of which are observable in the reapers of the present day. The inventor of this, the first machine of the kind in Scotland, received a public testimonial from agriculturists, in consideration of the services he thus rendered to agriculture. In America Mr. Hussey and Mr. M'Cormick took out patents for reaping-machines of superior character in 1833 and 1834 respectively.

The movements of the cutters of these machines were various. A few were advancing only, some sidelong and advancing, others reciprocating and advancing, a large number continuous and advancing, and others continuous and alternate. The reciprocating and advancing motion is that now employed on the machines in use. The principal difference in the machines now so largely used for cutting corn is in the form and character of the cutters, and in the mode of delivering the grain after it is cut.

The cutting-knives are of two kinds—one, obtuse-angled and serrated; the other, acute-angled and for the most part plain. Both are attached to a bar, and are made to work through another bar of iron fitted with hollow fingers, called guard-fingers, which, projecting forwards, catch the standing corn, and retain it firmly until it is cut. The serrated knife saws through it; the plain knife clips it, as it were; the finger-guard forming the fixed blade of the scissors.

The delivery of the sheaves is effected either by manual or mechanical labor; but the vast proportion of the machines in use are what are termed manual delivery-reapers. The delivery of the sheaves by manual labor is now almost at the back of the machine, the side delivery being generally abandoned, unless in the self-deliveries. In delivering the grain, a man, with a short-handled rake in his hand, sits upon the machine almost opposite the cutting apparatus. With this he inclines the grain towards the knife: and when sufficient to make a sheave has been cut, he rakes it off the platform upon the machine, on to which it has fallen, and deposits it on the ground. The cut subjoined will illustrate the method of raking off. In making a neat and squarely-formed sheaf, the raker is greatly assisted by a hinge in the platform, which enables him, by pressure of the foot, to tip the board over, so as to let the corn slide gently down.

With the back-delivery, the sheaves must be tied up and removed out of the way of the machine before it comes round again. Such a reaper, therefore, always requires a full supply of hands to attend upon it. But it is the best for all that. It does require

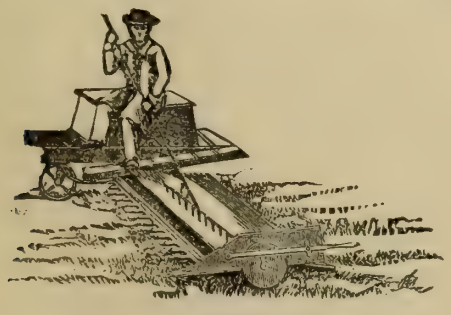


Fig. 2.—Hussey's Reaping-machine (cutting part).

a skilful, careful man to 'tilt,' but the fact that the course has to be kept clear for the horses every round, spurs the laborers, who thus do more work than they would otherwise accomplish. Besides, it is a very doubtful advantage to be enabled to slash down the crops irrespective of the gathering capacities. Moreover, with the self-deliveries, it is the distance gone over, and not the quantity of crops collected, that regulates the size of the sheaf. With uneven crops, this is an inconvenience. Sheaves of different sizes are very troublesome in the stock. They will not stand well, and in stacking it is difficult to keep uniformity in building. Large and small sized sheaves are not equally dried, and are not ready for stacking at the same time. Eight people 'lifting' after the manual-reaper will do as much work as nine following the self-delivery, so that the saving of a man's labor claimed by the self-delivery is doubtful. The sheaves are rather better formed by the manual machine than by the self-delivery. Each kind, has, however, and will likely continue to have its advocates, though the preponderance is in favor of the manual.

The mechanical or self-delivery machines, as they are generally called, are of two kinds—one lays the cut corn in swaths, the other deposits it in sheaves. The latter is decidedly the best and most fashionable of the two.

The automaton sheaf-deliverers best known to the public are those of Samuelson of Banbury; Hornsby and Son; Burgess and Key; Brigham and Bickerton, Berwick; Howard and Co., Bedford. We give a description of Samuelson's sheaf-deliverer

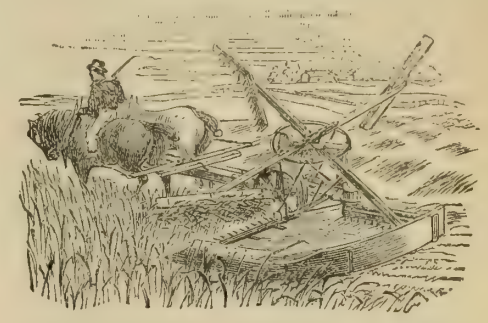


Fig. 3.—Samuelson's Self-delivery Reaping-machine.

(largely used in Great Britain), which will be made plain by the accompanying cut. The self-delivering machinery consists of a series of four rakes—two toothed, and two plain—attached to an upright shaft, in such manner as to admit of a free ascending, descending, and horizontal motion. The two toothless rakes, or 'dummies,' are shorter in the arms by six inches than the other two, and are merely employed to incline the grain towards the cutter. The platform upon which the grain falls after it is cut is of quadrant shape, and is surrounded, on the outer edge, by a rim of about a foot deep. The side of the *cam* next the platform is bent or depressed, so that the rakes on reaching this point, make a sudden fall, or eccentric motion, thus assuming the horizontal attitude necessary to sweep over the platform on the level. The rakes are adjusted so as to lay the sheaves about 12 feet apart, to the side, and out of the way of the horses. This machine has a double-throw knife—an arrangement which reduces the driving speed, and consequently the wear and tear of the machinery.

In M'Cormick's automatic delivery-machine, a rake is so used that 'during one part of the revolution of the gathering-reel, it acts as one of the vanes of the reel in bending the standing corn to the cutting-blades. When the rake reaches the cutting-blades in front of the platform, it ceases to revolve around the reel-shaft (which continues its rotary motion), and is made to move horizontally upon a vertical hinge, to which one end is attached (the points of the teeth being near the surface of the platform), sweeping the cut corn off at the side, and depositing it on the ground in sheaves ready for the binder.' The Messrs. Brigham and Bickerton's improved machine has a deep upright board of sheet-iron to keep the corn on the platform. Iron rods on these sheets separate the corn. This firm has thrown off two branches lately. The first offshoot was Messrs. Lillie and Elder, and the last was Bickerton and Co. The three firms make good serviceable reapers. Howard and Hornsby's reapers are substantially and simply constructed, embracing slight improvements every other year, formed on experience. Prices range from £20 to £35.

The makers of manual delivery-machines are numerous, including in a prominent degree Kemp, Murray, and Nicholson, Stirling; Jack and Sons, Maybole; Harrison, Macgregor, & Co.; Picksley, Sims & Co.; Ransome, Sims and Head, Ipswich; Samuelson & Co., Banbury; J. and F. Howard, Bedford; and many others of fame. The manual delivery-machines of the first named firm are very popular, strong and ingeniously manufactured, while those of the Maybole firm are not quite so strong, but work with great ease and tastefulness. Carefully handled, the manual delivery-reaper will take up laid and twisted crops admirably. Indeed, all the reapers nowadays, perfected as they are year by year, now do their work remarkably well, leaving a beautiful stubble and a nice sheaf. The sheaves from the reaper, however, are not so easily dried for the stackyard as those from the scythe, but they defend rain better, and are altogether preferable. The number of reapers now in use in Great Britain is enormous, and is growing rapidly every year. They are a most decided improvement. Indeed, they are one of the most valuable introductions that have been made in rural agriculture in this country. At almost every farm of ordinary or even comparatively small dimensions, there is a reaper, and three or four engaged on the larger holdings. The cost of the manual delivery ranges from £18 to £30.

The cost of reaping by machinery is much less than either by

scythe or sickle. Mr. Wilson of Woodhorn, Morpeth, found that the cutting of wheat with the sickle (binding and stooking included) cost him from 11*s.* to 15*s.* per acre, and with the scythe 8*s.*, whilst with the machine it only cost him 5*s.* 9*d.*, exclusive of wear and tear. From data supplied by a large number of their customers, Messrs. Samuelson & Co. make out that the saving by mechanical over hand labor is, as compared with reaping, 4*s.* per acre, and with mowing, 1*s.* 9*d.* per acre; and most farmers who have tried reaping-machines set down the saving at from 20 to 30 per cent. Besides, there is about a like economy in time, which is of immense importance in a variable climate like that of Great Britain.—See Woodcroft's *Appendix to Patents for Reaping-machines;* Mr. Jacob Wilson's 'Essay on Reaping-machines,' in *Transactions of Highland Society* for January 1864; *Book of Farm Implements*, and *Book of the Farm*, by Henry Stephens; J. C. Morton's *Cyclopædia of Agriculture.*

REASON, REASONING. The word Reason denotes that function of our Intelligence having reference to the attainment of a particular class of truths. We know a great many things by immediate or actual experience. Our senses tell us that we are thirsty, that we hear a sound, that we are affected by light. These facts are truths of Sense, or of immediate knowledge, and do not involve the reason. Reason comes into play when we know a thing not immediately, but by some indirect process; as when, from seeing a river unusually swollen, we believe that there have been heavy rains at its sources. Here the mere sense tells us only that the river is high; it is by certain transitions of thought, or by the employment of our thinking powers, that we come to know the other circumstance, that in a remote part of the country there have been heavy rains.

In ascertaining these truths of reason, or of Inference, as they are called, there are various steps of operations, described under different names. Thus we have (1), DEDUCTION, or SYLLOGISM; (2), INDUCTION; and (3), GENERALIZATION of Notions, of which ABSTRACTION and DEFINITION are various phases. These are described under their several designations. The nature of the function or faculty denominated Reason or the Reasoning Faculty, can be explained by showing how it results from the fundamental powers of the Intelligence. See ASSOCIATION OF IDEAS.

There is another and peculiar signification attached to the word Reason, growing out of the philosophy of Kant. He maintained the existence of certain principles or cognitions *à priori*, or of intuitive origin, and not derived from experience, such as cause and effect, the axioms of mathematics, &c. See COMMON SENSE. It was a function of the reason, according to him, to recognize those principles; while the generalizations of mere experience, as that water extinguishes fire, were proved by the Understanding. Other philosophers give the name 'Noetic faculty' (Greek, *nous*) to the same function. Hamilton calls it the 'Regulative faculty.'

RÉAUMUR, RENÉ ANTOINE FERCHAULT DE, a celebrated naturalist and physicist, was born at La Rochelle, in the department of Charente-Inférieure, France, 28th February 1683; and studied in the Jesuits' College at Poitiers, and afterwards at Bourges. With an eye observant of facts of every kind, and an indiscriminate thirst for information, he yet specially devoted his attention to physics, natural history, and mathematics. In 1703, he went to reside at Paris, where he speedily attracted general attention by the publication of three geometrical Memoirs on particular cases of the intersection of lines; and in 1708, he was elected a member of the Academy of Sciences, and was charged with the supervision of the work *Description des divers Arts et Métiers*, published under the auspices of the government. R. lightened his labors with occasional researches into various subjects of natural history. These researches occupied him from 1708 to 1715, and were followed by a series of investigations into the condition of the woods, gold-bearing rivers, and turquoise mines of France. His investigations into the nature of the turquoises of Languedoc led him to the discovery, that they consisted of the fossil teeth of extinct animals. The collections of memoirs of the Academy Sciences from 1722 till 1725 contain a number of papers by R., in which he details his discoveries of the mode of producing steel from iron (an art till that time unknown in France), of the tendency which fused metals have to become crystallized, and of the mode of tinning iron (also till that time unknown in France). For these brilliant and valuable successes, he received from the French government a sum of 12,000 livres, which he spent in promoting and encouraging the industrial arts in his native country.

R.'s volatile genius next prompted him to take up the subject of pottery; and here also his ingenuity and perseverance were rewarded with success, for though he failed in successfully imitating the porcelain of China, he succeeded in producing (1739) an opaque glass, which was equal to the porcelain of Saxony and Japan. All this time, he occasionally pursued his studies in natural history, at one time propounding a mode for preserving eggs (by coating them with fat), at another giving directions for the production of fowls by artificial incubation. His invention of the *Thermometer* (q. v.) which bears his name need not be more than mentioned here. He died of a fall from a horse at his estate of Bermondière, in the department of Maine, 17th October 1757, leaving behind him a voluminous collection of works on all the subjects above stated, also a treatise on 'the silk of spiders,' which was translated into Manchu by the command of the Emperor of China; and a number of Memoirs (1731—1740), containing his thermometric researches on air, and on mixtures of fluids with fluids or solids. But by far his most important work is the *Mémoires pour servir à l'Histoire des Insectes* (Amsterdam, 12 vols. 1737—1748), which embodies a number of original observations and discoveries concerning the habits and instincts of insects, sufficient of itself to immortalize their author. Only six volumes of this work have been published, the seventh being very incomplete at the period of the author's death. While collecting materials for this great work, he kept numerous insects of all kinds in his garden, in order to have every opportunity for observing them. The Academy of Sciences obtained, by the terms of R.'s will, his collections of minerals and plants; materials for a History of Quadrupeds and Birds, afterwards made use of by Brisson and Buffon; a History of Arts, in MS.; and an immense number of finished and unfinished MS. Memoirs.

REBA'TE, a longitudinal groove, cut in a piece of timber, to receive the edge of another piece, or the ends of a number of



Rebate.

pieces of wood. A notch, such as that in a door standard for a door, as in the fig., is also called a rebate. In Masonry, such a joint is called a joggle.

REBA'TED, in Heraldry, having the points broken off or cut short.

RE'BEC (anciently *rubèbe*, or *rebelle*, Arabic, *rébab*), an ancient musical instrument of the violin kind, of which the body, instead of consisting of two hemispherical enlargements, like other instruments of the same tribe, was narrow towards the neck, and gradually enlarged till it rounded off at the lower end. It had a bridge and three strings tuned in fifths, and was played with a bow. The earliest known representation of the rebec, however, taken by the Abbé Gerbert from a MS. of the 9th c., gives it but one string. The Moors introduced this instrument from the East into Spain, whence it spread over the rest of Europe, and was the precursor of the violin. The four classes of rebecs, treble, alto, tenor, and bass, were favorite instruments of the minstrels of the middle ages, and were used both for the dance and to accompany street-singing. Milton, in his *L'Allegro*, characterizes the instrument as the 'jocund rebec.'

REBE'LLION (Lat. *rebellio*, from *bellum*, war, a revolt by nations subdued in war), an openly avowed renunciation of the authority of the government to which one owes allegiance, or a levying of war to resist the authority of the government. Unlike insurrection, which may be merely an opposition to a particular law, rebellion involves a design to renounce all subjection to the state. *A commission of rebellion* is a commission awarded against a person who treats the sovereign's authority with contempt, by not obeying his proclamation according to his allegiance, and refusing to attend his sovereign when required. It consists of four commissioners, who are ordered to attack the rebel wherever found. In Scotland, by legal fiction, a debtor disobeying a charge on letters of horning to pay or perform in terms of his obligation, was accounted a rebel, as being disobedient to the sovereign's command contained in the writ. This disobedience was called civil rebellion, and the penal consequences of actual rebellion followed it, until they were abolished by 20 Geo. II. c. 50. By the old form of diligence (which is still competent), it has therefore been said that debtors were imprisoned not for debt but for rebellion. The fiction was discarded in the provisions of the statute 1 and 2 Vict. c. 114, simplifying the form of diligence and the steps by which imprisonment for debt is effected.

The expression 'The Great Rebellion,' is generally applied in England to the revolt of the Long Parliament against the authority of Charles I. It began with the votes of the two Houses regarding the militia in 1642, by which they endeavored to seize the military power of the country, and the departure of the king for York, which was immediately followed by the breaking out of hostilities. The civil war was, properly speaking, terminated by the submission of Charles to the Scots, in April 1646; but the period of the rebellion is usually held to include the Commonwealth or Protectorate, and to extend to the restoration of Charles II. in May 1660.

The revolts in behalf of the House of Stuart in 1715 and 1745 are often, particularly in Scotland, spoken of emphatically as 'The Rebellion.' The former rising in favor of the Chevalier de St. George, son of James II. of England, called the Old Pretender, was headed by the Earl of Mar, and put down in 1716: the latter was led by Prince Charles Edward, known as the Young Pretender, who, landing in the Hebrides, was joined by the Highland chieftains and numerous followers, and after taking possession of Edinburgh, and marching to Derby, retreated into Scotland, and was defeated with great slaughter by the Duke of Cumberland at Culloden, on the 16th of April 1746.

RE'BUS, an enigmatical representation of a name or thing by using pictorial devices for letters, syllables, or parts of words. The term probably originates from the device speaking to the beholder *non verbis sed rebus*. Devices of this kind, allusive to the bearer's name, were exceedingly common in the middle ages, particularly in England. In many instances, they were used by ecclesiastics and others who had not a right to armorial ensigns. Thus, on the rector's lodgings at Lincoln College, Oxford, erected in the 15th c., to which Thomas Beckyngton, Bishop of Bath and Wells, liberally contributed, is carved the rebus of that prelate—a becon and tun, with *T*, the initial letter of his Christian name.

In Westminster Abbey, Abbot Islip's chapel gives two forms of his rebus—one, a human eye, and a small branch or slip of a tree; the other, a man in the act of falling from a tree, and exclaiming, 'I slip!' Many of the monograms of the artists of the middle ages and early printers were rebuses. That of Ludger von Ring was the letter *L* inserted into a ring. A large proportion of the early coats of arms were rebuses on the names of the bearer of them, as, for example, three salmons for the name of Salmon, a lock and heart for that of Lockhart, three skenes or dirks for Skene. Family badges are also frequently of the nature of a rebus, and mottoes, as *Ver non semper viret* of the Vernons.

RÉCAMIER, Jeanne Françoise Julie Adelaide Bernard, Dame, perhaps the finest representative specimen, in later times, of that character peculiarly French, the 'woman of society,' the potentate in petticoats, who sways the *salon*, and out of it becomes in doing so a sort of 'unacknowledged legislator'—was born at Lyon in December 1777. Her father was a banker of that city, and, as well as her mother, was distinguished by much of the personal grace and charm which, in the daughter, seem to have culminated, as it were, in a form of almost typical perfection. She was beautiful, and in rare measure possessed, as the soul of her beauty, the woman's indefinable fascination, the *je ne sais quoi* of her country. She was educated under the charge of an aunt in the convent of La Déserte; and at about the age of 15, she went to Paris to join her parents, who had some time before migrated thither. Shortly after, she was married to M. Jacques Récamier, a rich banker about thrice her own age. The union is said to have been scarcely in the ordinary sense connubial ('M. Récamier n'eut jamais que des rapports paternels avec sa femme'); but a mutual affection and respect informed it from the first, and consecrated it to the end, as passion might possibly have failed to do.

A record of the splendid social triumphs of Madame R. would involve notice of nearly all that was distinguished in Paris during a space of about fifty years. In that strange, impalpable, yet most real way, of which, in this country, we can have only a faint and also coarse conception, she became a power, and she continued so; and this despite changes of fortune, which, among *us*, would have involved the extinction of even a more solid celebrity. To the famous Madame de Staël, she was bound by ties of extreme affection and intimacy; and when her friend was banished from Paris, as having drawn on her the little jealousy of Napoleon, she lavished her sympathy on the brilliant exile. Sometime after, the complete ruin of her husband's fortunes induced her to accept an invitation from Madame de Staël to join her at Coppet in Switzerland (1806). Here she was thrown into the society of Prince August of Prussia, and a mutual attachment ensued. It is supposed that, of all her innumerable admirers, he alone succeeded in touching her heart. A marriage was arranged, the necessary condition of which was the consent of M. Récamier to a divorce. This was not refused; but his mild and touching remonstrance sufficed to divert from her purpose a woman, on the one hand, of generous and noble feeling, and probably, on the other, constitutionally incapable of any very vehement passion. The man whose brilliant prosperities she had shared, she shrunk from deserting in the decay of fortune which had by this time befallen him. The devotion of her princely lover continued till his death in 1845; but it does not appear that after his first distinct failure—though he frequently again met his beloved—his efforts to secure her were very vigorously renewed. The lady's genius for love does not seem to have been great; but for friendship, it was almost unexampled. The most distinguished *ami* of her later years was M. de Chateaubriand, who solaced himself in his peevish decline by an almost daily visit to her. In 1846, he became a widower, and he then wished to marry Madame R., a widow since 1830; but the lady declined the honor—wisely for herself and for M. de Chateaubriand. Till the last day of Chateaubriand's life, he found—though his hand had been refused by her—in the friendship of Madame R., almost his only source of cheer and satisfaction.

Chateaubriand died July 4, 1848, and Madame R. followed him on the 11th May 1849. She died not so much of grief as of cholera, a disease of which her dread had always been great; and dying, she left behind her a reputation which must continue to give her a historic place among the French Queens of Society. If not quite so brilliant as some of them, she was obviously much more correct than most, on a ground of virtue or of coldness. Specially brilliant she was not; but she seems to have moved in some atmosphere breathed about her of bewildering charm and fascination. Passion, in its fiercer sense, she had not in herself, nor does she seem much to have inspired it; but the genius of refined *philandering*, as it is termed, was probably never more exquisitely embodied. See *Souvenirs et Correspondance tirés des Papiers de Mme. Récamier* (Par. 1859).

RECANA'TI, a town of Central Italy, in the province of Macerata, on the Musone, 14 miles south from Ancona. It is a station on the railway between Ancona and Rome. R. was a powerful military position in the 11th century: great privileges were bestowed on it by the Emperor Frederick II. in 1229, when the whole line of coast from the Potenza to the Munsone was granted to it for the erection of a port. Pop. above 6000.

RECEI'PT is the technical as well as popular term signifying a legal acknowledgment of money received in discharge of a debt or demand. It is often popularly believed that a written receipt is the only legal proof of payment; but this is a mistake, the fact being that it is only one mode of proving it. If the money be paid in the presence of witnesses, or even without witnesses, provided a jury or judge believe the statement on oath of the party paying it, this is, in England, quite as good evidence of the payment as if a written receipt were given; and even a written receipt is not conclusive, for it is subject to explanation, and if it was obtained in advance of a payment which never followed, or by fraud, it goes for nothing as a discharge of the debtor. If a receipt is in writing, and the sum paid exceeds 40*s*., it must be stamped with a penny receipt-stamp (which may be an adhesive stamp), otherwise the receipt is inadmissible as evidence of payment

Not only is a receipt proper subject to stamp-duty, but also any note or memorandum given to a person on payment of money, and acknowledging payment of any part of a debt or demand, whether signed or not; so receipts given on payment of bills of exchange or promissory-notes, are liable to stamp-duty. But there are several exceptions from liability to stamp-duty. Such are receipts for deposits with bankers (except when paid on allotment of shares, or in respect of calls on shares); receipts as to the assessed taxes—for land-tax, income-tax, and payments to the crown; receipts by officers, seamen, marines, or soldiers for wages or pay; receipts for purchase of government stock; receipts written on the back of duly stamped bills of exchange or promissory-notes, or upon the back of duly stamped purchase-deeds. Where a debtor tenders money, but requires a stamped receipt at the same time, he ought to provide himself with paper, and stamp, and writing materials, for the creditor is not bound to supply these. In Scotland, the receipt of money cannot be proved by witnesses, where the debt was created by writing, and it is not allowed to dispute the validity of a written receipt, except in cases of fraud.

RECEIVING STOLEN GOODS is a criminal offence, distinct from larceny. It implies that the goods were received with the knowledge that they were stolen. The offence is felony, and punishable with penal servitude from 3 to 14 years; or 2 years' imprisonment, with or without hard labor. In cases where the stealing is only a misdemeanor, then the receiving is also only a misdemeanor, and where the taking of property is an offence punishable on summary conviction, the receiving with knowledge is punishable in the same way. It is sometimes extremely difficult to distinguish between the case of a receiver and of one who is a party to the stealing, or a principal. The thief may be a witness against the receiver.

RECENT or HUMAN PERIOD, in Geology, is the title given to the epoch that has elapsed since man made his appearance on the globe. The causes that operated throughout the ages of geological time to produce the changes recorded in the various sedimentary deposits, did not terminate with the beginning of human history, but have been ever acting since man was able to observe and to record his observations, and are still in progress around us. The solid earth is being washed away by atmospheric agency, and the abraded portions are continually carried away slowly and imperceptibly by streams and rivers, to form new deposits in the depths of inland lakes or of the ocean. Volcanoes

are throwing up lava and scoriæ, and earthquakes are elevating portions of the earth's surface in one place, and depressing them in another; and plants and animals are, either with their living bodies or their dead exuviæ, forming, as in past ages, deposits in various places, as in the foraminiferous ooze of the deep ocean, and the enormous coral reefs of the eastern seas, or the peat-mosses and diatomaceous earths of temperate climes. The record of all these changes, and the remains of man and of the plants and animals which the strata produced by them contain, have for some years received great attention. As they form common ground for the antiquary and geologist, they have been diligently investigated by the students of both sciences. The classification adopted for the subdivision of the Recent Period is based on what is supposed to have been the progress of human civilization. The first rude inhabitants of a country seem to have been acquainted only with stone implements. Their hammers, knives, and spears were made of stone, sharpened by chipping the edges, and subsequently by grinding and polishing. In Denmark, these stone implements are found buried in peat-mosses, associated with the remains of plants and animals that still live in that or neighboring countries.

The common tree in these mosses is the Scotch fir, which has not been a native of Denmark during historical times. Of the same age are the 'kitchen-middens,' found on the coasts of the Danish islands in the Baltic. They are mounds of the shells of the oyster, cockle, periwinkle, and other edible mollusca, like those formed by the North American Indians on the eastern shores of the United States. The implements found in them are formed of stone, sometimes of wood and bone, but never of metal. Similar 'middens' have been described as occurring in various places in the north of Scotland. The people who built the earliest of the lacustrine habitations of S itzerland were also unacquainted with the use of metals. See CRANNOGES. The paucity or almost absence of human bones in such early deposits, whether in Denmark or Switzerland, is attributed by antiquaries to the supposed practice of burning the dead.

While the lower portion of the Danish peat-mosses is characterized by the presence of stone implements and the trunks of Scotch fir, the upper portions of the same mosses abound in trunks and acorns of the common oak, and with these are associated implements and articles of bronze. In many of the Swiss pile-buildings, the bronze implements also supplanted those of stone. The various articles exhibit a considerable advance in civilization, as is to be expected from the using a metal, the possession of which implies the existence of foreign commerce, since it was in ancient times only obtained from Cornwall.

In progress of time, the oak in its turn disappeared from the surface of Denmark, and was followed by the beech, which still continues to flourish luxuriantly in Denmark. The use of bronze also gradually gave way before the now discovered iron. A few of the lake-buildings seem not to have been abandoned until after the inhabitants became acquainted with the use of iron, as some articles made of this metal have been found at Nidau.

While it is useful thus to characterize the various steps in the civilization of man, and to associate them with the strata in which they occur, it would be a source of endless error to suppose that all such strata are contemporaneous; for the various ages have really existed at the same time not only in different countries of the world, but even in contiguous regions, and probably implements of the three materials have been used at the same time by different inhabitants of the same district. See BRONZE, AGE OF. The occurrence, then, of stone implements in several deposits exhibits not a similarity of age, but a similar stage of advancement in civilization, consequently no dependence can be placed on those calculations which trace back the iron, bronze, and stone periods as if they had preceded each other in regular chronological series, and each had occupied a given number of years.

RECE'PTACLE, in Botany, the expanded and abbreviated termination of a floral axis, bearing many flowers close together, as in the *heads of flowers* of the *Compositæ* and in the fig. The receptacle assumes a great variety of forms, and sometimes as in the fig, becomes a chief part of the fruit. It is the eatable part of the artichoke, and the 'cheese' of thistles, so well known to school-boys. The name receptacle is sometimes also given to that part of a single flower from which the whorls of floral envelopes and parts of fructification, or some of them spring; which, however, is more properly called the *thalamus* or *torus*.

RECE'PTION, RELIGIOUS, of monks, nuns, and other religious persons, is the ceremonial whereby they are admitted to the probationary state called the Novitiate (q. v.). Before the ceremony of reception, a short preparatory stage must be passed through by the candidate (called at this stage a 'postulant'), the duration of which usually ranges from two to six months. The ceremony of the reception, called also 'clothing,' is performed by a bishop, or a priest delegated by a bishop, and consists in blessing the religious dress or habit, and investing the postulant therein with appropriate prayers, the hair being at the same time cut off, and the secular dress laid aside, in token of the renunciation of the world and its pomps and pleasures. The reception, however, is understood to be only a provisional step; and the novice remains free to return to secular life at any time during the novitiate.

RECI'PROCAL (Lat. *reciprocare*), a term which is employed in Mathematics in a sense analogous to that attached to it in ordinary language. A geometrical proposition is the reciprocal (or *inverse*) of another, when the 'data' of the one are the 'quæsita' of the other, and *vice versâ*. In Algebra, one quantity is the reciprocal of another, when the one is the result of unity divided by the other; thus, 2 and $\frac{1}{2}$, x and $\frac{1}{x}$, $\frac{a}{b}$ and $\left(1 \div \frac{a}{b}\right)$ or $\frac{b}{a}$, are reciprocal quantities. The product of a quantity by its reciprocal must always be unity. *Reciprocal or Inverse Proportion*, a term formerly much used in arithmetical treatises, but now, and with much propriety, generally disused, referred to such questions as the following: If a rectangular field be 800 yards long, and 240 broad, what must be the breadth of another rectangular field of equal area which is 960 yards long?—the answer being 200 yards. In this question, we see that the breadths are not proportional to the lengths, but to the reciprocals of the lengths; thus, $\frac{1}{800} : \frac{1}{960} : : 240 : 200$; but in all such problems, it is better for the pupil to be left to exercise his judgment in applying to them the ordinary rule of proportion.

RECITATI'VE (Ital. *recitativo*, from *recitare*, to recite), a species of vocal composition which differs from an air in having no definite rhythmical arrangement, and no decided or strictly constructed melody, but approaches, in tonal succession and rhythm, to the declamatory accents of language; it is, in fact, as near an approach as possible to speech delivered in musical sounds. Recitatives are not performed in any strict species of time, the length of the notes depending on the singer, who lengthens or shortens them according to the expression required. It is, however, usual to note a recitative in common time, in order to facilitate the reading; and when any part of a recitative is to be performed in strict time, this is indicated by the words *rec. a tempo*. When a recitative is accompanied merely by a few simple chords of an instrument, to indicate to the singer the pitch and the harmony, it is called *recitativo secco*, or *parlante*, declaimed recitative. When the voice is accompanied by a considerable portion of the instruments of the orchestra, either in sustained chords or florid passages, it is termed *recitativo accompagnato*, *strumentato*, or *obligato*. Recitative was largely used in the ancient drama; and is used in the opera to express some action or passion, to relate a story, reveal a secret or design, &c. It is said to have been first introduced in the opera by Emilio del Cavaliere at Rome.

RECLAI'MING, in the Law of Scotland, means the appeal from a judgment of the Lord Ordinary to the Inner House. The reclaiming days are ten days after judgment, except against interlocutors disposing in whole or in part of the merits of the cause. The step by which the appeal is commenced is a reclaiming note.

RECLU'SE (Lat. *reclusus*, also *inclusus*, , shut up), a class of monks or nuns who, from a motive of special penance, or with a view to the more strict observance of Christian perfection, remained shut up from all converse, even with members of their own order, in a cell or other place of strict retirement. This practice was not allowed, except to persons of tried virtue, and by special permission of the abbot; and the recluse was, with due solemnity, locked up in the presence of the abbot or the bishop, who placed his seal upon the door, not to be removed without the authority of the bishop himself. The celebrated medieval theologian, Rabanus Maurus, was a recluse, when elected Archbishop of Mentz. Nuns also were found to practise the same voluntary seclusion, especially in the Benedictine, Franciscan, and Cistercian orders. A rule, specially designed for female recluses was composed by Ældred of Reresby, and is preserved by Holstenius in his *Codex Regularum Monasticarum*, vol. i. p. 418, and following. —In a wider sense, the name recluse is popularly applied to all cloistered persons, whether men or women, even those who live in community with their brethren.

RECO'GNIZANCE is a kind of judicial bond entered into with a court of record, the object of which is to secure the doing of some act, as the appearance of witnesses at a criminal trial, or the keeping of the peace by one who has threatened or assaulted another. The form of it is thus: 'A B doth acknowledge to owe to our lady the Queen the sum of ten pounds,' or some other sum to be levied of his goods if he fail in the condition endorsed; and then a condition is added, which states that if the thing secured is done, then the recognizance is to be void. This is the mode by which justices of the peace secure the attendance of the prosecutor

and witnesses at the trial of a prisoner who has been committed for trial, or the future good behavior of one who has committed a breach of the peace. If the thing secured is not performed, then the party bound forfeits his recognizance, that is, a debt of the amount specified becomes forthwith due to the crown.

RECOI'L. When the charge of gunpowder contained in a gun is fired, the sudden expansion of the powder into many times its former bulk acts with equal force in every direction. The resistance offered by the ball, which moves more or less easily in the bore, being far less than that of the bulky and heavier gun and carriage, the ball is forced to a great distance; but the gun, with its carriage, must nevertheless feel the reaction, and is driven backwards a certain space, ordinarily a few feet. This retrograde motion is called the recoil, and dangerous accidents sometimes take place from it. After the recoil, the gunners have to work the piece back to its former position for the next discharge. In the Armstrong naval gun, and some other modern cannon, the trunnions of the gun are mounted on an inclined plane, up which the recoil drives them, to run down again by their own weight. See also the description of the Moncrieff GUN-CARRIAGE. Other expedients have been tried with greater or less success; among them may be cited a series of solid India-rubber buffers, which, being compressed by the recoil, drove the gun home again on recovering their shape. The gun and shot remaining the same, the recoil is proportionate to the charge.

The recoil of small-arms is known as their 'kick,' and is felt on the shoulder of the marksman.

RE'COLLECT (Lat. *recollectus*, gathered together), a name given to the members of certain reformed bodies of monastic orders, whether of men or women, in the Catholic Church. Among orders of men, an offshot of the Augustinian hermits, which, under Louis de Montaya, in 1530, obtained considerable popularity in Spain, was called by this name, and the order still exists at Medina Sidonia, Leon, and Pamploma; but outside of Spain, this order is better known under the title of the REFORMED FRANCISCANS, who were established in France under Henry IV. and Louis XIV., and spread thence into Belgium, their houses in these countries and Germany becoming so numerous that they reckoned no less than ten provinces. A reform of the Cistercian order of nuns in Spain was called by the same name.

RECO'NNAISSANCE, RECONNOI''TRE, the noun and verb expressive of the operation of inspecting a country in which military operation are intended. This duty devolves on the department of the Quarter-master General, and requires the exercise of qualities of a very high order. The officer deputed to reconnoitre is well mounted, and accompanied by a small escort, also well mounted, in order to escape if noticed by the enemy. His duty is to measure every natural feature in his district by eye, or by more accurate measurement when practicable, and to produce a map, showing hills, valleys, streams, canals, plains, woods, &c. He must at the same time note all obstacles; what resources the country possesses to maintain men or horses; what the disposition of the inhabitants, &c. Reconnoitring is necessarily a very dangerous service; an officer so employed has often to resort to disguises, and if taken, runs some risk of being treated as a spy.—A maritime reconnaissance is analogous.

RE'CORD, as a legal term, is used in the United Kingdom to signify the formal statements or pleadings of parties in a litigation. In general, the rule is well settled that the pleadings which make up the record do not enter into details of the evidence, but merely set forth the conclusions or inferences, leaving the details of evidence to be supplied at the trial before a jury, or, if there is no jury, at the hearing before the judge or court. All the higher courts file the records in the suits, and are called Courts of Record, and one of the incidents of a Court of Record is, that the court or judge can commit for contempt any person who insults the court, or wilfully obstructs the business. A trial by record means that one of the parties has set up some former decision of the court, while the other denies that such a decision ever existed; whereupon, the only mode of solving the question is by producing the record of the former action, and so settling the dispute. In the Courts of Common Law of England, the parties, by the rules of pleading, come to an issue at last, after mutually answering each other, and the issue is either some short point of fact or of law. No intervention of the judge or court is necessary to come to an issue. In Scotland, however, the closing of the record is a formal step which requires the sanction of the judge, who closes the record after each party has said all he wishes to say by way of statement and answer. See also REGISTRATION.

RECORDS, PUBLIC (Lat. *recordari*, to remember), contemporary authenticated statements of the proceedings of the legislature, and the judgments of those higher courts of law which are distinguished as Courts of Record. It has been a subject of much discussion what constitutes a record, and in a looser sense the term record has sometimes been applied to any public document preserved in a recognized repository. No country is so rich in public records as England. A committee of the House of Commons, in 1837, described the public records of England as comprised under four classes. 1. Independent series of records of territorial surveys at different periods. 2. Series of enrollments, comprising on one roll varieties of distinct entries, classed together according to their formal character. 3. Records of judicial proceedings. 4. Separate documents, as letters, inquisitions, commissions, and privy seals. Act 1 and 2 Vict. c. 94, sets at rest the question what is legally to be held a record, by providing that the word records shall be taken to mean all rolls, records, writs, books, proceedings, decrees, bills, warrants, accounts, papers, and documents whatsoever belonging to Her Majesty, or then deposited, or which ought to be deposited, in any of certain places of custody, which are enumerated.

The oldest existing English records are Tallies in Exchequer, which, down to 1834, continued to be used both for receipts and for simple records of matters of account. They consist of wooden rods, marked on one side with notches, to indicate the sum for which the tally was an acknowledgment; while on the two other sides were written the amount, the name of the payer, and the date of the transaction; and the tally being divided longitudinally, the one half was preserved in Exchequer, and the other given to the person who had paid the money. This rude contrivance, which came down to us from Anglo-Saxon times, was an effectual safeguard against forgery. Parchment is the material on which the greater portion of the records are written; the skins being, in some cases, as in the rolls of the Exchequer and common law courts, attached at the top bookways; in other cases, as the Chancery and Wardrobe, sewed consecutively. Some records are in the form of books, as *Doomesday;* others are filed—i. e., each document is pierced with a string or gut passed through it, the whole being fastened together in bundles. A few records are written on paper. The early parliamentary records and statutes are principally in Norman-French, which continued in partial use till the time of Henry V.; all the other great series of records, except those of parliament, are in Latin down to the reign of George II., or later, except during the Commonwealth, when English was substituted.

Public records, which can be traced in germ before the Conquest, gradually expanded under the Norman and Plantagenet kings. They enabled the subject to defend and maintain those feudal rights and privileges which were gradually trenching on royal prerogative, and to protect himself from arbitrary exactions; while to the king they furnished precedents which could not be questioned for his calls of military service and taxation.

The various courts being the king's courts, and following the sovereign from place to place, their earliest receptacles were the royal palaces in different parts of England; but when the higher courts were permanently established at Westminster, 'treasuries,' or places of custody for the records of the different courts, were appointed there. A portion of the public records were, as far back as Henry III.'s reign, deposited in the Tower of London and New Temple; and in the reign of Edward III. the Tower had become a permanent treasury. The parliamentary committee of 1837 enumerated among the places of deposit a room in the Tower over a gunpowder magazine, and contiguous to a steam engine in daily operation; a chapel at the Rolls, where divine service was performed; underground vaults at Somerset House; damp and dark cellers at Westminster Hall; the stables of the late Carlton Ride; and the Chapter-house, Westminster. From the reign of Edward II. downwards, the attention of parliament has often been called to the safe custody and arrangement of the records as an object of solicitude. The fullest examination in recent times was made by a committee of the House of Commons in 1800, whose Report presents far the most comprehensive account of the records in existence. A commission was appointed to go on with the work which the committee had begun, and renewed six times between 1800 and 1831. All the several record commissions directed the commissioners to cause the records to be methodized, regulated and digested, bound and secured, and to have calendars made, and original papers printed; and numerous valuable publications have been issued by the commissioners from time to time. A full investigation into the proceedings of the Record Commissioners was made by a committee of the House of Commons in 1835, since which time annual Reports have been issued by the deputy-keeper of records.

The most important recent statute regarding the custody and preservation of the records is 1 and 2 Vict. c. 49, which restores to the Master of the Rolls that custody of the records which he had originally possessed, but which had for a long time become nominal. That officer is empowered to appoint a deputy-keeper of the records, and in conjunction with the Treasury, to do all that is requisite in the execution of this service. He makes rules for the management of the office, and fixes what fees may be demanded. He allows copies to be made, which, when certified by the deputy and assistant keepers, and authenticated with the seal

of the office, are producible as evidence in courts of law. The Home Secretary directs from time to time such of the catalogues, calendars, and indexes, and such of the records as he thinks fit, to be printed, and sold at prices fixed by him. The act 1 and 2 Vict. c. 94 contemplates the consolidation of all the records in the large receptacle near Fetter Lane, into which, under Sir John Romilly, then Master of the Rolls, they began to be gradually collected from their different scattered depositories.

Our limits will not allow us to enumerate more than a very few even of the more important classes of records. One class consists of the various territorial surveys, beginning with *Doomsday* (q. v.), and including, among others, the *Rotuli Hundredorum*, *Extenta Manerii*, *Testa de Nevill*, *Pope Nicholas's Taxation*, *Henry VIII.'s Survey*, and the *Survey of the Commonwealth*. Another extensive class belong to the *Exchequer*, including the *Pipe Roll*, or Great Roll of the Exchequer, beginning with the second year of Henry II., containing the yearly accounts of the revenues of the crown, certain and casual; the *Memoranda* and *Originalia* rolls, records of *First-fruits and Tenths*, records of the *Court of Augmentations*, instituted to decide questions regarding possessions belonging to the crown, on the dissolution of the monasteries, and *Placita*, or records of pleadings and judgments. The *Rotuli Curiæ Regis* contain the record of the proceedings in the ancient supreme court of law; and there are numerous classes of records of the proceedings in all the various courts of common law and in the Court of Chancery.

The record of *Fines and Recoveries* is an unbroken record of the transfer of lands from 25 Henry II. down to 1833, when this species of conveyance was abolished. The *Charter Rolls* are records of charters, of grants of privileges to religious houses, towns, and corporations, and creations of nobility from 11 Edward II. to Edward IV. The *Patent Rolls* are enrolments of instruments written on open (*patentes*) sheets of parchment, having pendent from them the Great Seal, addressed to the lieges in general. The *Close Rolls* are records of such letters under the Great Seal as were despatched closed or sealed up—royal mandates to particular persons for particular purposes, and not intended for public inspection. The *Liberate Rolls* contain writs issued out of Chancery, ordering the payment of money from the Treasury. The *Fine Rolls* contain accounts of fines paid to the king for license to alienate lands, freedom from knight-service, passing or renewal of charters, wardships, safe-conduct, pardons, &c. The *French Rolls*, *Norman Rolls*, and *Gascon Rolls* relate to the affairs of France, Normandy, and Gascony, when held by the English; and the *Rotuli Scotiæ* to transactions with Scotland. An important class of the records are those connected with parliament, including *Statute Rolls*, *Parliament Rolls*, *Records of Parliament*, and *Statutes* from 1485 to the present time, with the *Journals of the Lords and Commons* from Henry VIII. to the present time, and the *Writs of Summonses* and returns to parliament.

The *state papers* originally sprung from the Privy Council and Chancery, and include the correspondence of the Privy Council, secretaries of state, and other public departments, with miscellaneous domestic papers from the time of Henry VIII. to George II., a mass of correspondence with foreign powers, and an extensive collection relating to ecclesiastical affairs at and after the Reformation. Since 1855, the State Paper Office has become a part of the Public Record Office, and been placed under the control of the Master of the Rolls. Much has been done in the way of calendaring and arranging the contents of this valuable repository, and several volumes of calendars of state papers are being issued yearly to the public.

By the regulations established by the Master of the Rolls, 5th July, 1858, persons desirous of consulting the public records, including state papers, for a literary purpose, have to apply in writing to the deputy-keeper, stating the objects of their search, which, if necessary, may be more fully explained at a personal interview. If the explanation be satisfactory, a permission is issued to inspect and make extracts without payment of fees.

Scotland.—The public records of Scotland were undoubtedly numerous and multifarious as early as 1282; but the more ancient of them were lost by shipwreck in the reign of Edward I. of England. The control of the records has from very early times been intrusted to the Clerk Register, or Lord Clerk Register, one of the high officers of state, who had a seat in the Scottish parliament, to whom, and his deputies and other officers appointed by him, it was assigned to superintend both their formation and their custody. The earliest records of Scotland were in the inconvenient form of rolls, but in the reign of David II. the practice was introduced of writing them in books. By an act of 1463, the king's rolls and registers were appointed to be put in books; but the accounts in the Exchequer continued, nevertheless, to be kept in rolls till the passing of another act in 1672, appointing them to be written in books. Prior to the reign of Charles II., the public records were deposited, under care of the Clerk Register, in the Laigh Parliament House, now part of the Advocates' Library; and shortly before the Union, the whole records were transferred to that depository, where they continued till the erection of the large building called the General Register House, which was completed in 1787, and has recently been added to. The Register House serves the purpose of preserving and making available the national muniments, as well as accommodating the whole offices of record connected with the supreme court. The Lord Clerk Register and his depute have now merely the *custody* of the records, their preparation being intrusted to another class of officers.

Under the Scottish records are included the acts of parliament and of Privy Council, and the records of all the various courts of justice; also the records of the Great Seal, Privy Seal and Signet. An important class of records are the *Retours of Services*. A service is by the law of Scotland necessary to transmit a right to real property to the heir from his ancestor. At present this service consists of the decision of the sheriff of the county or the sheriff of the Chancery; but the form in use till 1847 was by retour, a writing which contained the verdict of a jury returned in answer to a brieve from Chancery for finding the heir at the death of his ancestor. The register of retours is not extant further back than 1547.

The registers connected with the transmission of heritable rights are even more important. After several unsuccessful attempts to introduce a system of registration, the great branch of the public records known as the *Register of Sasines* was established by act 1617, c. 16. By the system then introduced, which has since been continued with modifications in detail, all instruments requisite to the transmission of real property must be put on record for publication. Besides the principal register in Edinburgh, there are district registers, and any instrument may be recorded either in the general or district register. Volumes are issued from the General Register House to the district recorders of sasines, which, when filled, are returned to the General Register House. By this means the title to real property can be ascertained with certainty and precision, and may, if necessary, be traced back two centuries and a half. It is also obligatory to record in separate registers all instruments necessary for the constitution, transmission, and extinction of voluntary encumbrances. See REGISTRATION OF DEEDS AND WRITS. This system, while confirming the credit of the proprietor, also operates in favor of the security of creditors. There is a special *Register of Entails*, in which, in terms of act 1685, c. 22, deeds of entail must be recorded at the sight of the Court of Session. The object of registration in all these cases is *publication;* but charters by subjects, dispositions, bonds, contracts, and other probate writs may, under act 1698, c. 4, be recorded in the *Register of Deeds* for *preservation*. A third object of registration is *execution*. Every deed constituting a personal claim of debt, or an obligation to perform some lawful prestation, if intended to be made the subject of personal diligence for payment or performance, must be registered previously to execution being issued on it. Some volumes of calendars of state papers relating to Scotland have been issued to the public.

Ireland.—Many of the records perished during the wars prior to the final reduction of Ireland, and those which survived these commotions were long exposed to mutilation and destruction from the unsatisfactory arrangements for their custody. A commission was appointed in 1810 for the preservation and arrangement of the Irish records, whose labors, conducted with considerable success, were terminated by the revocation of the commission in 1830. In 1847, commissioners were again appointed to investigate the state of the records, in consequence of whose labors a bill for their safe custody was prepared, but afterwards abandoned. There is no general place of custody for the records of Ireland, which are scattered in different repositories in Dublin. Several volumes of calendars from the Irish *patent* and *close* rolls have been published under the direction of the Master of the Rolls.

RECORDE, ROBERT, generally allowed to have been the greatest English mathematician of the 16th c., but now almost forgotten, was born about 1500 at Tenby, in Pembrokeshire, Wales. He completed his education at Oxford, and there distinguished himself in mathematics, rhetoric, music, and anatomy; but wishing to make medicine his profession, he removed to Cambridge, and there, in 1545, he received the degree of M.D., 'being much admired by all who knew him for his profound and varied knowledge of art and science.' In 1547, he was in London, engaged in the composition of *The Urinal of Physic* (1548), a work which saw five editions; and was about the same time appointed family physician to Edward VI., and afterwards to Queen Mary. Ten years after this, we find him in the debtor's prison in London, where he died miserably in 1558.

His works are all in the form of dialogues between a master and his pupil, and are written in the rude English of his time; they are—*The Gate of Knowledge*, and *The Treasure of Knowledge*, two works that seem to be completely lost; *The Ground of Arts*,

teaching the Perfect Work and Practice of Arithm tic, &c. (Lond. 1549), an arithmetical work which has been frequently reprinted, and which exhibits a curious 'melange' of the Arabic and Roman notations; *The Pathway to Knowledge* (Lond, 1551), an abridgment of Euclid's *Elements*; *The Castle of Knowledge, containing the Explication of the Sphere both Celestial and Material*, &c. (Lond. 1551), an astronomical work, dedicated to Queen Mary, in which he compares the Ptolemaic and Copernician systems, and, but with great hesitation, gives the preference to the latter; *The Whetstone of Wit, which is the second part of Arithmetic*, a treatise upon algebra, a subject at that time little known, in which R. collects the substance of the best continental writers, and adds his own improvements and discoveries. In the appreciation of the general results derivable from algebraic formulæ, he is far beyond his contemporaries, with the sole exception of Vieta (q. v.). R. is regarded as the inventor of the symbol (=) for equality, and of the mode of extracting the square root of compound quantities. R.'s talents seem to have been as varied as profound, for, besides his mathematical pre-eminence, he was considered to be a skilful doctor, an able lawyer, and a philologist of no mean ability.

RECO'RDER is a judge of a city or borough Court of Quarter Sessions, being a barrister of not less than five years' standing. He is appointed by the Home Secretary, and the salary is paid by the city or borough out of the borough fund. His duties are the same as what are usually discharged by Courts of Quarter Sessions, and are confined chiefly to the trial of prisoners who have been committed by justices of the peace for trial during each quarter of a year. The recorder is not prohibited from practising at the bar, and he is almost invariably a counsel in active practice. The salary is generally small, but, nevertheless, the office is in great request among members of the English bar. There is no such office in Scotland, but the sheriff discharges similar duties.

RECORDER, the name of a musical instrument formerly in use in this country, somewhat like a flageolet, but with the lower part wider than the upper, and a mouthpiece resembling the beak of a bird. Its pitch was an octave higher than the flute, and it had a pleasing tone, hence Milton speaks of

> The Dorian mood
> Of flutes and soft recorders.

RECO'VERY, in English law, was a term much used in reference to estates tail, though it is also a general term denoting the decision of a court in favor of a party claiming lands or goods. A feigned recovery was an imitation of a similar proceeding, and was a device invented to break an English entail. An estate tail was an estate given to A and the heirs of his body, and at first it was enacted by a statute *De Donis*, under Edward I., that A could not sell or alienate the estate, so as to prevent the heirs of his body acquiring the benefit of it. But the lawyers invented a sham action and judgment, called a recovery, by which the issue were barred from all rights. The Fines and Recoveries Act abolished that form, and substituted for it a disentailing deed, which, when executed by the tenant in tail, has the same effect.

RECRUI'TING. Formerly, the task of raising recruits for the army was intrusted to the colonels of regiments, who employed civilian agents and others to persuade young men to join their standards; these agents often resorting to very illegal methods to entrap recruits. Subsequently, the duty was assigned to several recruiting corps, each known by the name of its commanding officer; but under this system, so many irregularites, and such difference of practice arose, that in 1802, for the purposes of uniformity, economy, and proper control, it was decided to place the whole recruiting under the immediate direction of the adjutant-general. For this purpose, the country was divided into recruiting districts. At the head of each district was placed an inspecting field-officer, with the duty of superintending all recruiting parties in his district, and of approving the recruits brought. At the district headquarters there was a paymaster responsible for all the financial concerns, and a medical officer, who examined the recruits in point of health and physical fitness.

Recruiting parties used to consist of old sergeants, who sought by every means to induce young men to enter the army; they frequented fairs, wakes, and country gatherings, endeavoring by beat of drum, smart uniforms, well-fed personal appearance, and persuasion—not always too truthful—to convince the rustics of the advantages of the Queen's service; advantages which really existed, though not always to the extent depicted. The adoption in 1872—1873 of the system of regimental localization changed all this. The United Kingdom is divided into 66 sub-districts, at the head of each of which is a colonel, who commands the brigade depot, and the auxiliary and reserve forces of his sub-district. He also controls the recruiting within his command, primarily, for the regiments composing the brigade; and secondly, for the rest of the army. To preserve uniformity of action, the colonels report on recruiting matters to the inspector-general of recruiting, an official on the staff at the War Office. The Army Discipline and Regulation Act of 1879 prescribes the rules for recruiting. Every person authorized to enlist recruits for the regular forces must give to every recruit a notice showing the conditions of the contract, and directing him to appear before a justice of the peace. If the recruit does not appear before the justice, or, appearing, does not assent, no further proceedings are taken. If he assents to be enlisted, the justice reads a series of questions and receives his answers, the attestation of which the recruit signs. The justice then administers the oath of allegiance; whereupon the recruit is held to be enlisted as a soldier. If within three months of the attestation the recruit pays for the use of Her Majesty a sum of ten pounds, he shall, in ordinary circumstances, be discharged. Save in the British and American armies, voluntary enlistment is unknown, and compulsory military service more or less universally obligatory. See the articles on the various countries. About 18,000 recruits used to be raised annually in time of peace for the British army; but about 30,000 are required since enlistment for short service with the colors became the rule.

Recruiting for the navy is treated under MANNING THE NAVY.

RE'CTIFYING is a process applied to alcohol after its distillation, to remove certain impurities which come over with it from the still. These, in part, consist of essential oils; and in order to effect their removal, caustic potash is added in sufficient porportion to saponify the oil present; water is also contained in the first distillation, and to remove this, and to assist in removing the oily matters, common pearl-ash is added. Technically, the former of these is called *gray salts*, and the latter *white salts;* and about four pounds of each are added to every 700 gallons of spirit, and well agitated, so as to combine with the oil and water. The spirit is then distilled again, and comes over much more pure, the alkaline salts, and the matters which have been combined with them, being left behind in the still. This is usually repeated two or three times, the quantity of the salts being diminished to one-half in the second, and proportionately decreased in the succeeding distillations. The rectifier is not only a purifier of the alcohol produced by the distiller, but he often given it a distinctive character; by adding flavoring materials to it, he makes it into gin, brandy, &c. Thus, in order to convert the spirit into London gin, juniper berries and coriander seeds are added previous to the last rectification. Œnanthic ether and other things give the flavor of brandy. This part of the operation is very much varied by the taste and skill of the recitfier.

RECTOR (Lat. *rector*, a ruler), the title of several classes of clerical and collegiate officials, some of which are referred to under their respective heads. As regards clerical rectors, the title, in its most ordinary English use, is applied to the clergyman who holds complete and independent charge of a parish. This use, however, is a departure from the canonical signification of the title, which meant rather a clergyman who was appointed to govern a parish where the chief parochial jurisdiction was vested in a religious corporation or in some non-resident dignitary. In certain of the monastic orders, the name rector is given to the heads of convents, as it is also given to the heads of universities, colleges, seminaries, and similar educational corporate institutions.

RE'CTUM, DISEASES OF. The terminal portion of the intestinal canal, named, from its comparatively straight course, the rectum, is the seat of various affections requiring medical or surgical assistance. Some of these affections, as piles, prolapsus ani and hæmorrhage from the rectum, have already been considered. Amongst the other diseases of the rectum of sufficient importance to claim notice in these pages are—

1. *Stricture of the Rectum*, which may be either spasmodic or permanent. *Spasmodic stricture* is comparatively rare. *Permanent stricture* may be either of a simple or malignant nature. *Simple stricture* consists in a thickening and induration of the mucous coat of the rectum, so as to form a ring encroaching on the calibre of the tube. It is situated about two or three inches from the anus, and the contraction is so great and unyielding that it is often difficult to pass a finger through it. The symptoms are constipation and great pain, and a straining in evacuating the fæces, which are passed in a narrow, flattened, or worm-like form, which is very significant of the nature of the case. In an advanced stage of the disease, diarrhœa and prolapsus often supervene. However great may be the constipation, strong irritant purgatives must be altogether avoided. Soft and unirritating evacuations must be procured by such medicines as the confection of senna combined with sulphur (see PILES), or injections of castor-oil or of tepid water. The diet should be regulated so as to assist the action of the medicines. Nutritious soups are serviceable, since, at the same time, they support the strength and leave little matter to be excreted. When much local irritation is present, it may be relieved by the hip-bath and by sedative injections; till it is subdued, surgical interference would do more harm than good. A bougie capable of being passed with moderate pressure through the stricture, should be inserted in the gut

every third or fourth day, and should be allowed to remain for about a quarter of an hour; and its size should be gradually increased. Nothing is gained by the forcible passage of large bougies. The cure is to be effected by pressure so applied as to produce absorption, not by mere mechanical dilatation. *Malignant stricture*—most commonly due to the scirrhous, but sometimes to the epithelial form of cancer—is by no means a very rare affection, and is more common in the female than the male sex. Until ulceration sets in the symptoms are like those of simple stricture, only exaggerated in degree; but afterwards there is a discharge of fetid muco-purulent matter streaked with blood. In this disease, the treatment can be only palliative, unless the surgeon resort to the formation of an artificial anus in the loins as a last resource.

2. *Spasm* of the *sphincter ani* muscle is characterized by extreme pain in the region of the anus, especially when an attempt is made to evacuate the bowels. The muscle contracts so firmly that the surgeon cannot easily introduce the finger into the rectum. The spasm may be caused by piles, by fissure of the anus, by ulceration of the rectum, and sometimes apparently by mere constipation. It is often relieved by the application of the Belladonna Ointment of the British Pharmacopœia.

3. *Neuralgia of the rectum*, known also as *proctalgia*, is a common disorder, and is especially prone to attack children and gouty persons. It is usually relieved by the judicious use of aperient medicines.

4. *Congestion*, sometimes proceeding to *inflammation*, is not uncommon in the rectum. The congestion occasions a sense of weight and fulness in and about the rectum, together with a variety of other symptoms. Amongst the causes of this affection are stone in the bladder, stricture of the urethra, an enlarged prostate gland, the presence of thread-worms, the abuse of irritating purgatives, exposure to cold draughts in the water-closet, &c.; and there can be no doubt that sedentary habits strongly favor the predisposition to this affection. The great object of treatment is to relieve the over-loaded vessels of the rectum. The bowels should be freely opened with castor-oil, leeches should be applied to the verge of the anus, and after their removal a warm hip-bath is advisable.

5. *Pruritus podicis*, or *itching of the anus*, is a very common and extremely troublesome affection. Sometimes it depends on the presence of thread-worms or of old piles, while in other cases it is one of the manifestations of the skin disease known as *Prurigo* (q. v.). The treatment must depend upon the exciting cause.

6. *Fissure of the anus* is a small crack which gives intense pain during the passage of the fæces, and often persisting for several hours. Free purgatives, and the application of astringent lotions or ointments (as tannin lotion or ointment of galls) should be tried; and if they fail, partial division of the sphincter muscle must be resorted to—an operation easily performed, and certain to give relief.

7. *Fistula in ano* signifies a fistulous or pipe-like track by the side of the *sphincter ani* muscle. It may occur as a *complete fistula*, which has an external opening near the anus, and an internal opening into the bowel; or as a *blind external fistula*, which has no actual opening into the bowel, although it extends to its outer coat; or as a *blind internal fistula*, in which the preceding conditions are reversed. A sketch of the mode of treatment is given in the article FISTULA.

For a detailed description of these diseases of the rectum, and for information on many other less important affections of this part of the body, the reader is referred to Bushe's *Treatise on the Rectum*, and to the more recent works of Mr. Ashton and Mr. Henry Smith on the same subject.

RECU'SANTS, in English law, are persons who refuse or neglect to attend at the worship of the established church on Sundays and other days appointed for the purpose. The offence as a legal one may be held to date from 1 Elizabeth c. 2; but there were four classes punishable under the statutes against recusancy simply 'recusants;' 'recusants convict,' who absented themselves after conviction; 'popish recusants;' who absented themselves because of their being Roman Catholics; and 'popish recusants convict,' who absented themselves after conviction. It was against the last two classes that the statutes were mainly directed. In addition to the general penalties of recusancy, the popish recusants, for wilfully hearing mass, forfeited 100 marks (£66, 13*s.* 4*d.*); and for saying mass, 200 marks, or £133, 6*s.* 8*d.*, in addition (in both cases) to a year's imprisonment. They were disabled, unless they renounced popery, from inheriting, purchasing, or otherwise acquiring lands; and they could not keep or teach schools under pain of perpetual imprisonment. Popish recusants convict could not hold any public office; could not keep arms in their houses; could not appear within ten miles of London under penalty of £100; could not travel above five miles from home without license; could not bring any action at law or equity; could not have baptism, marriage, or burial performed, except by an Anglican minister; all under penalties of forfeiture and imprisonment. Protestant dissenting recusants were relieved from the penalties of recusation by the Toleration Act of 1 Will. and Mary, c. 18. Catholics were partially relieved in the year 1791, and completely by the Emancipation Act of 1829.

REDA'N is the simplest work in field-fortification. It consists of two parapets whose faces join in forming a salient angle towards the enemy, like a letter V, in which the apex is to the front. Regarded by itself, the redan is a work of very little strength, since there is no flanking fire to protect its faces, and nothing to prevent an enemy from forcing an entrance at the gorge; but redans are useful in many positions, and the rapidity with which they may be constructed, render them favorites with engineers and generals. A row of redans along an exposed front of an army adds much to its strength, the troops behind protecting the gorge, and the redans flanking each other. It forms an excellent defence for a bridge-head, the gorge being covered by the river. Redans figured largely in Wellington's works for defending Lisbon in 1810. The redan of Sebastopol in 1855 was the principal point of the English attack, and the scene of two bloody repulses by the Russians in June and September.

REDBREAST (*Erythaca rubecula*, or *Sylvia rubecula*), a bird of the family *Sylviadæ*, familiar to every one in the British Islands and throughout most parts of Europe—a universal favorite, from the readiness with which it approaches or enters human habitations, its lively manners, its aspect of pert curiosity, the frequency with which its song is heard in autumn and winter, and the strange mixture of shyness and audacity which its behavior displays. It is generally known throughout Britain by the endearing name of *Robin Redbreast*, or more briefly *Robin*, and has many similar appellations in continental Europe, significant of the kindly regard entertained for it, which is everywhere such that children early begin to distinguish it from all other birds as their peculiar favorite. Its utmost length is about 5¾ inches, but it is of a rounder and fuller form than many of the *Sylviadæ*, the slenderness of its legs rather strikingly contrasting with the form of the body. The wings are rather short, the fifth quill the longest. The tail is scarcely forked. The bill is rather broad and depressed at the base, narrower and slightly compressed at the point, the upper mandible bent down and notched. The general color is olive-brown, and the reddish-orange breast is a conspicuous characteristic, particularly of the male.

The R. is a native not only of Europe, but of the western temperate parts of Asia, and of the north of Africa. In the most northern parts of Europe it does not appear; and in many northern regions it may be regarded as a bird of passage; but, contrary to the ordinary rule as to birds of passage, it never congregates in flocks; it is always seen either solitary or in pairs. The attachment of pairs seems to extend beyond the mere breeding season, and, indeed, throughout their lives, and to be stronger than in most birds. The breeding season is early in spring. The nest is made of moss, dead leaves, and dried grass, lined with hair, often placed a little above the ground in a bush or among ivy on a wall; the eggs five to seven in number, white, spotted with pale reddish-brown; but many are the stories of the curious situations in which the R. has built its nest, in close proximity to houses and workshops, regardless of the presence of human beings, and of the noise of hammers and wheels. In winter, the R. seeks the neighborhood of human habitations more than in summer, and becomes more bold and familiar. Its food ordinarily consists of worms, insects, and berries; and when it becomes a pensioner at any door or window, which it very readily does, it shows a particular relish for small scraps of meat. Its song is sweet and plaintive, but weak, not much noticed amidst the many voices of summer, but often heard in the quietness of autumn, and even of winter, throughout which it is continued whenever the weather is good.

In America, the name of R. is often given to the Blue Bird (q. v.).

RED COLORS. Those used by painters consist of certain chemical compounds, natural or artificial. Thus, the red pigment called Armenian Bole, is either the ochreous earth known by that name, imported from Armenia, Tuscany, and other places, or else, as is most frequently the case, it is a composition of whiting, red oxide of iron, and red ochre. Vermilion is a sulphuret of mercury produced either naturally or artificially. Chrome-red is made by boiling carbonate of lead with chromate of potash in excess, until it assumes a red color, after which it is washed in pure water, and dried in the shade. Indian-red is a native product of Persia, being found in the neighborhood of Ormuz. It is imitated by calcining colcothar with red ochre. Light-red is made by calcining yellow ochre, and this can be converted into flesh-color by a due admixture of white. A bright orange-red, sometimes called Sandix, is made by calcining white-lead. Minium, or Red Lead, is a very distinct red color, requiring but little preparation; it is much used. Red ochre is extensively found in the

Mendip Hills, and is an oxide of iron; with clay, it forms a brownish-red paint. There are several other red colors, but these are the principal ones employed by painters.

RED CRAG, a deposit of quartzose sand intermixed with rolled and comminuted shells, of a deep ferruginous or ochreous color, which occurs in Suffolk, and belongs to the Pleiocene strata (q. v.).

RED DEER. See STAG.

RE'DDITCH, a busy manufacturing town of Worcestershire, stands on an acclivity 12½ miles south-south-west of Birmingham, with which it is connected by railway. Needles, pins, fish-hooks, and fishing-tackle are made extensively. Pop. (1871) 6135; (1881) 9964.

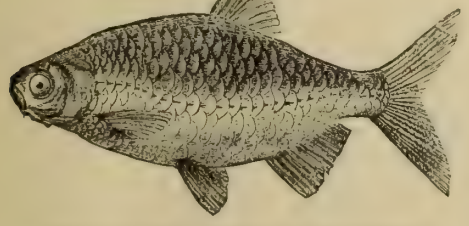
REDDLE, RADDLE, or RED-CHALK, an ochrey red-clay iron ore, which is chiefly imported from the continent, where it is found in Hessia, Thuringia, Upper Lusatia, Silesia, and Salzburg. It is found in small quantities in England, in the neighborhood of Rotherham, and at Wastwater, Cumberland. The English differs somewhat in quality from the foreign, and is chiefly used in polishing spectacle glasses. Of that from abroad, the finest quality is used for drawing on paper; the inferior sorts are used by carpenters and others for marking with; and the commonest is used for marking sheep. It occurs generally in thin beds, in clay-slate.

REDE'MPTION, in Law, the right of redeeming property which has been pledged to secure a debt. The equity of redemption is the name given to this right, and is commonly used in reference to mortgages of real estate, the mortgagor, after executing a deed of mortgage, having a right at any time to pay off the debt, and redeem or get back his property, unless he has been foreclosed by the creditor by a legal proceeding, the object of which is to sell the property to pay the debt. In Scotland, the equity of redemption is more usually called a reversion.

REDE'MPTIONISTS, one of the names of an order of monks devoted to the redemption of Christian captives from slavery. They are more frequently called TRINITARIANS (q. v.).

REDE'MPTORISTS, called also LIGUORIANS, a congregation of priests founded by St. Alfonzo Liguori (q. v.).

RED-EYE, or RUDD (*Leuciscus erythrophthalmus*, see LEUCISCUS), a fish of the family *Cyprinidæ*, common in lakes, slow rivers, fens, &c., in many parts of Europe and in England. It much resembles its congener the Roach (q. v.), but is shorter and



Red-eye, or Rudd (*Leuciscus erythrophthalmus*).

deeper. It is a richly-colored fish. The name Rudd refers to the color of the fish, the name Red-eye to that of its iris. The R. is better eating than the roach. It is readily caught by a baited hook. It sometimes attains a weight of two lbs.

RED GUM is the popular name for the papulous disease of the skin known to the physican as *strophulus*. It is a florid eruption, usually occurring in infants before or during their first dentition, and appearing on the most exposed parts, as the face, neck, arms, and hands, from whence it sometimes extends to other portions of the body. It occurs in minute red pimples, irregularly arranged, with occasional red patches, and sometimes a few interspersed vesicles. White pimples, popularly known as *white gum*, are also sometimes intermingled with the red papillæ. Strophulus is almost always an acute disease, seldom lasting more than a month. It is almost always an innocent complaint, and often occurs without any marked disturbance of the general health. In severe cases, the pimples cause a sensation of heat and itchiness, especially if the child is kept too warm, and slight febrile symptoms manifest themselves. Amongst the probable causes of this disease are the irritation caused by rough flannel next the skin, want of cleanliness of the skin—especially in relation to the child's excretions—the general disturbance of the system excited by teething, &c. Very little is required in the way of treatment further than to remove any obvious cause of the affection. Cold applications should be carefully avoided, lest they should translate the cutaneous irritation to some important internal organ. In the event of such a translation, the child should be placed in a hot bath, and mustard poultices or hot moist cloths sprinkled with turpentine, should be applied over the arms and chest.

RED HAND, in Heraldry. A sinister hand erect, open, and couped or, the wrist gules, being the arms of the province of Ulster, was granted to the baronets of England and of Ireland as their distinguishing badge, on the institution of that order in 1611, and is borne by the baronets of Great Britain and of the United Kingdom. It is assumed into the armorial coat, and may be borne upon a canton, or on an escutcheon, which may be placed either in the middle chief or in the fess point, so as least to interfere with the charges composing the family arms.

RED-HOT SHOT are cannon-balls heated to redness, and fired from cannon at shipping, magazines, wooden buildings, &c., to combine destruction by fire with battering by concussion. In the great bombardment of Gibraltar on Sept. 13 and 14, 1782, red-hot shot was used with great effect by the defenders under the governor, General Eliott, the attacking squadron being completely silenced, and a large number of ships set on fire.

REDING, ALOYS VON, the famous champion of Swiss independence, was born in 1755, in the canton of Schwyz. After serving in Spain, he returned to Switzerland in 1788. As captain-general of the canton of Schwyz, he repulsed the French Republicans, May 2, 1798, at Morgarten. After the formation of the Helvetic Republic, R. was one of those who eagerly worked for the restitution of the old federal constitution. In 1802, he founded in the eastern parts of Switzerland a league, with the intention of overthrowing the central government. When, after the departure of the French, almost all the cantons declared themselves against the Helvetic government, R. called a general diet at Schwyz, which assembled September 27, 1802, and occupied itself with the formation of a new independent constitution. R. went to Paris, in order to win over the First Consul to the proposed change. In spite of all his endeavors, however, he failed to succeed. The disarmament of the Swiss by a French army, and the acceptance of the act of mediation, put an end to his hopes and to his political activity. In 1803, he officiated still as Landamman, or chief magistrate, of Schwyz; but after that retired into private life till 1809, when he was invested once more with the same dignity. In 1813, R. conducted the negotiations with the allies in regard to the neutrality of Switzerland. He died in February 1818, leaving the character of an honest man, whose political career might have been more successful, had he not been wanting in firmness of mind and of character.

RED-LIQUOR, a chemical compound, much used by dyers. It is a crude acetate of alumina, and is commonly prepared in dyeing establishments by dissolving a quantity of alum in boiling water, and separately dissolving, also in hot water, three-fourths as much acetate of lead. The two solutions are next mingled together, and after settling, the clear fluid, which is the red-liquor, is poured off. The sediment is sulphate of lead.

REDOU'BT is a small fort of varying shape, constructed for a temporary purpose, and usually without flanking defences. The term is vague in its acceptation, being applied equally to detached posts and to a strong position within another fortress. Redoubts as a general rule do not exceed 40 yards square, with 4 guns and a garrison of 320 men. Redoubts are made square, pentagonal, and even circular. Each redoubt has parapet, ditch, scarps, ban-

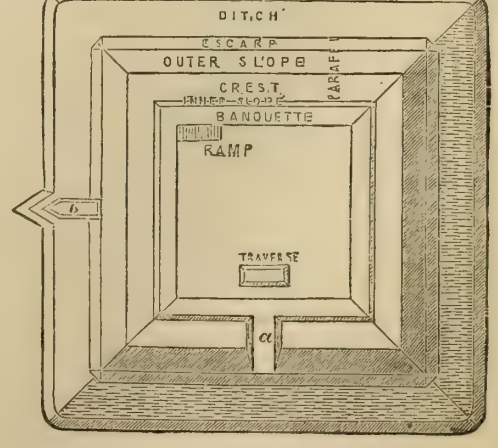


Fig. 1.

quette, &c., as in regular fortification; but it is commonly rather roughly constructed, haste and unprofessional labor precluding mathematical accuracy. The entrance may be by a cutting through the parapet, as at *a*, in fig. 1, the cutting being covered within by a traverse; or, preferably, by an excavated gallery leading into

the ditch, and thence by a ramp through the counterscarp. For the sake of flanking the ditch, and preventing an assaulting party from forming in it, caponnières of timber, loopholed, are sometime formed, as at *b;* or, if the soil be stiff or chalky, a gallery may be cut behind the counterscarp, and loopholed towards the ditch. In some modern redoubts, the line of each side is broken to afford flanking defence, as in fig. 2. Redoubts have the weak feature of



Fig. 2.

not defending their own ditches, and of being approached at their salient angles with comparative impunity. They are therefore not adapted to a protracted defence, but as temporary field works, or in a war of posts, they are often of incalculable importance. Troops whose stability in the open field is doubtful, are especially strengthened by redoubts in their line. Redoubts are particularly useful in fortifying the tops of hills, or commanding passes, or where the object is to occupy a hostile territory, or to feel the way gradually through a wooded country.

REDOUT KALÉ, a port on the Black Sea coast, in the district Kutaïs of the Russian lieutenancy of Caucasia, is situated in a marshy region at the mouth of a small river, about 12 miles north of Poti. It possesses a Russian fortress of considerable strength, fired by the Russians in 1854, to prevent its falling into the hands of the English. Population inconsiderable, though increasing.

RED POLE. See LINNET.

RED RIVER, the lowest western branch of the Mississippi, rises on the eastern border of New Mexico, flows eastward, separating Texas from the Indian territory, thence south-east through Louisiana, and enters the Mississippi 341 miles from its mouth. It is 2100 miles long, and receives numerous branches, the Washita, Negro, Big and Little Wichita, &c. Near its source, the south branch runs for 60 miles between perpendicular banks, 600 to 800 feet high. It is navigable for 8 months of the year to Shreveport. Thirty miles above this place is the Great Red River raft, formed of drift-wood, which blocks up the river for 60 or 70 miles. Its other important towns are Alexandria and Natchitoches.

RED RIVER OF THE NORTH rises in a cluster of lakes in Western Minnesota, U.S., near the sources of the Mississippi, and runs north, separating Minnesota from Dakota, into the British possessions, and empties in Lake Winnipeg, about 500 miles from its source, watering a beautiful country, and receiving numerous branches, the chief of which are the Cheyenne, the Pembina, and the Assiniboine.

RED RIVER, or SELKIRK, SETTLEMENT, was a colony in British North America (of which the chief part is now known as MANITOBA), lying along the Red River of the North. In 1811 the Earl of Selkirk, a member of the Hudson's Bay Company, attracted by the fertility of the soil on the banks of the Red River, obtained from the company a grant of a large tract of land on both banks of the river, extending some distance within the present frontier of the United States. Next year he brought out a number of settlers from the Highlands of Scotland. The right of the Hudson's Bay Company to grant this land was, however, disputed by the North-west Company; and when the settlers commenced to build, they were driven off by the servants of the North-west Company. Hostilities continued between the servants of the two companies for several years, and in 1816 there was a pitched battle between them. The Earl of Selkirk arriving soon after found his settlers scattered; but by his energetic measures, and by help of 100 disbanded soldiers from Europe whom he had brought with him, he secured for his old and new protégés a peaceful settlement. They established themselves near Fort Garry; and in 1817 the earl obtained from the Indians a transfer of their right to the land two miles back from the Red River on both sides. Still the settlers had some difficulties to overcome, especially from visitations of grasshoppers. These were gradually surmounted; but the population, including now a large number of half-breeds, remained very isolated, having little communication with the outside world.

In the year 1869 the Hudson's Bay Company surrendered all their claims to the North-west Territory to the British government, which in the following year transferred that territory to Canada. The Canadian government now organized that portion of the Red River district between long. 96°—99° W. and lat. 49°—50° 30′ N. as the PROVINCE OF MANITOBA. In 1881, the area of Manitoba was enormously increased, being enlarged from 14,000 square miles to about 150,000; and the province now extends from 89° 20′ to 101° 50′ W., and from 49° to 52° 30′ N. The population by the census of that year was, within the new limits, 65,954; the estimated pop. in 1883 was 160,000. The capital is Winnipeg (q. v.); pop. 7985 in 1881 (15,000 in 1883).

The Red River Valley is a level plain or prairie, with a soil unsurpassed in fertility by any in the world. It consists of from two to four feet of rich black mould, resting on a marly clay which elsewhere would itself be reckoned good soil. In places the ground has been cropped for fifty years without any apparent diminution of its fertility. The surface was generally treeless and ready for the plough, though a few miles to the eastward the country was wooded. The rich natural grasses of Manitoba afford a very favorable pasture for cattle. At the time of the transfer, the population was about 12,000. Since then there has been a steady influx of immigrants from the eastern provinces, from Britain, from the United States, from Iceland, and elsewhere. In 1882, the following towns maintained newspapers: Winnipeg, St. Boniface, Brandon, Portage-la-Prairie, West Lynn, Rapid City, Emersen, Maurice, Morrison, Rat Portage, Gladstone, Selkirk, Rock Lake, Crystal City, Minnedosa. Trade has rapidly increased. In the three years 1879 to 1881, the total exports of Manitoba rose from $512,000 to $626,000; the imports, from $1,000,000 to nearly $2,000,000. Manitoba is intersected by the Canadian Pacific Railway, and has direct railway connection southward with the United States. For the proposed direct sea route by Hudson's Bay, see that article. The government consists of a lieutenant-governor, appointed by the Dominion Government, a small executive council, and a legislative assembly. The university of Manitoba, at Winnipeg, embraces the college of St. Boniface (Roman Catholic), St. John (Episcopal), and Manitoba (Presbyterian). Provision has already been made for common schools throughout the province.

While the transfer to the British crown was pending, this district was the scene of contention. In 1869, the French-speaking population, led by Louis Riel, organized a force, imprisoned their English and Scotch opponents, seized Fort Garry, established a provisional government, robbed the strong box, and dictated terms to the governor of the Hudson's Bay Company, to which he had to submit. A military force arrived in 1870, and Riel, fearing capture, escaped, an event which put an end to the insurrection.—See Prof. Bryce's *Manitoba* (1882); two works by Fraser Rae; *A Year in Manitoba* (W. & R. Chambers, 1882).

RED ROOT (*Ceanothus*), a genus of plants of the natural order *Rhamnaceæ*, consisting of deciduous shrubs with simple alternate leaves and large red roots, whence their common name. The common RED ROOT of North America (*C. Americanus*), which abounds from Canada to Florida, is a shrub of 2—4 feet high, with beautiful thyrsi of numerous small white flowers. It is sometimes called *New Jersey Tea*, an infusion of its leaves being sometimes used as tea. It serves also as an astringent, and for dyeing wool of a cinnamon color. A Mexican species has blue flowers, and a Californian kind is used for evergreen hedges.

RE'DRUTH, a town of Cornwall, consists chiefly of one long street, which stands on a hill, in the center of a famous mining district, 9½ miles north-west of Falmouth. Iron foundries are in operation; but the principal product of this vast mining district is copper. In the vicinity are many mines, which are worked by large steam-engines. By railway there is easy communication to St. Ives and Falmouth Bays. Pop. (1871) 10,685; (1881) 9385.

RED SANDSTONE was the term formally applied to the combined Devonian and Permian rocks, when their relations to the Carboniferous strata were unknown. The discovery that one set of the red sandstone was below the coal, while the other was above it, caused their division into the Old Red (q. v.), or Devonian, and the New Red, or Permian (q. v.). For some time after this division, the original term Red Sandstone was retained by a few geologists to characterize the newer set of red rocks, but it is now quite given up.

RED SEA, or ARABIAN GULF, an inlet of the Indian Ocean, in form a long and narrow gulf, stretching north-west from the Strait of Bab-el-Mandeb (lat. 12° 40′ N.), by which it communicates with the Gulf of Aden, to the Isthmus of Suez (lat. 30° N.), which parts it from the Mediterranean Sea. It separates Arabia on the east from Egypt, Nubia, and Abyssinia on the west. Its extreme length is over 1400 English miles; it varies greatly in breadth—from about 20 miles at the Strait of Bab-el-Mandeb, to upwards of 230 at about lat. 16° 30′. At Râs (Cape) Mohammed (lat. 27° 40′ N.), the sea is parted into two arms or smaller gulfs, which enclose between them the peninsula of Mount Sinai; that on the west, continuing the direction of the main body of the sea, is the Gulf of Suez (Bahr-es-Suweis), of which the Strait of Jubal or Jublah forms the entrance; its length is about 180 miles; extreme breadth (about lat. 29°), upwards of 30. The eastern arm,

called the Gulf of Akabah (Bahr-el-'Akabah), is entered by the Strait of Tirân, and runs north-north-east to lat. 29° 30′ N. Its length is upwards of 100 miles; greatest breadth, rather more than 15. The depth of the R. S. varies considerably, but is in many places very great; the deepest sounding is marked as 1054 fathoms, in lat. 22° 30′. Southward of 16°, it is comparatively shallow; but the shallowest part of the whole Sea is the Gulf of Suez, which decreases in depth from 40 or 50 fathoms at the entrance to 3 fathoms in Suez Harbor, at the northern end, where the Gulf, which is supposed in ancient times to have extended considerable further north, has apparently been filled up by the sand washed up by the strong tides, or drifted in by the winds. The Gulf of Akabah is much deeper; it is, in fact, a narrow, deep ravine, with steep and rocky sides, forming the termination of the long valley of the Arabah, running northward to the Dead Sea. The basin of the R. S. itself is the lowest portion of a deep valley lying between the highlands of Africa on the west, and the lofty plateau of the Arabian hills on the east, which latter, rising at some little distance inland, leave for the most part a sandy and sterile tract along the sea.

The navigation of the R. S. has always been accounted difficult and dangerous, owing to the prevalence of violent winds, and the number of islands, shoals, and coral reefs, which line the shores. These coral reefs extend generally in parallel lines along the coast; they abound in all parts, but are especially frequent on the Arabian side, where the navigation is consequently very intricate. The coral is very beautiful, often red or reddish in color, but more commonly white. The islands generally occur singly, but between the parallels of lat. 15° and 17°, they are found massed in two groups—the Farsan (q. v.) Islands on the eastern, and the Dhalac (q. v.) Islands on the western side. In mid-channel, south of Râs Mohammed, there is generally a width of 100 miles clear. Along this channel, the winds are constant throughout the year in one of two directions; from May to October, the north-west monsoon blows; for the rest of the year, the south-east is the prevailing wind, and the water in the northern part of the Sea is then raised to a higher level than the Mediterranean. It had been generally supposed that the level of the R. S. was more than 30 feet higher than that of the Mediterranean, but it is now known, from careful observations, that the levels of the two seas are really the same. The principal ports are, on the Arabic side, Mocha, Jeddah (the port of Mecca), and Yembo (the port of Medinah); on the west, Suez, Cosseir, Suakin, and Massowah. The origin of the name R. S. has given rise to a variety of conjectures, and has never yet been satisfactorily settled. It is supposed to have been so called from the name Edom (Red), as the mountains of that country are washed by the waters of the Gulf of Akabah; from the red and purple coloring of the rocks which in some parts border it; from the red color sometimes given to the waters by animalcules and sea-weed; or from the reddish tinge imparted to them in some places by the subjacent red sandstone and reddish coral reefs. To the Hebrews it was known as *Yam Sûph*, the sea of *weeds* or *sedge*. By the Greeks, in the earliest times, the name R. S. was given to the whole of the Indian Ocean, including both the R. S. and the Persian Gulf, and not distinctively to the former (which was then and afterwards known as the Arabian Gulf), though the name, in later times, gradually became restricted in its application.

From the earliest times, the R. S. has been a great highway of commerce between India and the Mediterranean lands, and traversed successively by Egyptians, Phœnicians, Hebrews, and Arabs. It is first mentioned in the Book of Exodus, on occasion of the passage of the Israelites, which is supposed to have taken place a little south of the present town of Suez. The first recorded navigation of the Sea was in the time of Sesostris, in the 14th c. B.C. Three centuries later, Hebrew and Phœnician ships traversed the R. S. on the voyage to Ophir, from the port of Eziongeber, at the head of the Gulf of Akabah. The Gulf of Suez was for many centuries apparently the seat of the Egpytian trade in this sea and to India. After the foundation of Alexandria, and during the dynasty of the Ptolemies and the Roman dominion, the trade with India was vigorously carried on, though the chief seat of traffic was moved further southward, to the towns of Berenice and Myos Hormos, which sent out annually large fleets to India. After the establishment of the Mohammedan empire in the 7th c., an important trade with India and China seems to have been carried on through the R. S.; and through it, in the period between the 12th and 15th centuries, the goods of the East passed to the Venetian factories in Alexandria, until the discovery of the route round the Cape of Good Hope diverted the traffic with India into a different channel, and put an end to the commerce of the Red Sea. Since the establishment of the so-called Overland Route to India, and the opening of the Suez Canal in 1870, the R. S. has gained its importance as the highway of commerce between Europe and the East. See SUEZ. Italy has acquired a station on the west coast of the Red Sea, at Assab, near Bab-el-mandeb. France has four; Obock (for the Abyssinian trade), Dessi (island at Annessly Bay), Ad, and the peninsula of Sheik Said.

For the classical geography of the R. S. the *Geographi Græci Minores* of Müller (Paris, 1855), Kïepert's *Ancient Geography* (1881), and Bunbury's *History of Ancient Geography* (1880), may be consulted. Fuller information on the R. S. and its coasts will be found in the *Travels* of Niebuhr, Salt, Burckhardt, Rüppell, and others.

REDSHANK. See SANDPIPER.

REDSHID PASHA, a celebrated Turkish statesman, and long the chief of the party of progress in Turkey, was born at Constantinople about 1800. He accompanied his brother-in-law, the governor of the Morea, into Greece, and after his death, obtained the post of chief secretary in one of the government offices at Constantinople. On the outbreak of the Russian war (1828—1829), he was charged with a mission in Bulgaria, and exerted himself effectually to protect the Christian subjects of the Porte from the fanatic rage of their Moslem neighbors; and on his return obtained from Mahmoud, who fully appreciated his character, a post in the foreign office. On the creation of resident representatives at foreign courts, R. was sent to the courts of France and Britain, and applied himself diligently to the study of the language, manners, and political constitution of these countries; but was recalled in 1837, and nominated grand-vizier. His persuasive eloquence and firmness of character greatly aided the sultan in carrying out his plans for the better centralization of the administration, and for mercantile intercourse with foreign nations; but the old Turkish party were still too strong for him, and he was compelled to resign office, and return to Paris and London to support the Turkish against the Egyptian interests. Recalled by the death of the sultan, and the disaster of Nisib, to his old post, the foreign office, he succeeded, after a debate in council of three days' duration, in obtaining the hattisherif of Gulhane (3d November 1839), a species of constitutional charter, which, from the comparative weakness of its promoters, became a dead letter. The effects of his foreign diplomacy were soon apparent in the humiliation of the Egyptians in Syria; but a seraglio intrigue, which occasioned his dismissal, deprived him of the honor of concluding peace.

From 1841 to 1845, he was the Turkish representative at the French court, and though recalled to fill the post of grand-vizier (28th September 1846), he found his influence at court greatly diminished under the new sultan. He was vigorously supported by Sir Stratford Canning, the English ambassador, who was of opinion that all hopes of a bright future to Turkey depended solely upon Redshid Pasha. He was frequently deposed, and almost immediately recalled, according as the anti-reform party gained or lost the ear of the sultan; but the complications with Russia, which arose in 1853, threw the anti-reformers (who had counselled an obstinate disregard of all the Russian representations) into discredit, and R., more powerful than ever, was again recalled to the direction of foreign affairs. In 1854, he was again overcome by his political opponents, and retired from office, which he did not resume till after the peace of Paris. His re-appointment as grand-vizier excited great hopes of further salutary reformations; but the French influence at the Porte was pertinaciously antagonistic, and he was twice forced to resign, and as often recalled. At last, worn out with harassing cares and toil, he was seized with an illness, to which he speedily succumbed, at his palace of Emmirgian, 7th January 1858. Though a Turk, he was one of the most enlightened men of his time, and was well versed in foreign languages, general literature, and science.

RED SNOW. The apparent redness of snow, as seen from a distance, is often an effect of light, which adds a peculiar charm to mountain and winter landscapes, particularly in the mornings and evenings, when the rays of the sun fall most obliquely on the surface of the snow. But snow is occasionally found both in polar and alpine regions of a really red color. This phenomenon seems to have been observed by the ancients, as a passage in Aristotle apparently refers to it; but it attracted no attention in modern times till 1760, when Saussure observed it in the Alps, and from chemical experiments concluded that the red color was owing to the presence of some vegetable substance, which he supposed might be the pollen of a plant.

The next observations on red snow were made in the arctic expedition under Captain Ross, when it was found extending over a range of cliffs on the shore of Baffins Bay for eight miles, and the red color penetrating the snow in some places to a depth of 12 feet. On the return of the expedition in 1819, the coloring matter, as then existing in the melted red snow, was subjected to careful examination by Robert Brown and by Francis Bauer, the former most eminent botanist pronouncing it to be an unicellular plant of the order *Algæ*, whilst the latter referred it to *Uredo*, a genus of *Fungi*, and called it *U. nivalis*. Baron Wrangel afterwards declared it to be a *Lichen*, and called it *Lepraria Kermesina;* but Agardh and Dr. Greville of Edinburgh—the latter of whom obtained specimens from the Scottish island of Lismore—on further

examination, returned to the opinion of Brown, an opinion which has since been fully confirmed, and the plant is generally known by the name *Protococcus nivalis*, given to it by Agardh, or *Palmella nivalis*, given to it by Sir William Hooker. The motions of this microscopic plant in the earlier stages of its existence have led some observers, and among them eminent naturalists, to regard the organisms which they found in red snow as animalcules. See PALMELLACEÆ. But whilst no doubt is now entertained of its real nature, it is not impossible that animal as well as vegetable life may exist in red snow, and that real animalcules may have been observed. The red snow plant consists, in its mature state, of brilliant globules like fine garnets, seated on, but not immersed in, a gelatinous mass.

RE'DSTART, *Phœnicura ruticilla*, or *Ruticilla phœnicura*), a bird of the family *Sylviadæ*, nearly allied to the Redbreast, but having a more slender form and a more slender bill; the male in summer having the head, back, and wing-coverts gray; the forehead white, with a narrow black band at the base of the bill; the throat, sides of the neck, and face jet black; the wings brown, the tail and upper tail-coverts bright rufous chestnut, with a strip of dark brown on the centers of the two middle feathers; the rest of the under-parts mostly pale chestnut. The female is grayish-brown, with neither the white nor the black on the head, and less red on the tail. The R. is widely diffused over Europe, Asia, and the north of Africa. It appears in Britain as a summer bird of passage, and is found in almost all parts of the island. It is a bird of very lively manners, remarkable for the way in which it flits about, in and out of some hedge or bush, where it is in quest of insects. It has a very soft melodious song, which is continued during the breeding-season far into the night, and resumed at early dawn. In confinement it becomes very tame, and has been known to imitate the song of other birds, and even to learn a tune.—The BLUE-THROAT (q. v.) also belongs to the same genus. —The AMERICAN R. (*Setophaga ruticilla*) is a small bird of the family *Muscicapidæ*, or Fly-catchers, common in most parts of North America, a bird of great beauty, and extremely active in its movements.

REDU'CTION, in Arithmetic, is the conversion of a quantity in one denomination to an equivalent one of a different denomination. In the reduction of a quantity from a higher to a lower denomination, the process of multiplication is employed; and, contrarily, division is the needful process when a number of a lower denomination has to be reduced to an equivalent number of a higher.

REDUCTION, in Scotch law, means the annulling or setting aside of a deed or instrument, and thereby annihilating its legal effect. The action of reduction commences with a summons requiring the defender to bring the deed into court to be set aside, stating the reasons of reduction. The defender, if he defend the action, returns the summons, which implies that he intends to satisfy the production; i. e., to produce the document, and maintain its validity. The action can be raised only by a person who has some title or interest connected with the matter.

REDUCTION OF METALS. A metal is said to be reduced to its metallic state when it is separated from the condition of a chemical compound in which it exists as an ore. This is generally effected either by the direct action of heat, or by heating the compound along with a *reducing agent*. Thus, when oxide of mercury is simply heated, the oxygen is given off as gas, and mercury or quicksilver appears as metal. Again, when sulphuret of lead is heated with iron, sulphuret of iron is formed, and the lead is reduced to its metallic state. In this case, the iron is the reducing agent. The principal reducing agent employed in metallurgy is carbon, or rather the gas carbonic oxide, which is formed under certain conditions when carbon is burned. See METALLURGY, IRON.

REDUIT, in Fortification, is a central or retired work within any other work, intended to afford the garrison a last retreat, whence they may capitulate. It is commonly of masonry, loop-holed, and often circular. Many engineers doubt the use of reduits altogether, as blocking up the working space, being themselves inconvenient for the men, and incapable of protracted defence, while they frequently mask the fire of other works more to the rear.

RED-WATER—also known as Bloody Urine, Moor-ill, and Hæmaturia—is a disease of cattle, and occasionally of sheep; it depends upon the eating of coarse indigestible innutritive food, on continued exposure to inclement weather, and on other such causes, which lead to a deteriorated state of the blood. In England and Ireland, it affects cattle of all ages and of both sexes; but in Scotland it is most common amongst milch cows within a fortnight after calving. The appetite and rumination are irregular, the bowels speedily become constipated, and the urine reddened with the broken-down red globules of the blood. In the more advanced stages of serious cases, the urine is black. A dose of physic must at once be given, and for an adult animal may consist of ½ lb. each of common and Epsom salt, 3 ounces of sulphur, and a pound of treacle, mixed together in two bottles of water. Roots should be withheld, and the food consist of sound hay with a little cake. A full supply of pure water is further essential. Weakness, which is apt to supervene, may be warded off by giving several times daily two ounces each of gentian and ginger in a quart of ale. To prevent red-water, attend to feeding and watering, place rock-salt in the pastures and yards; and, as has been successfully done in Cheshire and other English counties, improve the grazing-lands, notorious for the production of the disease, by draining, liming, and manuring; and where these means are ineffectual, by ploughing them up, and cropping them for a few years.

RE'DWING (*Turdus iliacus*), a species of Thrush (q. v.), well known in Britain as a winter bird of passage. It spends the summer in the northern parts of Europe and Asia, and even occurs in Iceland; its winter range extends to the Mediterranean. In size, it is somewhat smaller than the Song Thrush or Mavis. The general color is a rich clove-brown on the head, upper parts of the body, and tail; the wing-feathers darker, but with lighter external edges; the lower parts mostly whitish, tinged and streaked with brown; the under wing-coverts and axillary feathers bright reddish-orange. The R. arrives in Britain rather earlier than the Fieldfare (q. v.), and like it, congregates in large flocks. It has an exquisite song, which it pours forth from the summit of a high tree, gladdening the woods of the north.

RED-WOOD, the heart-wood of *Adenanthera pavonina* (*Leguminosæ*), a large tree growing in India, where it is called *Rukta-chundun*, and is much used in dyeing red. Small quantities are brought to this country for the same purpose, but it is not in much demand.

REE, LOUGH, a lake in the middle of Ireland, between Connaught on the west and Leinster on the east, is an expansion of the river Shannon (q. v.).

REED, the common English name of certain tall grasses, growing in moist or marshy places, and having a very hard or almost woody culm. The COMMON R. *Phragmites communis*, formerly *Arundo Phragmites*) is abundant in Britain and continental Europe, in wet meadows and stagnant waters, and by the banks of rivers and ditches. It grows chiefly in rich alluvial soils. The culms are 5—10 feet high, and bear at the top a large much branched panicle, of a reddish-brown or yellowish-color, having a shining appearance, from numerous long silky hairs which spring from the base of the spikelets. The two outer glumes are very unequal; and the spikelets contain 3—4 perfect florets, with a barren one at the base. The culms, or stems, are used for making garden-screens, for light fences, for thatching houses and farm-buildings, for making a frame work to be covered with clay in partitions and floors, for battens of weavers' shuttles, &c. So useful are reeds in these ways, and particularly for thatching, that it is found profitable in some places to plant them in old clay-pits, &c. Probably they might be planted with advantage in many peat-mosses, where they are now unknown. The plant is not very common in Scotland; but in the fenny districts of the east of England, it covers large tracts called *reed-ronds*, and similar tracts occur in many parts of Europe.—Nearly allied to this is *Arundo donax*, the largest of European grasses, plentiful in the south of Europe, and found in marshy places as far north as the south of the Tyrol and of Switzerland. It is 6-12 feet high, and has very thick, hollow, woody culms, and a purplish yellow panicle, silvery and shining from silky hairs.

The woody stems are an article of commerce, and are used by musical instrument makers for reeds of clarionets, mouth-pieces of oboes, &c. They are also made into walking-sticks and fishing-rods. The creeping roots contain much farina and some sugar. —*Arundo Karka* is supposed to be the grass called *Sur* in Sinde, of which the flower-stalks are very fibrous; and the fibres being partially separated by beating, are twisted into twine and ropes. —The SEA REED is *Ammophila* (q. v.)—or *Psamma—arundinacea*.

REED. See LOOM.

REED, in Music, the mouth-piece of a hautboy, bassoon, or clarionet. Also, a piece of metal with a brass spring or tongue attached to it in such a way that the admission of a current of wind causes it to vibrate and sound a musical note. The reed is of two kinds, the *beating* reed and *free* reed. The former is used in the reed-pipes of an Organ (q. v.), and requires to be placed within a tube in order to produce a musical sound. It consists, as in fig. 1, of a metallic cylinder *a*, with the front part cut away, and a brass spring or tongue *b*, placed against the opening, and attached at the upper end. The admission of air to the pipe in which the reed is placed causes the tongue to vibrate against the edge of the opening, so as to cover and uncover the slit, through which the air passes to the pipe above, the regularly repeated

beat producing a musical note, dependent for its pitch on the length of the tongue, which is regulated by a strong spring of wire *c*, pressing against it. The quality of the sound is determined to a large extent by the length and form of the pipe in which the reed is placed. The *free* reed differs from the beating reed in this, that the tongue is a little smaller than the opening, and strikes, not the edge of the opening, but the air.

The admission of a current of wind causes it to yield so as to let the air pass, while, after recovering its position, it is carried back by its momentum equally far on the other side, and continues vibrating so long as the current of air is continued, the result of the pulsations being a musical note. The invention of the



Fig. 1.

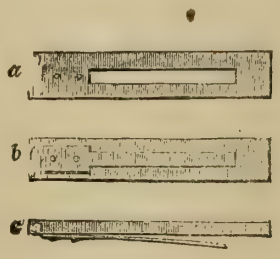


Fig. 2.

free reed has been ascribed to M. Grenié, a Frenchman, who brought it into use, but it has been long known to the Chinese. Its note is more smooth and mellow than that of the beating reed, and it has the advantage of not requiring a pipe, which is a necessary appendage to the latter. Besides being occasionally adapted to organ-pipes, it is used without a pipe in the Harmonium (q. v.), as represented in the subjoined fig. 2, where *a* is the brass frame containing the slit, *b* the reed in the frame, while *c* represents the position of the reed in the instrument, it being a little below the slit, when not in motion.

REED MACE. See TYPHA.

REED WARBLER. See WARBLER.

REEF, in naval matters, is a portion of a sail included between the bottom of the sail and a parallel row of eyelet-holes a short distance above it, or between such row of eyelet-holes and a parallel row higher up. The object of the reefs is to reduce the size of the sails when the wind becomes boisterous. For this purpose, cords are inserted at each eyelet-hole, which, when the sail is unreefed hang freely. When the intention is to take in a reef, the sail is slightly lowered; the men climb out along the yard or boom below its lower edge, fold the loose sail on the yard, and fasten the reefing-lines securely round the yard and sail thus folded. There are also systems of small ropes in some ships by which the sail may be reefed from the top without the men incurring the danger of going out on the yard during tempestuous weather.

REEL, a lively dance peculiar to Scotland, which may be danced by two couples, but admits a greater number. The music is in general written in common time of four crotchets in a measure, but sometimes in jig time of six quavers.

REEL-WINDING MACHINE, a beautiful contrivance, now used by the manufacturers of sewing-thread. It is for the purpose of winding the thread on to the reels upon which it is sold for use; and not only does it turn a number of reels round so as to wind the cotton upon them, but, by a peculiar arrangement, every turn is so managed that the cotton is reeled with the most beautiful regularity, each turn of the thread being laid on by the side of the previous one, and never crossing it.

RE-ENTERING ANGLE, in Fortification, is an angle in the line of works of which the apex points away from the front. As an example, the flanks of a bastion make re-entering angles with the adjoining curtains. Advantage is commonly taken of the comparatively sheltered position of these angles to form *places d'armes* for the assembly of troops.

RE-ENTRY, is a legal term used in leases, whereby the landlord stipulates for power to re-enter the premises in certain conditions, such as the non-payment of rent after the lapse of a specified period from the time it became payable. Before, however, the power of re-entry can be exercised, all the conditions must be strictly complied with.

REEVE (Sax. *gerefa*, Ger. *graf*), a magistrate existing in early times in England and elsewhere in Northern Europe, whose duties were at first principally fiscal. In the Saxon period in England, he represented the lord of a district, whether township or hundred, at the folkmote of the county; and within his district, he levied the lord's dues, and performed some of his judicial functions. The word still survives in the shire-reeve or sheriff (*scyrgerefa*), who was at first assessor to the ealdorman or earl, who along with the bishop, presided, but afterwards became himself the presiding officer. Similar functions were exercised in boroughs by an elective officer called the Portreeve. In Anglo-Saxon times all the English boroughs were subject to the rule of a portreeve, for whom the Norman conquerors substituted a bailiff, who, in the larger towns, was allowed to assume the appellation of mayor.

REEVE, a verb used in speaking of ropes, signifies the passing of a rope through any hole, dead-eye, block, or pulley, in conjunction with which it is to be used.

REEVES, SIMS, an eminent tenor singer, born at Woolwich in 1821. Before attaining his fourteenth year, he was a clever performer on various instruments, and tolerably well versed in composition; and at that early age he was appointed organist and director of the choir of North Cray in Kent. His musical education was conducted under J. B. Cramer, T. Cooke, and other artists of note. He first appeared in public as a baritone at Newcastle in 1839. His *début* was a complete success; and he acquired fresh fame in Scotland and Ireland. In order to perfect his voice and style, he went to Paris, and after studying there for some time, appeared at Milan in the tenor part of Edgardo in *Lucia di Lammermoor*, when his singing electrified the audience. He returned to England in 1847, and coming out at Drury Lane as Edgardo, was immediately recognized as the first living English tenor, and was engaged in 1848 at Her Majesty's Theater. In 1851, he was equally successful as first tenor at the Italian Opera in Paris. One of his best original parts was in Macfarren's opera of *Robin Hood*, produced in 1860.

RE'FERENCE, as a legal term, means the sending by a court, or by agreement of the parties, the decision of a matter to an arbitrator, or to an officer of the court or master. In cases where parties, without going the length of commencing litigation, agree to arbitration, they usually execute a deed or agreement of submission; but after litigation has begun, if the judge think it would be better that an arbitrator should settle the dispute, an order of reference is drawn up for that purpose.

REFERE'NDARY, a name given in the early kingdoms of Europe to a public officer, whose duty was to procure, execute, and despatch diplomas and charters. The office of Great Referendary to the monarchy of France merged eventually in that of Chancellor.

REFI'NING OF METALS. The last operation connected with the smelting of copper, tin, lead, and some other metals, is usually called the refining process. With copper, for example, the impure or 'blister' copper, containing from 95 to 98 per cent. of the metal, alloyed usually with small quantities of iron, tin, antimony, &c., is melted in a refining furnace, and exposed to the oxidizing influence of the air. By this means, the foreign metals present become oxidized, and rise to the surface as slag, which is skimmed off; the oxide of copper, formed during the process, being afterwards reduced by throwing coal on the surface of the melted metal, and stirring with a pole of green wood. The disengagement of gases from the wood during the 'poling' causes the metal to splash about, and so expose every portion of it to the reducing action of the coal; thus the oxide of copper is deprived of its oxygen, and the copper rendered nearly pure.

Tin is also refined by throwing billets of green wood into it while in a melted state, which has the effect of bringing impurities to the surface as froth, in a somewhat similar way to the oxidizing of foreign metals in copper. See TIN.

Lead is purified from antimony and tin by an analogous mode of oxidation, and silver is separated from it by a special process. See LEAD.

The refining of iron is a name applied to the process for partially separating the carbon from cast iron, and is described under IRON. Of the less important metals used in the arts, zinc, antimony, and mercury do not usually undergo any special refining process; aluminium, it is said, will not afterwards purify when once reduced to the metallic state; and nickel, of which German silver is largely composed, is refined by a process or processes kept strictly secret by manufacturers.

We may state here that no metal is ever quite pure in its commercial state, even though it has gone through the usual operation of refining, but all are to a certain extent alloyed with certain others. For the great majority of purposes, it is not necessary that metals should be chemically pure, and when it is, they can only be made so by refined chemical processes.

It will be readily understood, however, that it is always necessary to carry the refining of gold and silver further than the less valuable metals. To render gold sufficiently pure for manufacture into coin, an ingenious process has, within the last few years,

been proposed, by which fused gold is mixed with about 10 per cent. of black oxide of copper, and then stirred so as to oxidize any foreign metals which happen to be present. The oxide of copper does not fuse, but is disseminated through the melted metal, and oxidizes any tin, antimony, or arsenic, and causes them to rise to the surface, so that they may be skimmed off. Perfectly pure gold is prepared by dissolving the metal in aqua-regia—a mixture of nitric and hydrochloric acids—and precipitating silver (with which it is almost always alloyed) as well as any other foreign metals by chemicals which have no action on the solution of gold. The metallic gold is afterwards precipitated as a finely-divided powder, by a salt of iron, and is then fused and cast into bars.

Silver is rendered pure by dissolving it in nitric acid, filtering the solution, and then precipitating the metal with common salt as a chloride of silver. This is afterwards mixed with sulphuric acid, and then, by introducing bars of zinc, a chloride of zinc is formed, whilst the silver is reduced to the metallic state.

REFLE'CTION. See CATOPTRICS, HEAT, UNDULATORY THEORY. In the articles referred to, the laws of reflection are stated, illustrated geometrically, and deduced from the modern theory of the nature of light and radiant heat.

We may now *mention* one or two curious circumstances connected with reflection, which could not be well given in any of these articles.

In general, a reflected ray is more or less *polarized* (see POLARIZATION); and if the reflecting surface be metallic, or if it be formed of a substance of high refractive index, as diamond, it is in general *elliptically* polarized.

In various cases, principally known by the laborious investigations of BREWSTER (q. v.), the *color* of the reflected light not only differs from that of the incident light, but is different for different angles of incidence, and for different azimuths of the plane of reflection. The theoretical explanation of these very singular facts has not been as yet very satisfactorily given. In fact, the problem of reflection from the surface of a metallic or a crystalline substance is one which presents difficulties of a very formidable kind, principally from the want of definite data for the formation of a satisfactory fundamental hypothesis; and, in a secondary manner, from the intricacy of the requisite mathematical investigations.

RE'FLEX ACTION. See NERVOUS SYSTEM.

REFORM, PARLIAMENTARY, the name generally given to the acts which passed the legislature of the United Kingdom in 1832, by which an extensive change was made in the system of parliamentary representation. Parliamentary reform had for many years before been a topic of popular agitation. So far back as 1782, a motion by Mr. Pitt for a reform of the franchise was lost by a majority of 20, and similar motions in the years 1783 and 1785 by majorities of 44 and 74. The horror inspired by the excesses of the French Revolution caused a reaction, and the repression for a time of all liberal tendencies; and it was not till some time after the close of the French war that the desire for reform again manifested itself. Mercantile distress had added to the popular dissatisfaction, which was fomented by the revolutions of 1830 in France and Belgium; and an adjustment of the inequalities of the representative system, with an extended franchise, was looked forward to as a panacea for all the ills under which the community labored. The demand for parliamentary reform became more imperious on the death of George IV. and accession of William IV. Meetings were held over all the country, and though there was no open rioting, a constant alarm was kept up. On the resignation of the Duke of Wellington, November 16, 1830, the celebrated Reform ministry of Earl Grey came into office. Parliament assembled on February 3, 1831, and on March 1, Lord John Russel proposed his first scheme of Reform. After a long and animated discussion, the bill passed the second reading by a majority of 1. On the motion for a committee General Gascoyne moved, as an amendment, that the number of representatives for England and Wales should not be diminished; and the amendment being carried by a majority of 8, the ministry abandoned the bill, and resorted to a dissolution. The cry arose through the country of 'The bill, the whole bill, and nothing but the bill;' and when the new parliament assembled on June 14, a large majority including the whole of the county members for England, excepting four or five, were pledged to support the bill, which was again introduced on June 24, and passed the third reading in the House of Commons by a majority of 113. The Upper House, however, threw it out on the second reading by a majority of 41, and parliament was immediately prorogued. It reassembled on December 6, and on December 12 the third Reform Bill was introduced in the Commons by Lord John Russell, which did not like the former bills, diminish the number of members—a concession which the Opposition considered as an improvement, and it had a majority of 116 on the third reading.

In the Lords, the second reading was carried by a majority of 9, and the bill ordered to be committed. In committee, Lord Lyndhurst carried, by a majority of 35, a motion that the disfranchising clause should be postponed, and the enfranchising first considered; on which, the king having refused to accede to a creation of peers sufficient to carry the bill, the ministry resigned. A week of intense public agitation followed. The government were induced to resume office on the king granting them full powers to secure majorities by the creation of peers; but eventually that expedient was avoided by a sufficient number of Lords absenting themselves to leave ministers a majority on the third reading, when the bill passed by a majority of 84, receiving the royal assent by commission on June 7, 1832. Reform bills for Scotland and Ireland were immediately afterwards introduced and carried. For the details of the alterations made by these several measures on the distribution of members and the electoral qualification, see PARLIAMENT. The changes effected were so sweeping as to cause many of the advocates of Reform to be apprehensive that the balance of the constitution would be disturbed by the preponderance of the democratic element; but the determination of the masses was such, that the conservative influences of the country were powerless to stay or modify the measure. Yet no sooner was the contest at an end, than a reaction followed, falsifying equally the hopes of the supporters of the bill, and the fears of its opponents.

In 1854, a new Reform Bill was introduced by Lord John Russell for a further extension of the suffrage; but it was unaccompanied with anything like popular excitement, and was withdrawn in consequence of the breaking out of the Crimean war. A Reform Bill brought in by Mr. Disraeli in 1859, was rejected in the Commons by a majority of 39, and the consequence was a dissolution and change of ministry. The succeeding ministry of Lord Palmerston introduced and afterwards withdrew a Reform Bill.

No one, remembering amidst what apathy that took place, would have expected, within so few years, to see the subject revive, and assume such large dimensions. Mr. Gladstone's speech of 1864 first gave new life, and his declaration, that it lay with those who refused the elective franchise to justify the refusal, sounded the commencement of the new agitation. At the general election of 1865, reform was necessarily much discussed. The death of Lord Palmerston gave the country a ministry in which Lord Russell led the House of Lords, and Mr. Gladstone led the House of Commons. This ministry was not long in attacking the subject, and the reform discussions of 1866, so valuable as preparing for the final settlement of the question, commenced. The ministry adopted a suggestion which Mr. Bright had made, and tabled first a bill dealing with the franchise alone. Its proposals were of a moderate enough description, its leading provisions being to give the franchise to occupiers of premises of the annual value of £7 in boroughs, and of £14 in counties. At the desire of the opposition, led by Mr. Disraeli and Lord Stanley, government introduced its Redistribution of Seats Bill, and the two bills were combined and sent to committee together. In committee, parliament proved unmanageable. Several clauses were carried by the narrowest majorities, till at length, on the comparatively small question, whether 'clear' or 'rateable' annual value should be taken as the basis of the franchise, government was left in a minority of seven. The leaders, true to the traditions of party, resigned, and left the question of reform to the Conservatives. The resignation was beneficial to progress. In the autumn following it, numerous mass meetings, conducted in general with perfect order, were held; and some unlucky speeches of the opponents of any reduction of the franchise were employed more or less unfairly in order to get a starting-point for the kind of eloquence that such meetings require. It now became plain that the main drawback to reform, the alleged indifference of the working classes, had ceased to exist. Reform therefore became inevitable; and it was equally clear that if reform was to be carried by the Conservatives, the country would not accept from them a measure of the moderate character which it would have gladly taken from the Liberals shortly before.

The meeting of parliament in 1867, it is said, found the ministry of Lord Derby and Mr. Disraeli still undecided. But it was necessary to do something. The Queen's Speech accordingly broached the matter; and in the beginning of the session, Mr. Disraeli proposed to deal with the subject by way of resolution. His resolutions, however, were vague, and had to be withdrawn. Mr. Disraeli then (25th February 1867) made a speech, in which he proposed to bring in a bill, with a £6 rating franchise in boroughs, a £20 rating in counties, and with some of what were called 'fancy' franchises. With the redistribution question, he proposed to deal much as his actual bill afterward dealt. This proposed bill was understood to be a compromise with a section of the cabinet not favorably disposed to reform. However, as it did not succeed in making matters smooth, the leaders of the government are said to have reverted to what was their original policy. The dissentients, Lord Carnarvon, Lord Cranborne, and

General Peel, then resigned, and (on 18th March) the Reform Bill of 1867 was introduced.

The bill surprised the country. Mr. Disraeli has since said that, so far back as 1859, he and Lord Derby came to the conclusion, that if the £10 line, at which the Reform Act of 1832 had fixed the borough franchise, were disturbed, there was no other fixed line tenable; and he has made the further revelation, that he spent the interval between 1859 and 1867 in educating his party to the belief, that if the borough franchise was to be dealt with at all, it must be dealt with in the boldest manner. His bill, therefore, carrying out this policy, proposed that all householders within boroughs who were rated for the payment of poor-rates, should be entitled to vote. There were certain 'securities' attached to this proposal. The householder must have resided two years in the borough, and must have personally paid his rates. Further, the 'fancy franchises,' which again made their appearance, had coupled with them what was called the 'dual vote,' the object of which was to give to every householder who possessed one of them a second vote in addition to the first, which his house would give him. In counties, the bill proposed a £15 rating franchise, and all existing franchises were permitted to remain. In redistribution of seats, the bill proposed to take the second member from each borough of less than 7000 inhabitants, and to divide these seats, together with the seats taken from the corrupt boroughs, in nearly equal proportions between the larger counties and boroughs, giving one also to London University.

The bill was not permitted to pass without many alterations. Government, either influenced by a sincere desire for reform, or convinced that, as reform was at anyrate unavoidable, it was better that it should pass under their management than under the management of their opponents, were quite resolved that a bill should pass. They yielded to the House whenever they well could, and when they could not, the threat of dissolution at once brought the house to reason. The result of the labors of the session admits of being shortly stated.

The borough franchise remained substantially as at first proposed. Much of the session was lost in devising clauses by which the rating principle could be applied to those tenants whose landlords compounded for their rates. The principle was, however, maintained; and an amendment introduced by Mr. Gladstone, with a view of fixing the hard and fast line of £5, was rejected. But by a new clause, the system of compounding was put an end to, so that the franchise was really given to all householders except those excused from rating on the score of poverty. The period of residence, on the motion of Mr. Ayrton, was reduced from two years to one. On the motion of Mr. M'Cullagh Torrens, an important addition was made in the shape of the lodger franchise. Mr. Disraeli's bill of 1859 had contained a provision of the kind, and something like it was again added. It gives votes to all lodgers who have occupied for a year lodgings which would let unfurnished for £10, and who apply to be put on the roll.

The county franchise was reduced from £15 to £12 rating; and there was added (on Mr. Colville's motion) a reduction of the copyhold and leasehold franchise, giving votes to all owners or diferenters of the free annual value of £5 in property other than freehold, which continues to yield a 40s. franchise.

The dual vote was early abandoned, and its abandonment involved that of the 'fancy' franchises. These have now only interest as matters of history; but as the name appears often in the discussions, it should be mentioned that, in their last form, they proposed to give votes to all who paid £1 annually in direct taxes (not including licenses), who belonged to certain of the better educated professions, or who had £50 in a savings-bank or in the funds. Mr. Mill's proposal to extend the franchise to women found 73 supporters. The vote by ballot was rejected, equally with the government proposal to take the vote by means of voting-papers.

The comparatively restricted proposals of the government with regard to redistribution of seats were considerably extended. On Mr. Laing's amendment, the limit at which boroughs then returning two members should hereafter return only one, was raised from 7000 inhabitants to 10,000. This gave 38 seats to be distributed,* making, with the 7 seats forfeited for bribery by the boroughs of Lancaster, Yarmouth, Reigate, and Totness, 45 in all. Of these, 25 were given to the larger counties, which were severally divided into two or more districts for the purpose.† To boroughs, 19 new members were given—8 by way of additional members to boroughs already possessing members, and 11 to new boroughs.‡ To the University of London, one member was given. Mr. Laing's proposal to make the scheme of redistribution still more extensive, by applying to all boroughs having fewer than 5000 inhabitants the system of grouping which prevails in Wales and Scotland, was rejected.

The only amendment of importance which the House of Lords succeeded in making, was the addition of the system of representation of minorities. By this system, persons voting in London, where four members are returned, cannot vote for more than three; and in the counties and boroughs which return three members, cannot vote for more than two. The object is to prevent a majority which may possibly exceed the minority by only one man, from monopolizing the whole representation. The plan appeared first in Lord John Russell's bill of 1854, and having then been unpopular with both sides, does not appear to have been proposed since. Mr. Disraeli took occasion, in introducing his bill, to declare himself against it. Mr. Lowe proposed to add it in the Commons; and his proposal was supported by such men as Lord Cranborne among the Conservatives, and Mr. Mill and Mr. Fawcett among the Liberals. Mr. Bright joined the government in opposing it, and it was lost by a majority of 141. In the House of Lords, its insertion was again proposed by Lord Cairns, and carried by a very large majority, most of the Conservatives voting for it, against the government. When the Lords' Amendments were considered in the Commons, it was the only one of them which was agreed to. It is hardly necessary to say that a scheme such as that of Mr. Hare, for carrying out the principle in a rigorous and complete manner, was found to be far in advance of the day.

The opportunity of passing the Reform Bill was taken to provide for some minor improvements. The inconvenience of having parliament dissolved by the demise of the crown was obviated, and it was provided that ministers of the crown and their subordinates changing from one office to another should not have to submit to re-election. A boundary commission was appointed to re-adjust the boundaries of the boroughs and counties. Mr. Fawcett's proposal to throw the necessary expenses of elections, such as the expenses of polling-places, sheriffs, &c., on the borough or county rates, was, however, rejected.

Such is the Reform Act (for England) of 1867. Its passing, in some shape or other, from the temper of the government and its power of controlling the House, was at no time in serious risk. The most critical period was when Mr. Coleridge's amendment was brought forward, with the view of making way for Mr. Gladstone's amendment of the £5 rating limit; and here the government were served by the defection from the Liberals of 'the tea-room' party—a large number of 'extreme' and 'independent' Liberals, some of whom really preferred the *quasi* household suffrage scheme of the government, and others of whom were only resolved that a bill of some kind should pass. Mr. Gladstone's amendment was thus defeated.

Acts similar to the English one were passed for Scotland and Ireland in the session of 1868. The borough franchise for Scotland is substantially the same as for England, being conferred on every man who has for twelve months occupied, as owner or tenant, any dwelling within the borough, except he has been exempted from poor-rates on the ground of inability to pay, or has failed to pay. Scotland has also the £10 lodger franchise. In Scottish counties, proprietorship to the extent of £5 of clear yearly value confers a vote; the limit of the tenant franchise is £14. The Scottish act disfranchised seven English boroughs, and gave seven additional representatives to Scotland—two of these being assigned to the universities, and the rest to larger towns and counties. The universities of Edinburgh and of St. Andrews return one member jointly; as do those of Glasgow and Aberdeen. The Irish act made no alteration in the county franchise, but reduced that of boroughs to a £4 rating occupation.

As thus chosen, the House of Commons was composed, in 1869, of the following representatives:

	Of Counties.	Cities and Boroughs.	Universities.	Total.
England and Wales..	187	297	5	489
Scotland.....	32	26	2	60
Ireland.....	64	37	2	103
United Kingdom,	283	360	9	652

REFORMA'TION. The *Reformation* denotes the great spiritual and ecclesiastical movement which took place in Europe in the 16th c., and as the result of which the national churches of Britain, of Denmark, Sweden, Norway, and Holland, and of many

* The boroughs from which one member each was taken were Andover, Bodmin, Bridgenorth, Bridport, Buckingham, Chichester, Chippenham, Chipping-Wycombe, Cirencester, Cockermouth, Devizes, Dorchester, Evesham, Great Marlow, Guildford, Harwich, Hertford, Honiton, Huntingdon, Knaresborough, Leominster, Lewes, Lichfield, Ludlow, Lymington, Maldon, Marlborough, New Malton, Newport (Isle of Wight), Poole, Richmond, Ripon, Stamford, Tavistock, Tewkesbury, Thetford, Wells, and Windsor.

† West Kent, North Lancashire, East Surrey (already having two members each), and South Lancashire (already with three members), were subdivided, and two members given to each division, which absorbed 7 seats; and the counties of Chester, Derby, Devon, Essex, Lincoln, Norfolk, Somerset, and Stafford, together with the West Riding (all already in two divisions, with two members each), were divided into three parts, each represented by two members, which absorbed the other 18 seats.

‡ Birmingham, Leeds, Liverpool, Manchester, Merthyr-Tydvil, and Salford got each an additional member. The Tower Hamlets were subdivided, and got two additional members. Chelsea was made a borough, returning two members; and the following boroughs were appointed to return one each: Burnley, Darlington-Dewsbury, Gravesend, the Hartlepools, Middlesborough, Staleybridge, Stockton, and Wednesbury.

parts of Germany and Switzerland, became separated from the church of Rome. In other countries, such as Hungary and France, the same movement detached large portions of the population from the Roman Catholic faith, yet without leading to a national disruption with the papacy.

The causes of this movement were manifold; but, as may be supposed, they present themselves in very different lights to members of the different religious communions.

To Protestants, the Reformation appears as the natural result of causes which had long been at work, and which it needed but a fitting occasion to call into active operation. The church of Rome had gradually, from the 6th c., or the time of Gregory the Great, extended not merely its influence, but its direct control and government, over all the countries of Western Europe—in many places, as in Ireland, Scotland, and part of England, displacing the old national churches, which had been planted in earlier times, and which had survived under comparatively simple forms of government. Although some uncertainty may exist as to the exact constitution, doctrine, and discipline of the old Scoto-Irish Church, there can be no doubt that it did not acknowledge the direct superintendence of Rome, and that it was only after a long and varying struggle, not terminating till the 12th c., that the popes fully established their authority, and set up over this ancient church a completed hierarchy connected with Rome. It is only by keeping this in view that some features of the Reformation can be clearly understood and appreciated.

The natural result of the wide-spread supremacy of the Roman Church was, that the spiritual aspects of the church became gradually more and more merged in its mere machinery of external government. Everything that could give power and efficiency to it as an institute was carefully watched and nursed; but when, in the course of the 15th c., and even earlier, spiritual life began to die out in the center of this vast system of ecclesiastical government in Rome itself, the baleful effects of such spiritual decay speedily began to tell through all its borders. The growing corruption showed itself in many forms—in a prevailing ignorance among the monks and higher clergy; in the perversion of ecclesiastical offices, and especially in the grossly materialistic abuse of spiritual privileges and censures. The ignorance of the monks is depicted in strong colors in the satires of Erasmus and Buchanan, and in such books as the *Epistolæ Obscurorum Virorum*. The great impetus which the friars had given to the papal power in the 13th c., had died out. They had sunk, from being zealous and active preachers, into bigots and mendicants, cumbering the ground. The secular clergy were hardly less corrupted; in many cases, the higher dignitaries of the church had no interest in the spiritual duties of their office, and gave themselves up entirely to the pleasures of a worldly life, or, at best, to the duties of political or military activity. The revival of the old classical literature in Italy—the spirit of what is called the *Renaissance*—accelerated this movement of spiritual decay. The papacy itself became half-pagan. The church was little cared for even as an organ of government; it was used as an engine of self-aggrandizement and the most extravagant luxury.

These general causes, however, might have proved inefficient to produce any such radical change as the Reformation; they had been long felt and deplored. Wycliffe in England, and Huss and Jerome of Prague had denounced, in the most vigorous manner, the prevalant abuses; they had excited a wide-spread popular interest, and even to some extent secured royal favor. But the overbearing power of the church proved too strong for the reforming spirit in its earlier manifestations. In the midst of his evangelical activity, Huss was betrayed, through the promise of a safe-conduct, into making his appearance at the Council of Constance in 1414. No sooner was he fairly in the power of the Council, than he was confronted with certain articles of abjuration; and refusing to submit without being convinced, he was, in defiance of the promise made to him, condemned to be burned as a heretic. The rising spirit of reformation was temporarily quenched in the flames which consumed the intrepid martyr of Bohemia. The Council did nothing effectual to repair the abuses which he had denounced. The church remained apparently strong after a temporary excitement and alarm.

In the meantime, however, throughout the 15th c., new seeds of preparation for the great work were everywhere ripening. The literary movement begun in Italy, was spreading in Germany, in England and elsewhere. Reuchlin arose in Germany, Erasmus in Holland; England welcomed the latter as a student in the early reign of Henry VIII., while he was engaged in preparing his edition of the Greek New Testament. Various manifestations of spiritual life showed themselves, especially in the Rhine country. The Brethren of the Common Lot took up in a more evangelical form the succession of the Brethren of the Free Spirit, whose teaching had degenerated into a species of spiritualistic pantheism. Gerhard Groot, and Thomas à Kempis, represent this comparatively evangelical tendency, and springing from them, various men—the best known of whom is John Wessel of Gröningen—have been called 'Reformers before the Reformation.' If we add to these influences the internal political agitations of the Germanic empire—whose traditional opposition to the papacy was by no means forgotten—the growth of a healthy political activity in many of the great municipalities of the empire, we shall find abundant incitements to the Reformation in the social state of Europe, especially of Germany, and in the church in the beginning of the 16th century. It required only a definite spark to kindle the slumbering agitation, and this was not long wanting.

Whatever may be said of the doctrine of Indulgences as theoretically stated, it is not denied by the most zealous defenders of the institution that it has at all times been liable to the gravest abuse; and it so happened that at the period in question the abuse had risen to a scandalous height. See INDULGENCE. An agent of this system, of the name of Tetzel, a Dominican friar, came into Saxony in the year 1517, and established himself not far from Wittenberg, for the purpose of disposing of papal indulgences. He was a man of low and unscrupulous character, gifted with great volubility, and he carried on his traffic in a peculiarly offensive and shameless manner. Luther, who had been recently created a Doctor in the Holy Scriptures, and entered upon his career as a teacher in the university of Wittenberg, was roused to indignation by what he heard of the doings of this man. He saw the evil influence of the system upon the members of his own flock, and determined to raise his voice against it. 'God willing, I will beat a hole in his drum,' he exclaimed, with reference to the coarse vehemence whith which Tetzel commended the value of his wares. He posted on the door of the church of Wittenberg his famous 95 theses, and thereby created such a popular excitement that Tetzel was silenced, and obliged to retreat from the field. This was the beginning of the Reformation in Germany. Luther's attention once aroused to the working of the papal system, he proceeded to examine it in different aspects, and the result was, that his resolution to assail it strengthened as he advanced. Neither cajoling nor threats, neither the bland softness of Cajetan, nor the blundering polemics of Eck, were of avail to silence him. A papal bull was at length fulminated against him; and he consummated his audacity by burning the bull at one of the gates of Wittenberg, on the memorable 18th December 1520.

About the same time, and without any concert whatever, a similar movement against the sale of indulgences took place in Switzerland. In 1520, the Franciscan friars, who had the charge of promulgating the indulgences there, were opposed by Zwingli, a preacher in Zürich. His opinions were declared to be heretical by the two great universities of Cologne and Louvain; but he declared himself unmoved by the voice of Catholic authority; the magistrates and the people of the city supported him; and the result was the active spread of the reforming spirit, not only throughout Zürich, but the neighboring cantons of Schaffhausen, Basel, and Bern.

In the meantime, Luther advanced in his work. He addressed the 'Christian nobles' of Germany, loudly declaring that the time to rise against Rome was come. 'Talk of war against the Turk,' he cried; 'the Roman Turk is the fattest Turk in the world; Roman avarice the greatest thief that ever walked the earth; all goes into the Roman sack which has no bottom, and all in the name of God, too!' Step by step, he opened his eyes to the errors of the papacy, and no sooner reached a new conviction himself, than he launched it forth into the world. He pronounced against the Seven Sacraments, in favor of only three—Baptism, the Lord's Supper, and Penance. He contended for the use of the cup to the laity. His rapid writings—no fewer than three—in the same year, which he closed by burning the papal bull (1520), circulated in thousands, and were eagerly read. Nearly all Germany was aflame with the new spirit, and it seemed as if the empire would be wholly lost to the papacy.

The interposition of Charles V. produced at this crisis a temporary interruption in the progress of Reformation. Charles was crowned Emperor of Germany in January 1521, and immediately summoned at Worms a diet of the sovereigns and states of the empire. The papal leaders exerted themselves to have Luther summarily condemned at the diet. They succeeded so far as to make the emperor issue an edict for the destruction of the reformer's writings; but the estates refused to publish it unless Luther was allowed an opportunity of meeting his adversaries, under safe-conduct, and answering before the diet to the charges preferred against him. Luther was accordingly summoned to meet the assembled authorities of Germany at Worms. He gladly and proudly embraced the summons. His journey thitherward was a kind of triumphal procession, so enthusiastically did the people, and even some of the priests, greet him along the route. He is said to have entered Worms chanting 'Ein feste Burg ist unser Gott'—the *Marseillaise* of the Reformation, as has been remarked. The same night, however, the intrepid monk was heard in an agony of prayer in his room, overwhelmed by the solemnity of his circumstances. On the afternoon of the following day, he

made his appearance before the diet, and confronted its assembled statesmen and princes—a scene grand and striking in its features, which has been often painted. He was urged to retract; but he was immovable. In a speech, first in German, then in Latin, he expressed his determination to abide by what he had written, and called upon the emperor and the states to take into consideration the evil condition of the church, lest God should visit the empire and German nation with His judgments. A direct answer was demanded from him whether he would retract or not. 'I neither can nor dare retract anything,' he replied, 'unless convinced by reason and Scripture; my conscience is captive to God's Word, and it is neither safe nor right to go against conscience. There I take my stand. I can do no otherwise. So help me, God. Amen.'

It was evident that Luther was not to be intimidated. He remained some days in Worms; but neither persuasion nor threatening availed with him. He received orders to depart; and in the end of April, he set out on his way home. As he left Eisenach a few days afterwards, and was passing through a narrow defile near the fortress of Altenstein, he was seized by two armed horsemen with attendants, carried to the neighboring castle of the Wartburg, and there lodged in safety. This apparently violent seizure was the friendly act of his sovereign, Frederick of Saxony, to protect him from the destruction that his intrepid conduct was certain to have called down upon him had he remained at liberty. The ban of the empire had followed him, and temporary obscurity was his only safety.

The Reformation suffered, however, from the absence of his guiding hand. Carlstadt and others, when left alone at Wittenberg, gave the rein to many excesses. Reform seemed likely to merge into license. The heart of Luther, after a year's residence in obscurity, was incontrollably stirred within him to be at his old post again, directing and controlling the spirit of innovation; and he returned to Wittenberg in March 1522. The lawless movement, however, which had received impulse, was not to be restrained. It broke out in many quarters. Social oppression and misery added to the flames of fanaticism. The peasantry rose in arms, headed by the Anabaptist Münzer, and the horrors of a civil war raged throughout Germany. Luther exerted all his influence to stem the unhappy tide of affairs; exhorted the nobles on one hand, and the peasants on the other; and at no part of his career did he show a higher spirit and wisdom, although he has not always got the credit of this.

With his hands thus full of practical labor, he plunged at the same time into a violent controversy with Erasmus, which by no means reflected so much credit on him. Erasmus and he had hitherto, although in different ways, co-operated in the same cause; but they were men of such different spirit and temper, that a separation between them was inevitable. Luther had felt this for some time, but he was reluctant to come to an open breach. 'Do not join your forces to our adversaries; publish no books against me, and I will publish none against you,' he had said in a letter in 1524. On the publication, however, of Erasmus's treatise *De Libero Arbitrio*, Luther could no longer hold silence. He responded in the same year, 1525, by his counter-treatise, *De Servo Arbitrio;* and the war of words waged hotly and vehemently between them. Luther was not only hearty but violent in denunciation; his indignation sunk into coarseness, while the audacity of his logic plunged him into unguarded and even unmoral paradoxes, which left him gravely open to the cold and telling sarcasms of his opponent. He was evidently himself little satisfied with the result, and even his warmest admirers cannot see much to admire in the spirit and zeal which he manifested on this occasion.

Hitherto, the Reformation had not received any legal establishment. Frederick of Saxony, while warmly protecting Luther and his followers, did not yet take any steps to displace Romanism by legal enactment, and set up in its stead a Reformed Church. This was now done, however, by Frederick's successor. He commissioned Luther and Melanchthon to prepare a new form of church government and church service for his dominions. His example was followed by the other princes and states in Germany that had renounced the papal supremacy. The Reformation thus obtained substantive existence and civil support. It was no longer merely a spiritual movement, it became henceforth also a political power. This important result showed itself conspicuously at the Diet of Spires in 1526.

An endeavor made at this diet to suppress the new religious movement, and to insist upon the rigorous execution of the papal sentence against Luther and his followers, was successfully opposed by a majority of the princes and representatives of states; and it was resolved, on the contrary, that the princes should have full power to order ecclesiastical affairs in their own dominions as they thought proper. This resolution served greatly to extend the Reformation. The emperor was too busy for some years with his own affairs to be able to interfere with the course of events; and the reforming cause was in the meantime greatly strengthened and advanced in various states of Germany.

This period of progress and tranquillity, however, was soon interrupted. A new diet was convoked at the same place in 1529; and under the more powerful influence of the papal party, backed by the presence of the emperor's brother, who presided in the diet, the measures of the former diet were recalled, and all changes in religion declared to be unlawful except such as might be authorized by an approaching General Council. It was then that the Elector of Saxony, the Landgrave of Hesse, and other princes of the empire who had already embraced the Reformation, and established it in their dominions, made a solemn *protest* against the action of this diet—a circumstance which gave rise to the name of *Protestants*, which has since attached to all the followers of the Reformation. See PROTESTANT.

While the Reformation thus ran its course in Germany, and was adopted by the civil authorities in many states, it was making corresponding progress in Switzerland, and there at length also, after a famous and elaborate conference held at Bern in 1528, under the countenance of the civil authorities, the supremacy of the pope was abolished, and the Reformed doctrines, in even a broader and more definite shape than in Germany, were declared to be the only doctrine of Scripture. Bern, Zürich, and Basel continued to be the main centers of the reformed movement in Switzerland; but the reformed doctrines gradually extended throughout the great majority of the cantons. Chiefly those surrounding the Lake of Lucerne remained, as they remain to this day, strongly attached to the Roman Catholic faith. The chief point of difference between the reformers in Switzerland and Germany concerned the doctrine of the Eucharist. Luther, while abandoning the doctrine of a literal conversion of the bread of the Eucharist into the body of Christ, known under the name transubstantiation, held to a modification of this doctrine, under the name of consubstantiation. The bread did not become the body of Christ literally, but it contained the body of Christ. Christ was in the bread as really 'as the sword in the scabbard or the Holy Ghost in the dove.' Zwingli, on the contrary, and his coreformers in Switzerland, discarded all outward presence of Christ in the Eucharist. The service, in their view, was merely memorial. 'It is the spirit that quickeneth; the flesh profiteth nothing:' a passage which they applied to prove the worthlessness of any supposed eating of the body of Christ, even if such a thing were possible.

The dispute which arose on this subject between the reformers of Germany and Switzerland, and especially between their respective leaders, Luther and Zwingli, proved a serious impediment to the cause. Philip of Hesse sought to bring about a reconciliation between them. Zwingli, Bucer, and Oecolampadius met with Luther and Melanchthon at Marburg in the year 1529, on his invitation, and held a long conference, but without any result. Luther was not to be moved in a matter which he held to be of the very essence of the Christian faith. The combatants separated with their opinions unchanged.

When Charles V. perceived the firmness of the Protestant princes in the position which they had taken up, he became anxious for temperate and conciliatory measures. In an interview with the pope at Bologna, he urged, but without success, the necessity of a General Council, and at the same time took means to convene personally with the princes at a new diet to be held at Augsburg. In the view of this important convention, the reformers prepared, at the instance of the Elector of Saxony, a statement of their special doctrines. The basis of this, the famous *Confession of Augsburg*, was seventeen articles, delivered by Luther to the elector at Torgau, which had been adopted at a conference at Schwabach in 1529. These articles, enlarged and polished by the careful and moderate pen of Melanchthon, were submitted in twenty-eight chapters to the diet which met at Augsburg in June 1530. Twenty-one chapters were occupied with the statement of the opinions of the reformers, and the remaining seven devoted to an exposure of the errors of popery. The reading of this Confession by the Chancellor of Saxony, in name of the Protestant states, made an earnest and favorable impression upon the diet. The papal authorities submitted a reply, which was approved by the emperor, and ordered by him to be accepted as a conclusion of the religious differences which had arisen. The Protestants responded instead by an answer to the papal document, which was afterwards expanded by Melanchthon, and published under the title of *Apology for the Confession of Augsburg.*

The religious schism between the emperor and many of the states of Germany seemed now approaching a crisis which could only terminate in war. A renewed decree exceeding in severity that of Worms, was launched against the reformers. They on their part appreciated the solemnity of the crisis, and met, headed by the Elector of Saxony, first at Smalkald, and then at Frankfurt, in the years 1530 and 1531, when they entered into a treaty of defensive alliance, and encouraged each other in the resolution to maintain their religion and liberties against the threatened encroachments of the imperial edict. To Henry VIII. of Eng-

land, who was at that time just beginning his own erratic career of reformation, they sent a special invitation to co-operate with them, on the basis of the doctrines of the *Confession of Augsburg*, an invitation to which he responded, but which issued in no practical result. The emperor, notwithstanding the strongly hostile attitude which he had assumed, was not prepared as yet to plunge into hostilities. The Turks were menacing the frontier of the empire; he had his own personal objects to gain in the advancement of his brother Ferdinand to the dignity of king of the Romans, an object which he could not accomplish without a majority of votes at an imperial diet. He was content, therefore, to enter anew into negotiations with the Protestant princes; and after many unavailing projects of reconciliation, a treaty of peace was concluded between them at Nürnberg in 1532. The Protestants agreed to support him against the Turks, and to acknowledge Ferdinand as king of the Romans; while the emperor in his turn agreed to abrogate the edicts of Worms and Augsburg, and allow the Protestants the free exercise of their religion until some settlement by a General Council or a diet of the empire.

It was the emperor's necessities, and not his will, which consented to the peace of Nürnberg; there was no prospect, therefore, of its being lasting. But the Protestants availed themselves of their temporary repose to strengthen themselves and extend their power. The emperor continued to urge the pope to convoke a General Council. At length, in 1536, Paul III. issued a summons for a council to meet at Mantua in the following year; but the Duke of Mantua being disinclined to receive so many turbulent guests into his quiet city, the project did not take effect. In anticipation, however, and convinced that no council convened under the exclusive influence of the pope would deal fairly with the subject in dispute, the Protestants met at Smalkald in the year 1537, and while solemnly protesting against a mere Italian or papal council, at the same time agreed to a new summary of their doctrines, drawn up by Luther, to be presented to the assembled bishops. This summary is known under the name of the *Smalkald Articles*, and along with the *Confession of Augsberg* and the *Apology for the Confession*, constitutes to this day the doctrinal basis of the German Lutheran Church.

At length, in 1546, the same year in which Luther, worn out by his many toils, died somewhat suddenly at Eisleben, a council assembled at Trent. It was soon evident that no compromise was practicable between the Protestant and the papal party, and both sides prepared to try the venture of war. When the Council of Trent promulgated its decrees, and the Reformed princes in the Diet of Ratisbon protested against their authority, the emperor raised an army to compel their obedience. They, on their part, were ready with their forces, and marched into Bavaria against the emperor. The results, in the first instance, were severely disastrous to the Protestant cause, chiefly through the division of the princes, and especially the perfidy of Maurice, the nephew of the Elector of Saxony. Various attempts at reconciliation and compromise were again attempted, in which Melanchthon took a prominent part; but, as before, they came to nothing. A change of fortune gave a temporary triumph to the Protestant arms, and the result was that Charles concluded a formal treaty at Passau, in 1552, which may be considered the foundation of the Protestant liberties of Germany.

The Protestants stipulated for the free exercise of their religion, until the meeting of a diet which should settle a permanent religious peace; and in return, they agreed to lend assistance against the Turks, who were still menacing the frontiers of the empire. The promised diet assembled at Augsburg in 1555, and framed articles for the religious passification of Germany, according to which all adherents to the Augsburg Confession of Faith were left in the undisturbed enjoyment of their rights which they had acquired, were freed from papal domination, and allowed to order their religious concerns as seemed best to them; Protestants and Catholics alike being bound to respect each others' convictions, and not to injure or persecute one another on account of religion, under penalty of being proceeded against as enemies of the empire. This treaty of Augsburg terminates the period of the Reformation in Germany.

In the neighboring countries of Denmark and Sweden, the progress of reformed opinions had proceeded still more rapidly than in Germany. In both these countries the sovereigns took the lead in enlightening their people, and freeing them from the tyranny of the church of Rome. In Sweden particularly, Gustavus Vasa showed both great courage and prudence in carrying out a reforming policy. He invited learned Lutheran teachers into his dominions, and showed special zeal in the circulation of a Swedish version of the Scriptures, made by one of these teachers, named Olaus Petri, who occupies the most prominent place among the Swedish reformers. At an assembly of the states at Westeraas, in 1527, while the reformers in Germany were still struggling for bare existence, it was unanimously resolved that the Lutheran doctrines should be adopted in Sweden, and a Reformed Church, entirely independent of Rome, established. The same result occurred in Denmark in 1539, when an assembly of the Danish states at Odensee gave formal sanction to a plan of religious doctrine, worship, and discipline, drawn up by Bugenhagen, a disciple and friend of Luther, whom Christian III. had invited from Wittenberg for the purpose.

In France, the progress of the Reformation was of a much more uncertain and wavering character. As early as 1523, the new doctrines had spread greatly in many parts of France, under the countenance of Margaret, queen of Navarre, sister of Francis I., the constant rival of Charles V. The names chiefly associated with this early phase of the French Reformation, besides that of Margaret herself, are those of Lefevre and Farel, the latter particularly a man of active and fiery zeal, who had been originally a priest in Dauphiné, and whom we find subsequently associated with Calvin in Geneva. The university of Paris became for a time strongly infected with the 'new learning,' and many of the nobility, as well as the people, were actually inclined to throw aside the superstitions of Rome, and embrace a more scriptural form of faith. But the violent and inconsistent policy of Francis I., and the fierce spirit of faction which the struggle engendered, gave an unhappy turn to the course of events in France, and prevented the Reformation from obtaining in that country anything of the same national recognition that it obtained in Germany and elsewhere. Both Farel and Calvin were driven by the violence of persecution into Switzerland. The latter settled for a time at Basel, where he completed and published the first edition of his *Institutes*. The famous preface, addressed to Francis I., bears the date of Basel, August 1, 1535. In the following year, he repaired to Geneva, where Farel, already laboring in the work of the Reformation, retained him by a 'divine menace,' and he began that great career as a reformer, theologian, and legislator which has rendered his name so illustrious.

In Spain and in Italy, the spread of the Reformation, which in both countries had taken an active and hopeful start, was almost entirely suppressed by the power of the Inquisition. The church of Rome was able to bring its whole force to bear upon these countries, unchecked by political hostility. The flames of martyrdom, which elsewhere seemed to kindle a double zeal for the cause which they aimed to destroy, were here kept burning with such an incessant and devouring cruelty, as to consume all life out of the new movement, and brand the name of Protestant with the infamy which, in the popular mind, always attaches itself to hopeless failure.

The same policy was attempted in the Netherlands. Upwards of 100,000 of the inhabitants are said to have fallen under the atrocious cruelty of Charles V., and his son, Philip II. But the spirit of political freedom and moral earnestness proved at length an equal and finally, through a protracted and bloody conflict, a victorious match for the blood-thirstiness even of Philip and Alva; and the principles of the Reformation, after a Calvinistic type, were at length established in the United Provinces, along with the political supremacy of the House of Orange.

The Reformation in England is marked by peculiar features—an under-current of popular movement, dating even from the time of Wycliffe, and a somewhat inconsistent and wavering series of political changes during the reigns of the three Tudor princes, Henry VIII., Edward VI., and Elizabeth. In the beginning of the 16th c., as early as the first movements of Luther, there are indications of a revival of evangelical religious life among the tradesmen of London, and the peasantry in different parts of the country, particularly in Lincolnshire. The popular mind had begun to look with suspicion and ridicule upon some of the most characteristic doctrines of Romanism. A story is told by Foxe of a Lincolnshire peasant, busy thrashing his corn in his barn, accosted by a neighbor. 'Good-morrow; you are hard at work.' 'Yes,' replied the man, in allusion to the doctrine of transubstantiation, 'I am thrashing God Almighty out of the straw.' The residence of Erasmus in England, in the beginning of the reign of Henry VIII., stimulated a spirit of biblical inquiry among the educated classes, which, while it remained for the most part faithful to the church of Rome, as in the case of More and others, yet helped to advance a reforming movement. The study of his Greek testament was eagerly entered upon by a few students at both universities, especially at Cambridge. We find Biling, Tyndale, and Frith associated at the latter place in 1520; and in the decade following, Cranmer, Ridley, and Latimer all come into prominent notice.

It is at the end of this latter period—the year 1529—a year before the meeting of the Diet of Augsburg in Germany, that the Reformation in England may be said to take its first decided advance. In this year, the usurpations of the clergy, and the manifold ecclesiastical abuses prevailing in the country, were the subject of parliamentary legislation. The negotiations as to Henry's divorce from Catharine had been proceeding for some time, and the country was greatly excited by the course of events. In 1533, Henry was married to Anne Boleyn, and his former marriage with Catharine declared void. All appeals to Rome were forbidden.

In the two following years, the sovereign was declared to be the supreme head of the church of England, with authority to redress all errors, heresies, and abuses in the church; the monasteries were dissolved; and parliament petitioned that a new translation of the Scriptures might be authorized, and set up in churches. In all this course of reformation, however, there was but little religious impulse on Henry's part, for we find him again, in 1539, yielding violently to the spirit of reaction, and passing the famous statute known as the Six Articles, which rendered it penal to deny the doctrine of transubstantiation, or to affirm that priests might marry. Cranmer, who had been for some years Archbishop of Canterbury, labored to prevent their passing; and Latimer resigned his bishopric as soon as they were confirmed.

With the accession of Edward VI., in 1547, the Reformation greatly advanced. The statute of the Six Articles was repealed, with other reactionary measures of the close of Henry's reign. The parliament of 1548 established the use of the Book of Common Prayer; the clergy were permitted to marry; the cup was allowed to the laity; and in 1551, the forty-two articles of religious belief, afterwards reduced to thirty-nine, were promulgated. The temporary restoration of popery under Mary, and the final establishment of Anglican Protestantism under Elizabeth, are well-known events, belonging to the special history of these reigns.

In Scotland, the reforming impulses began with Patrick Hamilton about the same time that Cranmer and Latimer first appear active in England. Hamilton was educated in Paris and in Germany, and learned there the doctrines which he introduced into his native country. There was something, indeed, of the same popular movement, known under the name of Lollardism in Scotland, as in England, and Hamilton's preaching may have served to kindle up the dying embers of this movement. His early death, in 1528, undoubtedly produced a great effect. 'Men began,' says Knox, 'very liberally to speak.' 'The reik of Mr. Patrick Hamilton infected as many as it did blow upon.' After Hamilton, George Wishart appears as the next hero-martyr of the Scottish Reformation; and in connection with him—as his reverend disciple and companion—we first hear of John Knox, who became finally the great leading spirit of the movement, by whose influence popery was extirpated, and the Reformation established in Scotland in 1560. The Scottish Reformation followed the type of the Calvinistic Reformation in Geneva, where Knox had taken refuge during the period of persecution in Scotland, and acted for some years as the companion of Calvin. Episcopacy was abolished, and the fabric of the Reformed Kirk set up in every respect as far as possible in opposition to the papal system, which had become the opprobrium of the people.—Ranke's *History of the Reformation in Germany;* D'Aubigné's *History of the Reformation;* Waddington's *History of the Reformation.*

Such is the light in which this great religious revolution presents itself to the Protestant. Catholic students naturally regard it very differently; and although the name REFORMATION has come to be generally adopted as the historical designation of the religious movement of the 16th c., this name is only accepted by Catholics under protest, and as a conventional phrase, the rigorous meaning of which they distinctly repudiate. The more strict writers among Catholics employ in its stead the name 'Pseudo-Reformation,' or 'So-called Reformation.'

As regards the event itself, Roman Catholics, while they admit that many abuses existed in the church which called for reform, and many superstitions existed which deformed the true character of religion among the ignorant masses of the people, contend nevertheless not only that the extent and the nature of these abuses and superstitions are greatly exaggerated, but also that the task of reforming them did not imply either the necessity or the lawfulness of a separation from the church. They assert that the conduct and character of many of those who were most prominently engaged in the movement prove them to have been influenced by corrupt and unworthy motives; that in their effort to throw off the obedience of Rome, they rather sought emancipation from moral and disciplinary restraint, than the purification of the religious system of the church; that the change in many of the countries in which it was effected was brought about mainly through the agency of the sovereign, with a view to the appropriation of the revenues of the church; and that in others it was brought about by appealing to the prejudices of excited and unreasoning multitudes, who were taught to confound the system with its abuses, and who were incapable of distinguishing the true doctrine of the church from the superstitions which were justly held up for reprobation. And thus in the view of Catholics, the true REFORMATION of the church was not that which has been described above, as carried out by the seceders of the 16th c., but that internal change which was effected by the decrees of the Council of Trent, and by the religious revival which took place simultaneously with the sittings of that assembly. They dwell much on the fact, that all the notable successes of Protestantism were at its first origin, and that, in the words of Lord Macaulay, if Protestantism had at its first onset 'driven Catholicism to the Alps and Pyrenees,' so Catholicism, in its turn, 'rallied and drove back Protestantism even to the German Ocean.

As to the moral and religious results of the Reformation, the same difference of opinion exists. That the very necessity of action which it created had a beneficial influence on their own church, by the internal revival to which it led, Catholic freely admit; but they look upon the revolt against authority, the inauguration of religious innovation and scepticism, the separation from the church, and the disruption of Christian unity, as fraught with moral and intellectual evil; and a work of much learning has been devoted, by the well-known Catholic theologian, Dr. Döllinger, to establishing this point by the confessions of the first reformers themselves, and their immediate successors. See *Die Reformation, ihre innere Entwicklung und ihre Wirkungen*, von J. Döllinger (3 vols. 8vo, Regensburg, 1848).

REFO'RMATORY SCHOOLS. The first institution to which Queen Victoria gave her name was a reformatory for girls, established at Chiswick in 1834, under the name of the Victoria Asylum. It was the first of its kind in England; but as early as 1788, the germ of the reformatory movement may be traced in the working of the Philanthropic Society, which established a sort of farm-school, on the family system, for the reformation of depraved and vagrant children. A second school was established in Warwickshire in 1818, but was suffered to die for want of support, as was the third, set on foot by Captain Brenton in 1830. Captain Brenton was the first who took his stand on the principle, that no child under 16 should be sent to prison, but to some place where training might be provided in industry and virtue; and the girls' school at Chiswick originated in his influence, and was worked on his plans. On his death in 1839, reformatory efforts ceased for several years in England—the institution of the Philanthropic Society at St. George's in the Fields being a mere refuge for the destitute. But its chaplain was the Rev. Sydney Turner, since the well-known Inspector of Prisons and Reformatories; and his attention was directed to the reformatory movement abroad, where its principles were flourishing in the School of Mettray (q. v.), founded in 1839, and the Rauhes Haus (q. v.), at Hamburg.

In 1847, St. George's Institution restricted its care to boys charged with or convicted of crime; and at length, in 1850, broke up and removed to Redhill, establishing there, on the family system, the greatest Reformatory in England. From this time the progress was rapid and sure. In 1852, several schools were opened: Hardwicke Court by Mr. Baker; Kingswood, by Miss Carpenter; Stoke Farm, by Mr. Joseph Sturge; and Saltley, near Birmingham, by Mr. Adderley. Government then determined to legalize the system. Three parliamentary committees having pronounced against the imprisonment of children, the Reformatory Schools Act, 17 and 18 Vict., was passed in 1854, followed by amending Acts in the three succeeding years. One of the first principles of the movement was voluntary agency, and this agency was still retained. The Act sets out in its preamble, 'that whereas Reformatory Schools have been, and may be established by voluntary agency in various parts of the country, it is expedient that more extensive use should be made of these institutions.' The state certifies the school to be fit for its purpose, provides that, on conviction, after a short imprisonment, not more, generally, than 14 days, the child shall enter the school, and remain for a term of years, under the sole management of its conductors, paid for by the Treasury at the fixed rate of 6*s.* per week. A portion of this is recoverable from the parents, if they are in a condition to contribute to the child's support. Counties and boroughs may furnish from their funds money to aid in the establishment of reformatory schools. The results of the schools have been regularly presented to the public in the Reports of Her Majesty's Inspector, who has often traced to their operation the late marked decline in juvenile delinquency, which was previously rapidly increasing. By the end of 1856, 34 schools were in existence; 11 were added in 1857; and in 1860, the number in Great Britain was 59. At the close of 1880, there were in England 52, and in Scotland 12 reformatories. The number of inmates (including those out on trial) was 6665 in 1875, 6614 in 1876, 6853 in 1877, and 5927 in 1880. The total amount of money expended in the year 1880 on these important institutions was £134,080.

The average cost per head for food and clothing in 1877 was: English boys' schools, food, £8, 1*s.* 3*d.*; clothing, £2, 9*s.* 5*d.*; English girls' schools, food, £7, 12*s.* 10*d.*; clothing, £2, 0*s.* 8*d.*; Scotch boys' schools, food, £7, 9*s.* 2*d.*; clothing, £2, 9*s.* 7*d.*; Scotch girls' schools, food, £6, 12*s.* 10*d.*; clothing, £1, 19*s.* The Education Commission said of these schools: Upon the whole, none of the institutions connected with education appear to be in a more satisfactory condition.' It has, however, been urged that children should not be sentenced to reformatories on a first conviction, as it was becoming the rule to do, and that all children under 12 should be sentenced to an Industrial (q. v.) school instead.

REFO'RMED CHURCHES, a term employed in what may be called a conventional sense, not to designate all the churches of the Reformation, but those in which the Calvanistic doctrines and still more the Calvanistic polity prevail, in contradistinction to the Lutheran (q. v.). The influence of Calvin proved more powerful than that of Zwingli, which, however, no doubt considerably modified the views prevalent in many of these churches. The R. C. are very generally known on the continent of Europe as the *Calvinistic Churches*, whilst the name *Protestant Church* is in some countries almost equivalent to that of *Lutheran*. One chief distinction of all the R. C. is their doctrine of the sacrament of the Lord's Supper, characterized by the utter rejection not only of transubstantiation, but of consubstantiation; and it was on this point, mainly, that the controversy between the Lutherans and the Reformed was long carried on. See LORD'S SUPPER and SACRAMENTARIAN CONTROVERSY. They are also unanimous in their rejection of the use of images, and of many ceremonies which the Lutherans have thought it proper to retain. Among the R. C. are those both of England and Scotland, notwithstanding the Episcopalian government of the former; the Protestant Church of France, that of the Netherlands, many German churches, the Protestant Churches of Hungary, Poland, &c., with those in America which have sprung from them.

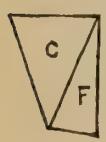
REFORMED PRESBYTERIANS. See CAMERONIANS.

REFRA'CTION. See DIOPTRICS; HEAT; REFRACTION, DOUBLE; UNDULATORY THEORY. In the articles referred to, the ordinary experimental laws of single and double refraction are stated; geometrical consequences, such as the mode of action of lenses, prisms, telescopes and microscopes are deduced from them; and the connection of these laws with the hypothesis of undulation is explained.

It remains that we should give the refractive and dispersive powers of a few common substances, to show the great diversity which exists amongst them, especially in the non-proportionality of dispersion to refraction. The following results are due to Fraunhofer, who was the first to employ, for this purpose, Wollaston's discovery of the *fixed lines* in the Spectrum (q. v.), without whose aid all such observations are of comparatively little value. The lines B, D, and H, which we have selected for the table, correspond to definite rays of red, orange, and violet respectively.

Substance.	Refractive Index. B.	D.	H.	Dispersion (H—B).
Flint Glass.....	1·6277	1·6350	1·6710	0·0433
Crown Glass....	1·5258	1·5296	1·5466	0·0207
Water.....	1·3310	1.3336	1·3442	0·0132
Turpentine.....	1·4705	1·4744	1·4939	0·0234

The numbers in the last column roughly show how far the red and violet are separated by prisms (of a given angle) of the various substances; and even this brief list shows how erroneous was Newton's idea that dispersion is proportional to refraction, an idea which led him to the conclusion that an Achromatic (q. v.) combination was impossible.



Thus we see that the refractive indices of flint and crown-glass are (approximately) as 16 : 15, while the dispersive power of flint is more than double that of crown. Hence, if we construct prisms of the two materials, such that the angular separation of red and violet which they produce shall be equal, the angle of the flint will be far less than that of the crown, and the whole refraction also less. The combination of two such prisms, with their edges turned opposite ways, as in the cut, will thus bend (or refract) a ray of white light without separating the red from the violet—and thus we may obtain *refraction without color*.

This is not strictly the case, on account of what is called *Irrationality of Dispersion*, the existence of which is easily seen from the above table. Thus, if we form two spectra, by means of properly constructed prisms of different media, such that the lines B and H coincide, the lines D will not generally coincide. In other words, some substances draw out the red end of the spectrum more than the violet—and *vice versâ*. Thus, from the above table,

	D—B.	H—D.
Flint Glass.....	0·0073	0·0360
Crown Glass.....	0·0038	0·0170

But 73 : 360 : : 38 : 187; hence we see that the distance from B to D in flint bears a less proportion to that from D to H than it does in crown. Thus, if, by proper arrangements, as before mentioned, B and H be made to coincide, D will be nearer the middle of the crown spectrum than of the flint. Hence a double achromatic lens, composed of flint and crown, may be made to refract equally any *two* colors of the spectrum; but there will be a slight non-accordance of the remaining colors. *Three* colors may be made coincident by using a *triple* lens, but this is now rarely constructed.

REFRA'CTION, CONICAL. In certain cases, light, passing as a single ray through a plate of a crystallized body, emerges as a hollow *cone* of rays; and in others, a single ray, falling on the plate, becomes a cone inside the crystal, and emerges as a hollow cylinder. These extraordinary appearances were *predicted* from theory by Sir W. R. Hamilton (q. v.), and experimentally realized by Lloyd. They form one of the strongest arguments in favor of the truth of the undulatory theory of light. In our article on that subject, we shall briefly describe them in connection with the theory of double refraction in biaxal crystals.

REFRACTION, DOUBLE. The great majority of crystallized bodies: and in general, all transparent bodies (such as glass), when unequally strained, as by pressure, heat, or rapid cooling, divide a single ray which falls on their surface into two. Through a plate of such a substance every object appears doubled. The cause of this singular phenomenon cannot be explained without reference to Polarization (q. v.), and it is therefore deferred to the article on the UNDULATORY THEORY OF LIGHT, where the principal experimental facts will be given along with their theoretical explanation.

REFRAI'N (Fr.), otherwise called the *burden* of a song, a part of a song which is repeated at the close of every stanza.

REFRI'GERANTS. This term is applied in Medicine both to internal and external cooling remedies. The medicines of this class prescribed for internal use cause a refreshing feeling and a sensation of coolness throughout the system, although they do not in reality diminish the temperature of the body. Their principal use is in the treatment of febrile and inflammatory affections in which the benefit they produce appears to depend on the fact, that their direct action on the coats of the stomach occasions by nervous sympathy, a temporary reduction in the force of the circulation. They likewise have the power of allaying gastric irritability and the morbid sensations of heat and thirst. The following are the refrigerants in most common use for internal administration: citric and tartaric acids taken in combination with bicarbonate of potash as effervescing draughts, ripe oranges, lemons (in the form of Lemonade, (q. v), chlorate of potash (ten grains dissolved in water, and sweetened with syrup, to be taken every second hour), and nitrate of potash, which may be taken in the same manner as the chlorate, or as *nitre-whey*, which is prepared by boiling two drachms of nitre in a pint of new milk; the strained milk may be given in frequent doses of two or three ounces. Many continental physicians regard oxalic acid in the form of lemonade as the best of all the refrigerants. Its poisonous character must not be forgotten, but five grains dissolved in half a pint (or more) of water may be taken, in divided doses, in the twenty-four hours with perfect safety.

The following remarks on the external application of refrigerants are for the most part condensed from Mr. Simon's able article on 'Inflammation' in Holmes's *System of Surgery*. Cold, continuously applied, is the sedative of every vital manifestation; and in theory, it may be regarded as being in direct and essential opposition to the causes of inflammation; and as it is thus an antidote to the causes of inflammation, rather than a remedy for the resulting changes, so, in order to get full advantage from its use, it should be employed from the moment when these causes begin to operate. Cold is of great value in the treatment of wounds, especially such as are made in surgical operations. The local temperature can be thus continuously moderated, care being taken that it is not too much reduced, so as to occasion gangrene. Under the effective use of cold (together, of course, with absolute rest of the parts), many a knee-joint, whether wounded accidentally or by a surgical operation, recovers without permanent injury. In most cases, local cooling is best effected by water of the desired temperature. Cloths wetted with it are spread over the surface which is to be acted on, their original low temperature being retained either by their being continuously dripped upon by means of a bundle of threads inserted in a reservoir of cold water, and acting like a siphon, or by their being frequently re-wetted or changed. Their surface should be exposed as freely as possible to the air, so as to secure ample space for evaporation. In cases where great cold is required—as, for example, in cases of strangulated hernia, of inflammation of the brain and its membranes, or of fever with well marked cerebral symptoms—bladders of pounded ice are preferable to wetted cloths. Both as regards the degree of cold and the period of its application, the surgeon should to a considerable degree be influenced by the sensations of his patient. When its application gives comfort, it is almost certain to be doing good; and in most cases where it gives discomfort, it is doing harm.

A notice of the external use of refrigerants would be imperfect without a reference to the memoir of Dr. Esmarch, Professor of Surgery in the University of Kiel, *On the Use of Cold in Surgery*, translated by Dr. Montgomery for 'The New Sydenham Society,' in the year 1861. His mode of application is by means of India-rubber bags filled with ice, snow, or some freezing mixture; or of

thin iron-plate reservoirs of cold water, made by means of a mould of gutta-percha to fit any inflamed part. In a case of 'chronic purulent inflammation of the knee-joint,' the ice-bags were continuously applied for 12 weeks. Dr. James Arnott's investigations on 'Local Anæsthesia by Cold,' in the *Medical Times* for the years 1854–5–7, and Dr. Chapman's method of treating nervous diseases by the application of cold to the spine, as recorded in his *Functional Diseases of Women* and elsewhere, require also a passing reference.

The application of cold, either through the medium of air or water, to the body generally is a subject of great importance. The use of cold air is especially seen in febrile cases, in which the physician directs the sick-room to be kept cool, and the patient (unless in exceptional cases) lightly clothed. Mr. Paget reports that the most successful cases of pyæmia that have fallen under his observation were those in which the patients were freely exposed to the air. The value of baths and cold affusions is noticed in the articles BATH and HYDROPATHY. In addition to what is there stated, it is important to know that prolonged immersion in water as warm as 95° Fahr. may be the means of reducing febrile temperature.

REFRIGERA'TION OF THE EARTH. That the earth is at present losing heat, is an immediate consequence of the observed fact, that the temperature of its crust *increases* as we descend; for, in any conducting body, the flux of heat is always from warmer to colder parts; and the rate at which heat is thus lost can be easily calculated if we know the conducting power (for heat) of the rocks forming the crust, and the rate at which the temperature increases with the depth under the surface; for the conductivity may be measured by the quantity of heat which, in unit of time, passes (per square foot of surface) through a layer of rock of one foot thickness, whose upper and lower surfaces are maintained at temperatures differing by 1° F. Hence, if k be the conductivity of the crust, and if the temperature increases by 1° F. every x feet of descent, the quantity of heat lost, in unit of time, from each square foot of surface, is measured by $\frac{k}{x}$. k and x can be determined by experiment for any particular locality, and thus the loss may be determined. These quantities vary very much in value in different localities, thus x is sometimes as great as 110, sometimes as small as 15. The value 50 is generally supposed to give a fair average—that is, for every 50 feet of descent the temperature increases by 1° F. Hence the stifling heat experienced in deep mines. At the depth of a mile, the temperature would on this estimate exceed that of the surface by more than 100° F. Beds of coal at such a depth could not be wrought, as the temperature would far exceed that of tropical climates.

Three methods of accounting for this increase of temperature towards the interior of the earth have been proposed: 1. That the earth was originally molten, either throughout, or for a considerable depth over the whole surface; 2. That the internal heat is due to chemical combination; 3. That the earth, ages ago, passed through a region of space where the temperature was far above that of its present envelope.

Of (1) it is sufficient to say, that such a state is the necessary consequence of impact, if the earth was formed by the aggregation of cosmical masses due to their mutual gravitation. It is scarcely doubted now that this is the origin of solar and stellar heat; and the fact of the moon's turning always the same face to the earth (see ROTATION), is most easily explained on the hypothesis of her original fluidity. The figure of the earth (see EARTH) is also a strong argument in favor of this hypothesis. This explanation of the origin of the earth's internal heat is obviously consistent with the increase of temperature as we descend below the surface—for a spherical mass of molten rock will evidently soon cool externally—while its low conductivity (rendered still lower by the high temperature) will prevent the interior from supplying anything at all equivalent to the loss at the surface. On this hypothesis, the rate of loss of heat must constantly become smaller and smaller, but very slowly; and it is possible that a considerable portion of the earth's mass may still be in a melted state.

The second hypothesis is perfectly sufficient to account for observed facts, but is apparently unnecessary, since (1) has been shown to be, in the universe, a *vera causa*. It is only alluded to here because Lyell and other distinguished geologists have endeavored to show from it that the earth need not be losing heat on the whole, a result perfectly untenable. They suppose the internal heat to be generated by chemical combination, and then that the compounds so formed are again decomposed by electric currents produced by the heat (see THERMO-ELECTRICITY), and are thus prepared to combine again, and reproduce the heat. Were this the case, we should have a Perpetual Motion (q. v.), and, in the present state of science, this is known to be impossible.

The third hypothesis, proposed by Poisson, is easily shown to be inconsistent with known facts; for, if the passage through the warm region be supposed to have taken place from 1250 to 5000 years ago, the temperature at the earth's surface must have been from 25° to 50° above the present mean temperature, which is inconsistent with history. If it took place 20,000 years ago, the mean temperature must have been 100° F. above its present value. Geology shows that this cannot be accepted. And, if it be supposed to have taken place more than 20,000 years ago, the requisite temperature must have been incompatible with the existence of animal or vegetable life.

From the above argument, which is taken from a paper by Sir William Thomson in the *Transactions of the Royal Society of Edinburgh* (1862), it is obvious that the first hypothesis is that which we must, in the present state of our knowledge, adopt.

Supposing the temperature of melting rock to be from 7000° F. to 10,000° F. (and experiments seem to show that it lies somewhere between these limits), the present state of temperature of the crust indicates that the earth became solid somewhere between 100,000,000 and 200,000,000 years ago. These estimates are based on the known laws of conduction of heat discovered by Fourier, and the conductivity of rocks and soils, deduced by Principal Forbes (q. v.) from observations made in the neighborhood of Edinburgh. But as these observations refer to conductivity at very moderate temperatures only, and as Forbes has shown that conductivity is in general lowered by heating, the lower limit above may possibly be reduced to *twenty million years*.

In conclusion, we may mention, to show how little the internal heat of the earth has to do with surface temperature, that Thomson has shown (*Proc. R. S. E.*, 1863—1864) that if we accept the estimate of 1° F. of increase of temperature for 50 feet of descent, the earth's surface is heated (by conduction of heat from within) only $\frac{1}{75}$th of a degree Fahrenheit.

REFRI'GERATING MACHINES. Under the head ICE, some notice is given of machines by which it can be prepared artificially; but as the practical importance of refrigerating apparatus is daily increasing, we propose to give here a fuller sketch of one or two kinds. The ice-making machine of Carré & Co., of Paris, being one of the simplest and best of those which produce cold by the evaporation of some volatile liquid, we shall describe it first. It is shown in figures 1 and 2, and consists of two strong cast-iron cylinders A and B, connected together by a metal tube T, all perfectly gas-tight. The whole apparatus is made strong enough to stand seven or eight atmospheres of internal pressure.

The cylinder A is charged with an aqueous solution of ammoniacal gas. Ammonia is a powerful absorber of heat, and is, moreover, so extremely soluble in water that the latter takes up nearly seven hundred times its volume of the gas. Air is completely expelled from the apparatus by opening a screw valve and heating the cylinder. It is then ready for use. On applying heat to the cylinder A (fig. 1), which fits into a small stove for the purpose,

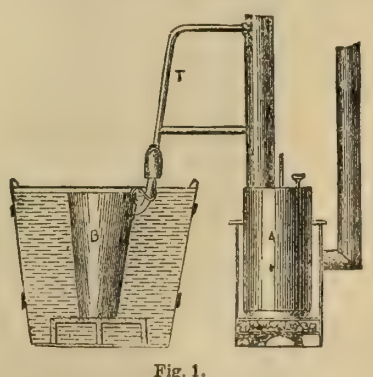


Fig. 1.

the solution of ammonia is volatilized, and carried over and condensed in the cylinder B, which is placed in a vessel containing cold water. The heat reaches to about 220° F., and while it is being applied, the volatilized ammonia condenses into a liquid under very high pressure, produced by its own atmosphere, in the cold cylinder B. When the heating is gone on long enough—about half-an-hour for a small machine—the hot cylinder, A, is removed from the fire, and placed in a vessel of cold water, as shown in fig. 2. The cooling of this cylinder immediately causes the reabsorption, by the removal of the pressure, of the condensed ammonia from the other cylinder B; and as it passes again from the liquid to the gaseous state, intense cold is produced (see HEAT), and, in consequence, heat abstracted from everything in contact with this portion of the apparatus.

The cold cylinder B is shown in section in fig. 2. It is so constructed that the ammonia is contained in an outer jacket, leaving a hollow space in the center. When ice is to be made, the latter

is filled with salt water or other liquid which does not freeze at 32° F., and into this is placed a loosely fitting metal cylinder D, containing the water to be frozen. In this way, with a small

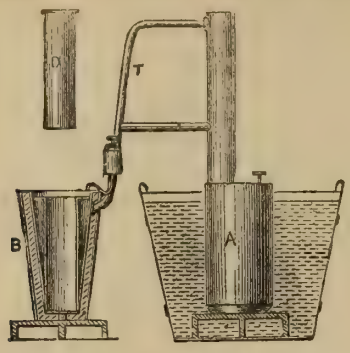


Fig. 2

machine for domestic purposes, a few pounds of ice can be made in an hour or two; but large machines, on the same principle, are made which produce 440 lbs. of ice per hour.

There is a well-known refrigerating machine by Mr. D. Siebe of London, in which ether is used as the volatile fluid, its evaporation being produced not by heat, but by the action of an air-pump; the necessary cold is produced in the surrounding brine as the ether passes into vapor.

M. Pictet of Geneva has invented an ice-machine which works with anhydrous sulphurous acid instead of ether; but otherwise his process somewhat resembles Siebe's. It is now at work at an Ice-making Company's works in King's Road, Chelsea. Some

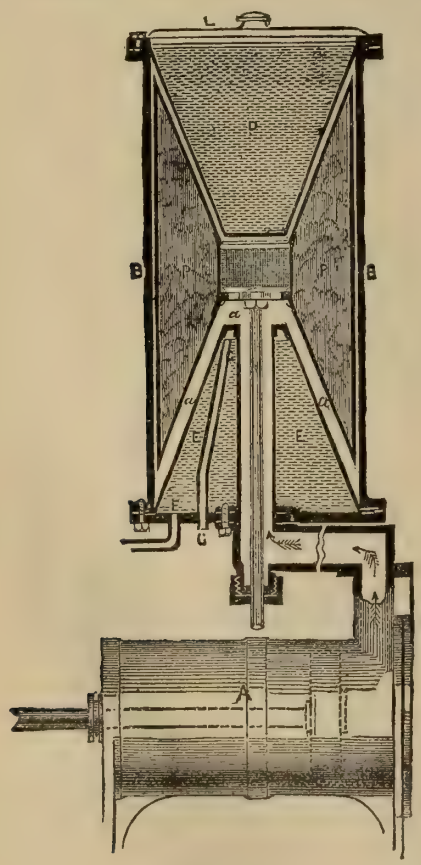


Fig. 3.

machines are also in use which produce ice by means of freezing mixtures; but they are of minor importance.

Mr. A. C. Kirk, late of the Bathgate Chemical Works, undertook, a few years ago, a series of experiments with a view to the construction of such an apparatus which would produce cold by the simple expansion and compression of air. He ultimately succeeded in producing an ingenious machine, which he patented on the 25th April 1862, the number of the specification being 1218.

Although it is not strictly true that the mere rarefaction of air produces cold, yet it will simplify the explanation of this machine to assume in the meantime that it does so. Its simplest form is shown in fig. 3, and consists of a cylinder with a piston to compress air, communicating with another cylinder containing a kind of piston or plunger where the compressed air is cooled and expanded. The machine is driven by a steam-engine, and it may be as well to remark, that the actual relative position of the cylinders is different from that shown in the diagram, which is given rather to show the principle of the apparatus than as an accurate representation of it.

The compressed air is forced by the compressing cylinder A, into the refrigerating cylinder BB, just at the moment when the position of the plunger, PP, is close upon the upper cone D. This air, which fills the space *aa*, between the plunger PP, and the lower cone E, is of course heated by the compression; and in order to cool it again, cold water is made to calculate in the cone E, by an entrance-pipe F, and an exit-pipe at G. The next movement of the machine draws the piston in the cylinder A to the opposite end, and consequently allows the compressed air to expand again; but at the same moment the plunger, PP, descends close upon the cone E, thus allowing the space between the plunger and the upper cone D, to be at its fullest when the expansion of the enclosed air is at its greatest.

By this arrangement, the patentees secures that the air while being compressed will always be at the lower, or what he calls the hot end, of the refrigerating cylinder B; and while being expanded, it will always be at the upper or cold end. There is a regenerator constructed as in the Caloric Engine (q. v.) of wire-gauze, placed in the middle of the plunger at C. This, while it allows the air to move freely through it, prevents the conveyance of heat or cold from one end of the cylinder to the other. The plunger, PP, is filled internally with sawdust or some non-conducting material.

We may now explain that the low temperature of the air which surrounds the cone D during expansion, is not produced by simple rarefaction. That alone would not produce cold. It is necessary as well to abstract heat from the air by giving it some work to do, and here it unavoidably does work, in assisting to force back the piston of the compressing cylinder, while in the act of expanding. The air loses an equivalent of heat exactly in proportion to the amount of force which it expends in moving, or in assisting to move, the piston. See FORCE.

Before air is admitted into the cylinder, it is necessary to dry it thoroughly, by first passing it through a box containing chloride of calcium, because, if any moisture were present, it would freeze in the regenerator, and stop the action of the machine. In the particular form of the apparatus shown in the figure, the substance to be cooled is placed inside the cone D, which is furnished with a lid L. Here not only water, but even mercury, can be frozen with facility.

Most of the machines of this kind which have as yet been made were required for working on a more extensive scale than the one shown in fig. 3 could easily do. In the larger-sized machines, accordingly, instead of one hollow cone like D (fig. 3), a series of circular V-shaped corrugations are fixed to the top cover of the refrigerating cylinder. These form annular passages, through which a continuous current of some fluid not easily frozen, such as brine, flows. This is of course cooled by the expanded air (in the manner already explained) at the cold end of the cylinder, and can be conveyed away in pipes. The most serious objection to this method was its comparative cost.

The increasing imports of dead meat from America gave a new impulse to the improvement of refrigerating processes. The meat chambers were at first cooled by means of currents of air forced over and between ice-blocks. This method kept the air perpetually moist, and produced somewhat deleterious effects on the meat. The Messrs. Bell of Glasgow secured the assistance of Mr. J. J. Coleman, who perfected a purely mechanical refrigerator known as the Bell-Coleman machine. This apparatus has a good deal in common with Kirk's. The air is taken from the meat chamber and greatly compressed, being played upon the while by small jets of water, in order to abstract the heat developed during pressure. It next circulates through a series of tubes where it is further cooled, and deposits great part of its moisture. The next stage is the expansion process; and by being constrained during expansion to perform a certain amount of mechanical work in turning cranks, it further loses heat. It is now found to be a powerful refrigerating agent. Machines on the Bell-Coleman principle have been fitted up in many lines of ocean steamers, and have rendered possible the transmission from America, Australia, and New Zealand, enormous quantities of beef and mutton in perfect condition. It is also used for stationary refrigerators in hot countries. For the Haslam machine it is claimed that the air from it is drier than from that of Mr. Coleman.

The ether-machine of Siddeley & Mackay of Liverpool, which is an improvement on Siebe's, is now a good deal used for making ice, and for other purposes. In it a steam-engine is employed to work two vacuum-pumps, and to supply motive-power to other parts of the apparatus. The refrigerating vessels contain thin

pipes, through-which brine or chloride of calcium flows. Ether surrounds these pipes; and under the reduced pressure produced by the vacuum-pumps, with which the refrigerators communicate, a portion of the ether evaporates, producing cold in the act of doing so, as already explained. The ether vapor is then condensed at a slight pressure, cooled by a stream of cold water, and returned to the refrigerator. Reece's ammonia machine is more recent than Carré's, and is worked with anhydrous ammonia, instead of an aqueous solution of it. In Reece's process, less fuel is required to distil the ammonia, less water to condense it, and less power to work the moving parts of the machine.

It is only within the last twenty years that much attention has been given to the construction of machines for the production of artificial cold on the large scale; but they have already received several important applications. In this country, besides being available for the production of ice; the extraction of certain salts from mixed solutions, such as sulphate of soda from common salt —the former separating at a temperature above that which keeps the latter in solution; the separation of paraffin from mineral oils; and in other chemical operations, as well as for cooling worts in breweries and distilleries, they are now turned to good account in bringing fresh meat from distant countries to our shores. In warm countries, besides other uses, they could be applied to cool large hospitals and public buildings, by sending a current of some cold liquid through pipes, just as we in Great Britain heat buildings with pipes through which hot water flows.

REFUGEE′ (Fr. *refugié*), a name given to persons who have fled from religious or political persecution in their own country, and taken refuge in another. The term was first applied to those Protestants who found an asylum in Britain and elsewhere at two different periods, first during the Flemish persecutions under the Duke of Alva in 1567, and afterwards in 1685, when Louis XIV. of France revoked the Edict of Nantes. Of the numerous French artisans who settled in England on this last occasion, the most part Anglicized their names, as by substituting Young for 'Le Jeune,' Taylor for 'Tellier,' &c., so that their posterity can now hardly be recognized as of foreign origin. According to Lower (*Patronymica Britannica*) De Preux became Deprose, and 'Richard Despair, a poor man,' buried at East Grimstead, was, in the orthography of his forefathers, Despard. There were also refugee families of a higher class, some of whose descendants and representatives came to occupy a place in the peerage. The Bouveries, Earls of Radnor, are descended from a French refugee family. The refugee family of Blaquière was raised to the Irish peerage; and Charles Shaw Lefevre, Lord Eversley, is the representative of a family of Irish refugees. The military employment offered in Ireland after 1688 maintained a considerable number of foreign Protestants.

General Frederic Armand de Schomberg, was raised by William III. to the peerage, becoming eventually Duke of Schomberg. A Huguenot officer of hardly less celebrity was Henry Massue Marquis de Ruvigny, created by William III. Earl of Galway. Lord Ligonier was also of a noble Huguenot family, and England has had at least one refugee bishop in Dr. Majendie, Bishop of Chester, and afterwards of Bangor. Among other refugees of note may be enumerated Sir John Houblon, Lord Mayor of London in 1695, one branch of whose family is now represented by Lord Palmerston; Elias Bouherau or Boireau, D.D., whose descendant was created a baronet as Sir Richard Borough of Baselden Park, Berkshire; as well as Martineaus, Bosanquets, and Papillons, whose descendants have attained more or less eminence in the country of their adoption. The first French Revolution brought numerous political refugees to England, and Great Britain is noted throughout Europe for affording a ready asylum to refugees of all classes, both political and religious. Weiss' *History of the French Protestant Refugees, from the Revocation of the Edict of Nantes to the Present Time*, translated by Hardman (London, 1854); J. S. Burn's *History of the French, Walloon, Dutch, and other Foreign Protestant Refugees settled in England from the Reign of Henry VIII. to the Revocation of the Edict of Nantes.*

REGALBU′TO, or RAGALBUTO, a city in the island of Sicily, in the province of Catania, and 30 miles west-north-west of the city of that name. It is beautifully situated on a hill near the right bank of the river Salso, and with Mount Etna bounding the prospect on the north-east. Its only object of interest is the cathedral. Pop. 9000.

REGA′LIA, the ensigns of royalty, including more particularly the apparatus of a coronation. The regalia of England were, prior to the Reformation, in the keeping of the monks of Westminster Abbey, and they are still presented to the sovereign at the coronation by the dean and prebendaries of that church. During the Civil War, the crown and most of the regalia fell victims to Puritan zeal; and on the restoration of the royal family, new ensigns had to be made for the coronation of Charles II., which with occasional alterations and repairs, have continued in use down to the present day. The regalia, strictly so called, consist of the crown, the sceptre with the cross, the verge or rod with the dove, the so-called staff of Edward the Confessor (made in reality for Charles II.), the blunt sword of mercy called Curtana, the two sharp swords of justice, spiritual and temporal, the ampulla or receptacle for the coronation oil, the anointing spoon (probably the only existing relic of the old regalia), the armillæ or bracelets, the spurs of chivalry, and various royal vestments. All these, with the exception of the vestments, are now exhibited in the Jewel-room in the Tower of London, in which are also a smaller crown, sceptre, and orb for the coronation of a queen-consort, two other queen-consorts' sceptres—one of ivory, made by Marie d'Este; and the state-crown of silver and diamonds, which was used at the coronation of Queen Victoria, containing a large ruby and sapphire, the former said to have been worn by Edward the Black Prince. The Prince of Wales's crown of gold, without stones, is modern.

The proper regalia of Scotland consist of the crown, the sceptre, and the sword of state. The crown probably belongs to the time of Robert Bruce, and is adorned with crosses and fleurs de lis alternately. It was originally an open crown, but two concentric arches were added in the reign of James V., surmounted at the point of intersection by a mound of gold and a large cross patée. The sceptre is of the time of James V.; the sword was a present from Pope Julius II. to James IV. in 1507. During the Civil War, the regalia were removed by the Earl Marischal for safe custody from the Crown-room of Edinburgh Castle, their usual place of deposit, to his castle of Dunnottar; and while Dunnottar was besieged by the Parliamentary army, the regalia were preserved by being conveyed by stratagem to the manse of Kinneff, by the wife of Ogilvy of Barras, the lieutenant-governor, and the wife of the minister of Kinneff. From the Restoration to the Union, the regalia continued to be kept in the Crown-room as formerly; at the beginning of each session, they were delivered to the Earl Marischal or his deputy, in whose custody they remained while parliament was sitting, and were afterwards restored to the charge of the Treasurer. William, ninth Earl Marischal, who opposed the Treaty of Union in all its stages, declined to witness its consummation, but appeared by his deputy, who took a written protest that the regalia should not be removed from the castle of Edinburgh without warning given to him or his successor in office. From that time till 1818, the regalia remained locked in a chest in the Crown-room, away from public gaze, and it came to be the general belief that they had been secretly conveyed away to London, an idea confirmed by the keeper of the Jewel-office in the Tower showing a crown which was alleged to be that of Scotland.

On the 4th February 1818, an order being obtained by warrant under the sign-manual of George IV., then Prince-regent, the chest in the Crown-room was broken open, and the crown, sword, and sceptre were found as they had been deposited at the Union, along with a silver rod of office, supposed to be that of the Lord High Treasurer. They are now in the charge of the officers of state for Scotland, as commissioners for the custody of the regalia, and are exhibited in the Crown-room, along with a ruby ring, set with diamonds, worn by Charles I. at his coronation at Holyrood in 1633; the golden collar of the Garter, sent by Elizabeth to James VI.; the St. George and Dragon, or badge of the Order of the Garter; and the badge of the Order of the Thistle, with figures of St. Andrew and Anne of Denmark, set in diamonds. These latter insignia were bequeathed by Cardinal York, the last of the Stuarts, to George IV., and sent to Edinburgh Castle in 1830, by order of William IV.

REGALIA, or REGALE, RIGHT OF, a right in ecclesiastical things, claimed by sovereigns in virtue of the royal prerogative, which has frequently been the subject of controversy between kings and popes. It involved several points as to presentation to benefices, most of which formed the object from time to time of negotiation by concordat; but the most serious conflict arose out of the claim made by the crown to the revenues of vacant benefices, especially bishoprics, and the co-ordinate claim to keep the benefice or the sea vacant for an indefinite period, in order to appropriate its revenue. This plainly abusive claim was one of the main grounds of complaint on the part of the popes as to the practice of lay INVESTITURES (q. v.), and it reached its height in England under the first Norman kings, especially William Rufus. The most memorable conflict, however, on the subject of the regalia was that of Innocent XI. (q. v.) with Louis XIV., which was maintained with great pertinacity on both sides for several years, the king extending the claim to some of the French provinces which had until then been exempt from it, and the pope refusing to confirm any of the appointments of Louis to the sees which became vacant, as long as the obnoxious claim should be persisted in. The dispute continued till after the death of Innocent, Louis XIV. having gone so far as to seize upon the papal territory of Avignon in reprisal; but it was adjusted in the fol-

lowing pontificate, the most obnoxious part of the claim being practically abandoned, although not formally withdrawn.

REGA'LITY, a species of territorial jurisdiction formerly existing in Scotland, nearly akin to a Palatinate (q. v.) in England. The lands were given over by the sovereign *liberam regalitatem* to some powerful noble, called a *Lord of Regality*, to control as he best might with the strong hand. The lord of regality exercised the highest prerogatives of the crown, including originally the four pleas, often having a complete court of his own, with seneschal, chancellor, chamberlain, and other officials, in imitation of royalty. An offender amenable to a court of regality might have been repledged from the sheriff, or even from the Court of Justiciary. Jurisdictions of regality were abolished by act 20 Geo. II. c. 50.

RE'GALS (perhaps from *rigabello*, an instrument used prior to the organ in the churches of Italy), a small portable finger-organ in use in the 16th and 17th centuries, and perhaps earlier. Many representations exist of this instrument, including one sculptured on Melrose Abbey. The tubes rested on the air-chest, which was filled by the bellows; and the bellows were managed with one hand, and the keys with the other. Until 80 years ago, there existed in the royal household an officer called the *Tuner of Regals*.

REGA'RDANT, a term used in heraldry with reference to an animal whose head is turned backwards. See PASSANT and RAMPANT.

REGA'TTA. This word originated in the Venetian dialect, and signified a boat-race, held annually with great solemnity among the gondoliers. Thence the expression has extended its meaning, and is now applied to all rowing or sailing matches indiscriminately, and especially to the contests between yachts.

REGELA'TION. This is an exceedingly ill-chosen term for a somewhat obscure phenomenon, inasmuch as it implies a previous state which may not have existed. Unfortunately, the term has come into general use, and we must make the best of it. The principal fact to be explained is the adhesion of two pieces of ice brought into contact, not merely in air, but even when both are immersed in water at such temperatures as 100° F. Several explanations have been proposed, of which we may specially mention those of Faraday, Forbes, and J. Thomson.

Faraday's idea seemed to be, that in liquid and solid bodies the proximity of particles in a particular state tends to produce the same state in other particles; and thus, that a film of water between two plates of ice tends to assume the solid state. There are many singular phenomena in physical science, which are apparently explicable by this suggestion; but with all due deference to so great an authority, the so-called explanation seems merely to *shift* the difficulty, without in any way overcoming it.

Forbes starts with the assumption, that ice is essentially colder than water, and therefore that there is constantly a transfer of heat from water to ice which is in contact with it; the effect being to cover the surface of the ice with a film of half-melted ice or half-frozen water. Such a film, existing between two slabs of ice, would part with heat to both, and would freeze without melting the adjacent ice. This explanation would be satisfactory if the postulate could be granted, but it seems very improbable that there is any such essential difference of temperature between solid and liquid water.

The explanation proposed by Professor J. Thomson is undoubtedly founded on a *vera causa*, but there may be some hesitation in allowing that the cause is adequate to the production of the observed effect in every case. It is certain, however, that it accounts for at least part of the phenomenon. It is founded on his very beautiful theoretical discovery that *the freezing-point of water is lowered by pressure*, which was experimentally verified by W. Thomson. Hence, if two slabs of ice be pressed together, at the points of greatest pressure the ice will be melted; its latent heat of fusion must be drawn from surrounding bodies, and thus cold is produced which will freeze part of the film of water between the two slabs. The points of greatest pressure will thus be shifted, and the process of melting and regelation may go on indefinitely. Objections to this explanation were advanced by Faraday and Forbes, who showed that slabs of ice freeze together when suspended vertically with the view of avoiding pressure between them. But J. Thomson shows that the capillary forces of the film of water which must (in these cases) be between the slabs (for without directly applied pressure the effect cannot be obtained with slabs of *dry* ice), are sufficient to produce the pressure requisite for the application of his mode of explanation.

This part of the subject cannot be said to be completely cleared up; but the theory of J. Thomson has been applied with perfect success to the explanation of the very extraordinary phenomena observed in Glaciers (q. v.), where enormous forces are constantly at work. It evidently at once accounts for the result of observation, due to Rendu and Forbes, that a glacier moves like a viscous fluid; in fact, it shows why and how the mass gives way to pressure, and how it is re-frozen in a new form, which in turn gives way to the new distribution of pressure. The explanation of the veined structure, the formation of clear ice from snow, &c., are all easily deduced from it.

The phenomena of regelation are easily seen in the making of snow-balls, which is well known to be impossible, by the hands at least, when the snow has been exposed to great cold, and is therefore dry. But, even in this case, the effect is easily obtained by the application of pressure sufficient to melt the ice, as is well seen in wheel-tracks, &c. By means of a Bramah's press, it is easy to convert a snowball into a sphere of perfectly clear ice.

REGENERA'TION is a theological expression denoting the spiritual change which passes on all men in becoming Christians. There are various interpretations of the mode and meaning of this change, but its necessity in some shape or another may be said to be admitted by all branches of the Christian Church. By all, man is supposed, as the condition of his becoming truly Christian, to pass from a state of nature to a state of regeneration, from a state in which he obeys the mere impulses of the natural life to a state in which a new and higher—a divine—life has been awakened in him. The words of our Lord to Nicodemus: 'Verily, verily, I say unto thee, except a man be born again, he cannot see the kingdom of God,' are accepted as the expression of this universal necessity by the Christian Church. It may be further stated that every branch of the Catholic Church recognizes, although under very different conditions, the Holy Spirit as the author of this change. The change, in its real character, is spiritual, and spiritually induced. According to certain sections of the Christian Church, however, the change is inseparably involved with Christian baptism in all cases; while other sections do not acknowledge any essential connection between baptism and regeneration. In the view of the former, baptism constitutes always a real point of transition from the natural to the spiritual life. The grace of baptism is the grace of regeneration; the laver of baptism is the laver of regeneration, not merely in any formal sense, but in a real and living sense, so that every baptized person—or at least every rightly baptized person—has already become a Christian truly, although he may fall away from the grace that he has received. This is what is commonly called the High Church doctrine of regeneration.

In the view of others, regeneration is a special, conscious process, which takes place independently of baptism, or of any other outward fact or ceremony. It implies a sensible experience—an awakening whereby men come to see the evil of sin, and the divine displeasure against sin, and, through the Holy Spirit, are born again, put away their former evil life, and begin to live a new divine life; and many Christians have spoken with rapture of this *experience*, of its thoroughness, its suddenness, its immediateness. There are different shades of opinion on the subject, some holding it as a condition of regeneration, that the regenerate should be able to recount, or at least give some precise idea of the time and manner of the change through which they have passed; others repudiating such views as savoring of fanaticism, yet holding no less to the spiritual definiteness of the change, independently of church forms of any kind; and such views, in contradistinction to the High Church doctrine, have received the name of Evangelical. The idea that regeneration is essentially involved in baptism, or identical with baptism, is supposed by many Christians to be a peculiarly unevangelical idea.

REGENERATOR FURNACE. See GLASS, Vol. IV., pp. 777–8.

RE'GENSBURG, or RATISBON (Lat. *Reginum*, *Radespona*), the capital of a Bavarian province, stands on the right bank of the Danube, 65 miles N.N.E. of Munich. Pop. (1880) 34,516. R. formerly a free city of the empire and seat of the Diet, is situated in the midst of a broad and fruitful valley, lying 1000 feet above the level of the sea. It presents a strongly-marked medieval character, with its ancient ramparts, fosses, and gates, and its narrow crooked streets, with their high, many-cornered, gabled houses, while it retains many interesting monuments of its importance and wealth during the middle ages. Among its 13 Roman Catholic churches, the most remarkable is the cathedral, begun in 1275, and not completed till the middle of the 17th c., which ranks, since its restoration in 1830—1838, as one of the noblest specimens of German architecture, and is especially noteworthy for the fine monuments of its former bishops, and for its silver altar and numerous painted-glass windows, restored in 1830.

The Scottish Church of St. James (secularized in 1862) dates from the 12th c., and is built in the pure Byzantine style. There are several monasteries in R., and three Protestant churches. The old town-hall was used for a century and a half as the place of meeting for the imperial diet. The royal library contains 60,000 volumes. The city has several highly ornamental fountains, and contains a monument to Kepler, the astronomer, who died in R. A stone bridge connects R. with the busy trading suburb of Stadt and Hof. The manufactures of R. include gold, silver,

brass, and steel wares, paper, earthenware, beet-root sugar, brandy, and candles and soap of superior quality. Since 1853, it has been a free port; and in addition to ship-building, which is carried on with much activity, the trading community is extensively engaged in the transport of corn, wood, and salt. R., as the principal seat of the Danube Steam-navigation Company, is an especially busy trading port.

R., which ranks as one of the most ancient cities of Germany, and was built by the Romans, by whom it was named *Reginum*, was a place of considerable commercial importance in the early ages of Christianity. In the year 750, a bishopric was founded here, which embraced a large portion of Bavaria and the Upper Palatinate. Under the Emperor Frederick I., it was relieved from the subjection under which it had previously stood to the dukes of Bavaria, and declared a free city. During the middle ages, it was the chief seat of the Indo-Levantine trade, and was one of the wealthiest and most populous cities of Southern Germany. From 1663 to the dissolution of the German empire in 1806, R. was, with a very short interregnum, the seat of the German Diet; and after undergoing various changes of fortune during the period of Napoleon's power, was finally ceded to Bavaria, of which it has since formed an integral part.

RE'GENT (Lat. *rego*, I govern), one who exercises the power without having the name of a king. In a hereditary monarchy, there are various circumstances which may necessitate the delegation of the sovereign power—as the devolution of the crown on a minor too young to be trusted with the kingly office; the incapacity of the sovereign by illness, mental or bodily; and the case of absence from the realm. A regent under the title of Protector (q. v.) has often been appointed to exercise royal authority in the sovereign's minority, the latest instance in England being during the minority of Edward VI.; and regents and councils of regency have been sometimes named by the sovereign to provide for the probable nonage of his heir. According to Coke, the surest way of making such an appointment is by authority of the Great Council in parliament; and in recent times the appointment has generally been made by statute. During the frequent absences of the first two kings of the House of Hanover in their continental dominions, it was the practice to appoint regents or *Lords Justices* (q. v.) to exercise the powers of sovereign. In 1788, when George III. became incapacitated from exercising the kingly office by insanity, it became a question whether his eldest son, then of full age, had a right to be regent, or whether the nomination rested with parliament. The chief political authorities of the time were divided in their judgment, but the king's recovery ended the discussion. On the return of the malady, all parties were unanimous that the regency should be conferred on the Prince of Wales; this was done, however, by parliament, and for the first year of his regency, certain restrictions were imposed, which were to be removed in the case—which eventually occurred—of the king's continued illness.

In 1830, a Regency Bill was passed, providing for the administration of the government, should the crown descend to the Princess Victoria before she attained eighteen years of age; and in 1840, a Regency Bill (3 and 4 Vict. c. 52), was passed, providing that the late Prince Consort should be regent, in the event of the demise of the Queen, her next lineal successor being under age. During her present Majesty's various short absences from the country, there has been no delegation of the royal power.

REGENT OF A UNIVERSITY. In the university of Paris, where this as well as other learned distinctions originated, every Master of Arts possessed the privilege, which he was bound to exercise, of delivering public lectures. The same was the case at first in the universities of Oxford and Cambridge. In process of time, however—about the middle of the 13th c.—the title of Master became a degree attainable by any one after a certain amount of residence, and a certain proficiency, and the duty of lecturing was confined to a limited number of graduates, called *Regents*. The regents were eventually succeeded in the office of lecturing by the established professors. In the English universities, a Master of Arts becomes a regent after a short period, and is supposed to read lectures during the year of his regency. The regents still form the governing body in the Convocation and Congregation at Oxford, and in the Senate of Cambridge. In the Scottish universities, according to their early constitution, the regents were the lecturers; and celibacy was enforced on them down to about the middle of the 17th century.

REGGE'LLO, a small town of Italy, in the province of Florence, and 16 miles east-south-east of the city of that name. It is surrounded by beautiful hills, which produce wines, fruits, and grain in abundance. Pop. 10,200.

RE'GGIO (anciently *Rhegium Julii*), a seaport in the south of Italy, the chief city of the province of Reggio (formerly Calabria Ultra I), stands on the shore of the Strait of Messina, ten miles S.-E. of the city of Messina in Sicily. Pop. (1871) of town and suburbs, 29,854; of commune, 25,235. It is well built; its streets are wide and regular, and it is surrounded by a wall flanked by towers. A fine cathedral, a hospital, and several educational institutions are the principal buildings. Manufactures of linens, stockings, silks, and oderiferous waters, are carried on. The fisheries of the vicinity are profitable, and abound in the Pinna (q. v.), a mollusc, the very delicate skin of which is made into gloves, stockings, and caps of great value. The climate of R. is salubrious, and the scenery of the vicinity exceedingly beautiful; the soil is rich, and produces fruit-bearing plants, both of the temperate and tropical zones, in great variety. Behind the city rises Aspromote, a mountain of the Apennines, where Garibaldi was wounded and taken prisoner in 1862.

The ancient *Rhegium* was founded by the Greeks, was governed wisely and justly by Anaxilas, and afterwards by his sons, 494—461 B.C. It was besieged and destroyed by Dionysius the Elder, rebuilt by Dionysius the Younger and afterwards united to Rome.

REGGIO, a city of Central Italy, formerly belonging to the duchy of Modena, and now included in the province of that name, stands on the ancient *Via Emilia*, 16 miles west-north-west of the city of Modena. R. is situated on a fertile plain on the right bank of the Crostolo; is surrounded by a wall; contains beautiful palaces, and a fine cathedral of the 15th c. and other churches, which possess famous paintings; the *Teatro Nuovo*, one of the finest theaters in Italy; the lunatic asylum; a museum, an academy, and many other institutions. It is a rich city, and has manufactures of cotton, of cloth, and of other stuffs. Population of the town proper, about 20,000.

RE'GIAM MAJESTA''TEM is the title given to an ancient collection of laws bearing to have been compiled by order of David I., king of Scotland. The authenticity of the work has been controverted, the prevalent opinion being that it is a compilation from the English work of Glanville, called the *Regiam Potestatem*, and that the publication of the book was an artifice of Edward I. to further his design of assimilating the Scotch law to that of England.

REGI'LLUS, Lake, anciently a small lake of Latium, to the south-east of Rome, probably in the extinct volcanic crater of Cornufelle, near the modern Frascati, which was drained in the 17th c. Lake R. is celebrated in the semi-legendary history of Rome as the scene (496 B.C.) of a great battle between the Romans, under Aulus Postumius, and the Latins, on behalf of the banished Tarquin, under O. Mamilius. The latter were entirely defeated.

RE'GIMENT, in all modern armies, is a colonel's command, and the largest *permanent* association of soldiers. Regiments may be combined into brigades, brigades into divisions, and divisions into armies; but these combinations are but temporary, while in the regiment the same officers serve continually, and in command of the same body of men. The strength of a regiment may vary greatly even in the same army, as each may comprise any number of battalions. In 1881 the numerical designations of the British foot regiments were dropped, the regiments reorganized as territorial regiments in 102 regimental districts, and other changes made. Most of the regiments have now 4 battalions, of which the first two are regulars, and 3d and 4th militia. Some have 5 battalions; and two rifle brigades have 9 battalions each. (For the correspondence of the old and new systems, see *Army List*, or any of the almanacs that quote it.) The whole artillery force is comprised in one regiment. The strength of a regiment is changed from time to time; usually by the addition or withdrawal of private soldiers. The present plan would be, in case of war, to raise the skeleton regiment to war strength by calling in men from the Army Reserve.

The regimental system could only exist where standing armies are maintained. Accordingly, the Macedonian syntagmata and the Roman cohorts were evidently regiments in a strict sense. During the middle ages, feudal organization precluded the system, and its first reappearance was in France. Francis I. formed legions of 6000 men each, which were divided into independent companies, the latter being, in fact, battalions, and each legion a regiment. The word regiment began to be applied to bodies of British troops in Elizabeth's reign; regiments are spoken of at the time of the Armada, 1588, and as composing the force in Ireland, 1598. From that time forward, the army and militia of Britain have been organized into regiments.

Charles I. and the parliament each raised regiments, all of which were disbanded at the Restoration, with the exception of the Lord-General's Regiment of Foot, and his Life Guard of Horse. These two were re-engaged (1661), and form the present Coldstream Guards and Royal Horse Guards. In the same year, a Scotch Corps of 1700 men, which had taken service in France in the time of James I., returned to England, and was included in the British army as the 1st Foot. In 1693 was raised the 1st troop of Horse Grenadier Guards, and the 2d troop in 1702. These were re-formed in 1782 as the 1st and 2d Life Guards.

Besides cavalry and infantry, the British army comprises the regiment of artillery, and the corps of Royal Engineers, and military train.

The 110 regiments of the line have recently been re-organized as 71 regiments of linked battalions (see WAR SERVICES). The old arrangement was as under.

	Regiments.	Officers and Men.
Life Guards	2	868
Horse Guards (Blues)	1	434
Cavalry of the Line—		
Dragoon Guards 7		
Dragoons 3	28	15,973
Hussars 13		
Lancers 5		
Horse Artillery	1	5,633 in 6 brigades.
Foot Artillery		29,291 in 26 brigades.
Royal Engineers	1	5,710
Foot Guards	3	5,950 in 7 battalions.
Infantry of the Line	110	119,483 in 141 battalions.
Army Hospital Corps	1	1,574
Army Service Corps	1	3,014
West India Regiments (black troops)	2	1,832 in 2 battalions.
Colonial Corps	1	649 in 1 battalion.
Total	151	190,411

Each regiment is nominally commanded by a colonel, who is an old general officer, and whose office is merely a sinecure. The real command rests with the lieutenant-colonel in each battalion, who is assisted by a major, and has for a staff an adjutant, a quartermaster, a paymaster, and a surgeon. The regiment or battalion is divided into companies in infantry, engineers, and Army Service Corps; into troops in the cavalry. The artillery is divided into 30 brigades, each of which is as large as an ordinary regiment. The brigade is subdivided into batteries, which are the working units. The working officers are captain and 2 lieutenants to each infantry company or cavalry troop; major, captain, three lieutenants per battery of artillery.

The following table shows the allotment of the several ranks in each arm at home :

	Infantry Battalion of 8 Companies.	Cavalry Regiment of 8 Troops.	Field-Artillery Brigade of 7 Batteries.
Officers—			
Staff	5	7	11
Companies, Troops, or Batteries	21	21	35
Non-commissioned Officers—			
Staff	10	11	6
Companies, &c.	48	48	77
Rank and File—			
Corporals, &c.	40	32	70
Privates	480	415	934
Total	604	534	1133

By the scheme of army organization carried out between 1867 and 1876, each of the ten military districts, into which the three kingdoms are divided, falls again into 66 *infantry* brigade or sub-districts, 2 cavalry and 12 artillery sub-districts. The infantry brigade consists of 2 line battalions, the brigade depôt. 2 militia battalions with reserves and volunteers. The additional reforms of 1881 proposed that the territorial brigade should be consolidated as a 'territorial regiment' with a county depôt. See UNIFORM.

REGIME'NTAL SCHOOLS are maintained by the state in every regiment. There is a schoolmaster for the soldiers and elder boys; and a trained schoolmistress—usually the schoolmaster's wife—to teach the girls and infants of both sexes. Attendance at the schools is optional. Religious instruction takes place on Monday mornings, when children can be kept from school. The girls' school comprises an 'industrial' section for needlework, &c. The charge for the year 1880—1881 was £40,109.

REGIOMONTA'NUS, the name adopted by an early German mathematician, called Johann Müller, probably because he was a native of Königsberg (of which *Regiomontanus* seems intended as a Latin equivalent), where he was born 6th June 1436. Which Königsberg, however, is to be understood, is a disputed point among his biographers, but Delambre and others favor the one in Franconia. R. was sent by his parents to Leipzig at the age of 12, and there made such rapid and extraordinary progress in mathematical studies, that by the time he was 16, he could find nobody, it is said, in the Saxon University competent to give him further instructions. He therefore removed to Vienna, where, in 1461, he became professor of astronomy, but was permitted to reside in Italy for some time, in order to study Greek, with the view of making himself acquainted with the writings of the Alexandrian geometricians and astronomers. He appears while here to have gone through a great amount of laborious work in the collection, collation, and copying of Greek MSS., in studying the language (under the best masters, such as Theodore Gaza), making astronomical observations, lecturing to the students of Padua on the Arabian philosopher Alfragan, and composing his celebrated work, *De Triangulis Planis et Sphæricis* (first published at Nürnberg, 57 years after his death), which, according to Delambre, gives a very complete account of what was then known of plane and spherical trigonometry.

In 1464, R. returned to Vienna, where he remained for some years in the discharge of his duties as professor; but afterwards removed to Buda, in Hungary, on the invitation of Mathias Corvinus. In 1471, he went to Nürnberg, where he lived in close intimacy with a wealthy and enlightened citizen, named Bernard Walther, who furnished him, among other things, with means to start a book-printing establishment, and to construct various astronomical instruments, by which they were enabled to demonstrate the inaccuracies of the 'Alphonsine Tables.' Their united labors are to be found in the *Observationes* 30 *Annorum à J. Regiomontano et B. Walthero* (Nürnberg, 1544). R. now devoted himself vigorously to the composition of scientific works, among others, his *Kalendarium Novum* (ante 1475), which is thought to have been the first almanac that ever appeared in Europe. This last work excited great attention among the learned and powerful of the time, and the first edition was rapidly sold off. The king of Hungary presented R. with a gift of 800 or 1200 golden crowns. Pope Sixtus IV. now sought his assistance in his meditated reformation of the calendar, and to secure his services, conferred on him the dignity of Archbishop of Ratisbon. He now left Nürnberg, and proceeded again to Rome, where, however, he died, 6th July 1476, at the early age of 41. R.'s premature death was a serious loss to the science of mathematics. He is pronounced by competent authorities the most learned astronomer of his age; and his sagacity and ardor were such as to promise important acquisitions to our knowledge of celestial physics. A list of his numerous writings is given by Delambre in the *Biographie Universelle*.

RE'GISTER, LORD, or LORD CLERK REGISTER, a Scottish officer of state who has the custody of the national archives. He was in former times the principal clerk of the kingdom, from whom all other clerks derived their authority. The office used to be held at pleasure, but since 1777 has been conferred for life. The Lord R. is assisted in his duties by a resident deputy.

REGISTER OF ORGAN, a name sometimes given to the sets of pipes or stops of an organ. See ORGAN.

REGISTERS OF VOICE, a term applied to the different kinds of sound distinguishable in the graduated scale of notes produced by any individual voice. Those sounds which, like the ordinary sounds of speech, proceed naturally and freely from the voice, constitute what is called the *chest voice*. By means of a strained contraction of the glottis, notes may be produced of a higher pitch than those of the chest voice; these are called *falsetto* or *head voice*, and have a peculiar flute or flageolet-like quality of their own. Though often sweet and exceedingly pleasing, they cannot be used for a length of time without some amount of constraint or effort, and they are never so powerful, so open, or so impressive as the chest voice. The lower notes, and, in most voices, by far the greater number of notes, belong to the chest voice, the falsetto being only employed in the higher and highest sounds. The sounds produced by the head voice are called the *upper register*, those produced by the chest voice the *lower register*, of the voice; and such notes of the chest voice as may also be produced by the falsetto are said to belong to the *middle register*. In a properly trained voice, the falsetto is so blended with the chest voice that there is no perceptible break between them.

REGISTRA'TION OF BIRTHS, DEATHS, AND MARRIAGES is an improvement introduced in modern times, and ingrafted on the law and social custom of the United Kingdom for the purpose of keeping an exact account of important facts connected with the population of the country and its social progress. In England, the first act for this purpose was passed in 1836, and a general registry-office was provided in London (at Somerset House) for England and Wales. But even before the new arrangement, there had been long in operation an ecclesiastical mode of registration of marriages, baptisms, and burials in connection with each parish church, the officiating minister being required to keep such a register. By that act, which still retains its force as to baptisms and burials, registers of public and private baptisms, and burials solemnized according to the rites of the Established Church in any parish or chapelry, are to be kept, and entries made by the minister within seven days at least after the ceremony. These registers are to be transmitted annually to the registrar of the diocese, who keeps the same, and allows in-

spection on payment of certain fees—severe penalties being incurred by any one who forges or injures the register. This mode of registration was found to be insufficient for statistical purposes, for it was confined only to births and deaths, so far as the ceremonies of the church extended; and hence a systematic plan was instituted in 1836 by the acts 6 and 7 Will. IV. c. 85, 86, which have been since amended by subsequent acts. The head of the office is the Registrar-general. Every poor-law union throughout the country was subdivided into districts for the purposes of the acts. In each district, a registrar, locally resident, is appointed, and a superintendent registrar is put over these.—1. As regards *Births*, it is the duty of the registrar to inform himself of every birth that takes place in his district, and to record the particulars without fee or reward, except such as the act authorizes him to take. The forms of the register-books are all settled by the act of parliament, and include a statement of the date of birth, name (if any), sex; name and surname of the father, and name and maiden surname of the mother; rank and profession of the father; signature, description, and residence of the informant; date of registration; signature of the registrar; and baptismal name of child, if added after registration.

Up till 1875, registration was not compulsory on the relatives and others acquainted with the event; but by the Births and Deaths Registration Act, 1874, it is the duty of the parents, or, failing them, of the occupier of the house where the child is born, and of each person present at the birth, to give notice to the registrar within forty-two days after the birth. No fee is required in such cases. But after forty-two days, and within three months, the father or guardian, or a person present, may make solemn affirmation, and on paying a fee of 7*s*. 6*d*., obtain a registration. After the expiration of three months, special formalities are required, save in the case of children born at sea. The person who finds a child exposed must give notice within seven days. The penalty for knowingly causing a birth to be registered otherwise than is provided by the acts, is £50. No entry made more than six months after the event (save for children born at sea), will be received as legal evidence.

2. *Marriages*.—with regard to marriages which are performed in the Established Church, every officiating clergyman is required, immediately after the office of matrimony solemnized by him, to register in duplicate the marriage according to a form prescribed by the statute, and one of the duplicates is to be forwarded to the superintendent registrar. The form states the date of marriage; the name and surname of each of the parties; the age as to minority; condition as to previous marriage; rank or profession; residence of each at the time of the marriage; and the name, surname, and rank or profession of the father of each of the parties. Every marriage in England which does not take place in a parish church or chapelry of the Established Church, must take place either in a registered building—and most of the chapels or dissenters are so registered—or in the office of the superintendent-registrar. In the two latter cases, it is necessary that the registrar be present in the registered building at the time, or that the superintendent-registrar be present in his office at the time with witnesses. In such cases, the registrar or superintendent-registrar himself registers the marriage so celebrated.

3. As to *Deaths*, every registrar is required to inform himself carefully of every death within his district, and he is bound to enter the particulars in the form required by statute. The form contains a statement of the date of death, name and surname, sex, age, rank or profession, cause of death, name, and residence of the informant, and date of registration. It is the duty of the relatives, or, failing them, of those present at the death, of the occupiers and inmates of the house where the death took place, to give notice within five days after the death. No fee requires to be paid. Four times every year, the district-registrar sends a certified copy of all the deaths to the superintendent-registrar, and when the book is filled, he sends the book itself. These are sent on to the General Register House in London.

The registers of births, marriages, and deaths for England are now kept in London at Somerset House. Besides the registers kept since the passing of the act in 1836, many of the older registers have been collected, and put under the care of the Registrar-general. Indexes are kept of all the certified copies of the registers, and every person is entitled on payment of a fee, to search them, and have a certified copy. For a general search of all these indexes, a fee of 20*s*. is paid; for a search of a particular index, 1*s*. is paid, and 2*s*. 6*d*. for a certified copy. This certified copy is sealed with the seal of the office, and is evidence in all courts. During the time the register is in the hand of the superintendent-registrar, he is bound also to keep an index, charging a fee of 5*s*. for a general search, and 1*s*. for a particular search.

In Ireland, the system of registration of births, deaths, and marriages was introduced in 1863. By the statute 26 and 27 Vict. c. 11, a statute passed relating to births and deaths, a General Register-office was provided in Dublin, and a registrar-general appointed. The country was subdivided into districts. The provisions of the English act are imitated, except that parents and occupiers of houses are bound to furnish the information of births within three months. A penalty of 20*s*. is incurred by parents, occupiers, or persons present, who neglect to give notice of the births and deaths; but the penalty is not incurred if the omission was accidental or not wilful. By a statute of the same year (26 and 27 Vict. c. 27), the minister neglecting or refusing to register a marriage, is liable to a penalty of £40; and in other cases, the registrar is bound to register it. By 26 and 27 Vict. c. 90, a like provision is made for a general register of marriages.

In Scotland, a system of registration of births, marriages, and deaths was introduced in 1854, by the Act 17 and 18 Vict. c. 80; later acts are 18 and 19 Vict. c. 29, and 23 and 24 Vict. c. 85. A registrar-general and a general registry-office for Scotland are provided in Edinburgh (at the Register House); the parochial board of each parish appointing the parish registrar, subject to the sheriff altering or combining districts. Owing to the difficulty of discovering regular and irregular marriages, detailed provisions are required, and the husband, or, in default, the wife, is, under a penalty of £10, bound to send the particulars. Registration is compulsory; the notice of births must be given within twenty-one days, deaths within eight days, and marriages within three days.

REGISTRATION OF DEEDS AND WRITS, in the law of Scotland, is an important feature of the administration of the law. The general registration is authorized either by virtue of a clause of registration inserted in a particular deed, or under the old act of parliament of 1698, c. 4, which applies to all probative writs whatever. The clause of registration arose from the practice of churchmen drawing the enforcement of ordinary contracts within their jurisdiction, by causing the parties to consent that the court should, as it were, execute diligence at once if the obligation were not fulfilled. The clause used to be in the form of an authority given to a procurator to go before a judge, and consent to a decree in terms of the obligation; but it is now enough to use this form: 'I consent to the registration hereof for preservation (or for preservation and execution).' Hence, when money is not paid at the time appointed, diligence issues at once on application of the creditor for execution. The practice is now almost universal to insert a clause of registration in deeds stipulating for money payment, especially bonds. When there is a clause of registration, the principal deed is retained in the register, and an attested copy or extract authenticated by the clerk, and authorizing diligence, is given out, and a copy of the deed is entered in a book. When the deed has no clause of registration, it is recorded as a probative writ only, and the principal deed is marked by the clerk, and returned with a certified copy, a copy being also kept in the record. The registration, under authority of a clause of registration, is called a registration for execution, and is in effect a short cut to a judgment without the formality of an action, and the registration may take place after the death of the creditor as well as of the debtor. The other registration is usually called a registration for preservation, the object being merely safe custody; but the extract or copy kept in the register is allowed to be evidence in all cases except where there is an action of improbation to reduce the original deed for forgery. The general register is separate from that of deeds containing clauses of registration, and is applicable to all writs of which it is useful to preserve a copy.

Another class of registers has for its object publication to all the lieges, which is effected by allowing inspection to the public, and these writs are those connected with heritable rights, being used by all who lend money on land, or purchase land. There is under this class (1) a register of sasines—i. e., of the final deeds completing the title to property, and vesting it in the owner; (2), a register of entails—i. e., of deeds which perpetuate the enjoyment of land by a specified class of heirs; (3), a register of interdictions—i. e., by which a proprietor of heritage limits his own power of alienation; (4), a register of adjudications—i. e., transfers by operation of law; (5), a register of inhibitions—i. e., of diligence restraining an owner of land from alienating it to the prejudice of creditors; (6), a register of inventories, by which heirs limit their liability to the amount of their ancestors' assets. By the combined effect of these registers, the state of heritable property, as affected by incumbrances, is displayed to all parties who are interested in ascertaining that fact, and the practice has been found of great benefit to the land-owners of Scotland. Besides the general registers for all Scotland, there were once local registers in every county and burgh for similar purposes; but since 1871 only indexes and abridgments are sent to each county, and the deeds themselves, except in burghs, must be registered in the General Register House in Edinburgh. The general result of the Scotch registration system is, that deeds and all other writings may be registered for preservation either in the central register in Edinburgh, or in the burgh registers; that deeds containing clauses of registration with consent of execution, as well as protests of bills of exchange, may be registered for preservation and

also for execution in the Books of Council and Session, or in the registers of the subordinate courts; and that all deeds, instruments, and proceedings affecting heritable property must be registered, so that any one can ascertain the burdens affecting it, by inspecting the burgh register as to burgage property, and as regards all other property by inspecting the General Register in Edinburgh, where the whole of the general and local deeds can be found concentrated.

At the head of the management of these public registers is the Lord Clerk Register, by whom and by his deputy and officers the details of registration are carried out. The General Register House in Edinburgh, in which are collected all these records, was completed in 1787, a general principle of the management being, that the formation of the records is intrusted to one set of officers, and the safe custody of them to another set, so as to provide a better check on the whole process.

RE'GIUM DO'NUM (Lat. royal gift), an annual grant of public money formerly received by the Presbyterian ministers in Ireland. It began in 1672, when Charles II. gave £600 of secret-service money to be distributed annually among the Presbyterian clergy in Ireland, on hearing that they had been loyal to him, and had even suffered on his account. The grant was discontinued in the latter part of the reign of that monarch, as well as in the time of James II., but was renewed by William III. in 1690, who increased it to £1200 a year. It was further augmented in 1723 by George I., in consequence of the Presbyterians having supported the House of Brunswick; raised to £2200 in 1784, and to £5000 in 1792. The amount of the grant for 1863 was £39,746. The grant was at one time shared in by other dissenting ministers, but was latterly confined to the Presbyterian body. The propriety of receiving the Regium Donum was much disputed by those of the same persuasion in England and Scotland. The Regium Donum was withdrawn by the act of 1868, which came into force January 1, 1871, disendowing the Irish Episcopal Church.

RE'GIUS PROFESSOR, the name given to the professors in the English universities whose chairs were founded by Henry VIII. In the universities of Scotland, those professors are called Regius Professors the patronage of whose chairs is vested in the Crown.

RE'GLET, a flat narrow mouding rising equally on both sides. It is used to separate panels, and to form frets, &c.

REGNAULT, Henri Victor, a distinguished recent French chemist and physicist, was born at Aix-la-Chapelle in 1810. While still very young, he was left to provide for himself and his sister, came to Paris, and became a shopman in a bazaar. He made such good use of his scanty leisure, that he qualified himself for admission (in 1830) to the Ecole Polytechnique, and, after the two years' course, came out as a mining engineer. He became a professor in Lyon, whence, in 1840, he was recalled to Paris as a member of the Academy of Sciences, in consequence of some important discoveries in organic chemistry. Having filled chairs in the Ecole Polytechnique and the Collége de France, he became, in 1854, director of the imperial porcelain manufactory at Sèvres.

He was distinguished for extreme skill and patience in experimental work, more than for brilliance or novelty in discovery; and devoted himself especially to the determination of important physical data, such as the laws of expansion of gases, the measurement of temperature, latent and specific heats, &c. His greatest work is that on the numerical data bearing on the working of steam-engines, for which the Royal Society of London awarded him their Rumford medal. He also received the Copley medal (1869) of the Royal Society, and was one of the foreign members. In addition to numerous papers in the *Annales de Chimie*, &c., he published a *Cours Elémentaire de Chime* (4 vols., 14th ed. 1871). He died in Jan. 1878.

REGRA'TING. See Engrossing.

RE'GULA, a band under a Triglyph (q. v.) in the Doric style, or the bands between the canals of the triglyphs.

REGULAR CANONS (Lat. *Canonici Regulares*, canons bound by rule), the name given, after the reform introduced into the system of cathedral clergy in the 11th c., to the members of those canonical bodies which adopted that reform. They were thus distinguished from the so-called 'secular canons,' who continued exempt from rule, and who are represented down to modern times by the canons, prebendaries, and other members of cathedral chapters, in those churches, in which the full cathedral system of the Roman Catholic Church is maintained. The rules of the regular canons being variously modified in different countries and ages, a variety of religious orders arose therefrom, Augustinians, Premonstratensians, &c. See Canons, Augustines.

REGULAR PLANE FIGURES are those surfaces whose perimeters are equilateral and equiangular polygons. They are named according to the number of sides which compose the perimeter, being triangles, squares, pentagons, hexagons, &c., according as they have 3, 4, 5, 6, &c. sides respectively; and to all except the *Square* (q. v.) the prefix 'regular' or 'equilateral and equiangular' is applied, to distinguish them from other plane figures which have an equal number of sides, but have not all the sides and angles equal. Circles can be inscribed in and described about all regular figures. See Polygons. *Regular bodies, solids, or polyhedrons* are those solids whose sides are plane figures, all the plane figures being equal, similar and regular. The number of such bodies is necessarily very limited; in fact, no more than *five* such bodies are possible. They are the tetrahedron, hexahedron or *cube*, octahedron, dodecahedron, and icosahedron. The sides or faces of the first, third, and fifth of these solids are equilateral triangles; those of the second are squares; and those of the fourth are regular pentagons. From these five regular solids having been treated of, or described by Plato, they are generally known as the Platonic bodies, or Plato's five solids.

REGULARS, REGULAR CLERGY (Lat. *regulares*, from *regula*, 'persons bound by rule'), a name used to designate that portion of the clergy, in the Catholic Church, who belong to the monastic orders or religious congregations, and thus live under an established rule, commonly including the three vows of poverty, chastity, and obedience. The name Regular is employed in contradistinction to 'secular,' the term applied to the clergy who are employed in the ordinary parochial duties, or at least who are not withdrawn from liability to such duties, by being subject to any religious rules or constitutions. The name, therefore, comprises all friars, monks, regular canons, clerks of the missions, and, in general, all members of clerical congregations who live under an approved rule.

REGULATIONS, Military and Naval, are the official codes of rules for the guidance of officers in all the cases where uniformity of practice is requisite, and which cannot rightly be left to individual discretion. Regulations may be divided into three classes: viz., those affecting drill, discipline, and finance. Of the first class are such as cavalry regulations, infantry field manual, naval gun drill, &c. Of the second are the Army Discipline and Regulation Act, and Queen's Regulations (q. v.). The third class are represented by the War-office regulations, purveyors' regulations, explanatory directions for paymasters, navy paymasters' regulations, &c. All these are continually supplemented and altered by circulars.

RE'GULUS. See Golden-crested Wren.

REGULUS, a term in Metallurgy, which is now used in a generic sense for metals in different stages of purity, but which still retain, to a greater or less extent, the impurities they contained in the state of ore. When, for example, the ore known as the sulphuret of copper is smelted, the product of the different furnaces through which it passes is called regulus until it is nearly pure copper. The name, which signifies 'little king,' was first given by the alchemists to the metal antimony, on account of its power to render gold brittle.

REGULUS, Marcus Atilius, a favorite hero with the Roman writers, was consul for the first time 267 B.C., and for his successes against the Sallentini, obtained the honor of a triumph. Chosen consul a second time 256 B.C., he was sent along with his colleague L. Manlius Vulso at the head of a navy of 330 ships (with a land army on board) against the Carthaginians, it being the 9th year of the first Punic War, and encountering the enemy's fleet off Heracles Minor, he totally defeated it. The Romans then landed near Clypea, where they established their headquarters, and ravaged the surrounding Carthaginian territory with fire and sword, but Manlius being recalled to Rome with one half of the land forces, R. was left to carry on the war with the remainder. For some time he was victorious in every encounter, but at last (225 B.C.) suffered a total defeat; 30,000 Romans were left dead on the field, about 2000 fled and took shelter in Clypea, and R. with 500 more was taken prisoner. R. remained in captivity for five years, but when fresh reverses induced the Carthaginians to solict peace, R. was released on parole and sent to Rome in company with the Punic envoys. The rest of his history is one of the most favorite of Roman tales. It is related, *con amore*, by the Roman poets and historians, as an instance and a model of the most supreme heroism, how R. at first refused to enter Rome since he was no longer a citizen; how, after this conscientious scruple was overcome, he declined to give his opinion in the Senate, till that illustrious body laid upon him its commands to do so; how he then earnestly dissuaded them from agreeing to any of the Carthaginian proposals, even to an exchange of prisoners (though no reason appears why such an exchange should not have been effected); and how, after he had succeeded by his earnest appeals, in obtaining the rejection of the Carthaginian offers, he resisted all persuasions to break his parole, though conscious of the fate that awaited him, and refusing even to see his family, returned with the ambassadors to Carthage, where the rulers, maddened by the failure of their

schemes through his instrumentality, put him to death by the most horrible tortures.

The common story is that he was placed in a cask or chest stuck full of nails with the points projecting inwards, and rolled about till he expired; and on the news of this event reaching Rome retaliations equally atrocious were committed on two of the noblest Carthaginian prisoners. Unfortunately this noble instance of heroic patriotism and unflinching fortitude has not even been noticed by Polybius (about 200 B.C), who details at great length the other achievements of R.; and Palmerius (Paulmier de Greutesmesnil) and Beaufort, two eminent historical critics, have adduced strong reasons for the story being merely invented for the purpose of excusing the horrible treatment of the captive Carthaginians. Niebuhr roundly declares it to be a forgery, and believes that R. died a natural death; though, excepting the silence of Polybius (which would be utterly unaccountable on the supposition of the mode of his death being the same or similar to what is stated in the common account), there appears to be no reason to doubt the statement in which all the other Roman historians agree, that he was put to death by the Carthaginians.

REGUR, the native name for the cotton-soil of India. It is a rich darkish loam, which has yielded a constant succession of crops—one of cotton, and two of corn—for twenty centuries. It covers extensive level tracts in the southern peninsula, varying from 3 to 20 feet in thickness.

RËI, REE, or REA, the nominal unit of account in Portugal and Brazil, but no longer existing as a coin; multiples of it, however, still form the authorized coinage in both countries. In Portugal, copper pieces of 5, 10, and 20 (*vintem* = 1*d.* nearly) reis, silver coins equivalent in value to 50, 100 (*testoon*), 200, 480 (*cruzado novo*), 500, and 1000 (*milreis*) reis, and gold pieces of 1000, 2000, 4000 (*moeda douro*), 5000, 6400, 10,000 (gold crown), and 12,800 (*dolra*) reis, are the current coin of the realm; but accounts are kept almost exclusively in milreis and reis. The milrei in Brazil is, however, only equivalent to about 2*s.* 3*d.* sterling; while that of Portugal is fully twice this value, the exchange at present being about 4*s.* 7*d.* sterling. Gold and silver coins have almost disappeared in Brazil, the circulating medium consisting of notes of a milrei and upwards, together with copper and bronze coins.

REI'CHENBACH, a flourishing manufacturing town of Saxony, 11 miles south-west of Zwickau. It contains several wool and cotton mills, stoneware and other factories; and produces extensively woollen fabrics, leather, nankeens, lace dresses, damask napkins, waistcoatings, and hosiery. The greater part of the machinery in the town and vicinity is driven by steam. Pop. (1880) 16,509.

REICHENBACH, a town of Prussian Silesia, on the right bank of the Peilbach, romantically situated at the foot of the Eulen Mountains, 46 miles by railway south-east of Liegnitz. It contains six cotton factories, and carries on linen and woollen manufactures, yarn bleaching, dyeing, and printing. Pop. (1871) 6938; (1880) 7255.

REICHENBACH, KARL, BARON VON, a German naturalist and technologist, was born at Stuttgart, the capital of Würtemberg, 12th February 1788, and educated at Tübingen, where he received the degree of Ph.D. Soon after he conceived the project of founding a new German state in the South Sea, but his plans were watched by the French authorities, and being suspected to have some hidden political significance, their author was arrested and imprisoned for some time in the fortress of Hohenasperg. On his release he turned his attention to the natural sciences, and their application to the industrial arts, visiting the principal manufactories of Germany and France, and on his return he established at Villingen and Hausach kilns for the production of wood-charcoal.

In 1821, in connection with Hugh, Count of Salm, he commenced a number of manufactories of different kinds at Blansko in Moravia, which were carried on under his own superintendence. R.'s management was so economical and effective, that the concern soon became extremely profitable; and R., after a few years, was the possessor of a handsome fortune, which he invested in the purchase of large estates, including the château of Reisenberg, where he kept his magnificent collection of meteorites; he was about the same time created a baron by the king of Würtemberg.

R.'s position as manager of the works at Blansko afforded him valuable opportunities, which were not neglected, for scientific investigation, and the numerous new facts thus brought to light have been of great value to science and art. From the nature of the works, the objects which chiefly presented themselves to his investigation were the compound products of the distillation of organic substances, and by careful analysis he succeeded in bringing to light a number of compounds of carbon and hydrogen not previously known. Among these were creosote (1833), and paraffin (q. v.). In later years he launched out into speculations of a wholly different character. Studying with enthusiasm the subject of animal magnetism, he discovered, as he thought, a new force in nature. See OD. His chief literary works are, *Geologische Mittheilungen aus Mähren* (Vienna, 1834), the first geological monograph published in Austria; *Physikalich-physiologische Untersuchungen über die dynamide des Magnetismus und der Electricität, und ihre Beziehungen mit der Lebenskraft* (Brunswick, 1847—1849); several other works on 'odic force,' published at Stuttgart between 1852 and 1858; several papers in the *Neues Jahrbuch der Chemie und Physik; Kohlerglaube und Afterwissenschaft* (1856), in reply to a work of Karl Vogt; *Aphorismen über Sensibilitat und Od* (1866); *Die Odische Lohe* (1867). R. died at Leipzig, Jan. 19, 1869.

REI'CHENBERG, after Prague the largest town in the kingdom of Bohemia, stands in the middle of the most populous and industrious district of the Austrian monarchy, in a romantic valley on the Neisse, 52 miles north-north-east of Prague. Linen, cotton, and woollen fabrics are manufactured extensively, as well as fire-arms, hats, leather, shoes, gold and silver wares, musical instruments, &c. During the Austro-Prussian war of 1866, Prince Frederick Charles had his headquarters at R. Pop. (1880) 28,090.

REI'CHENHALL, a small town of Bavaria, on the Saal, 8 miles south-west of Salzberg. It was almost wholly consumed by fire in 1834, and has been handsomely rebuilt since that time. It is the center of the Bavarian salt works, and in the manufacture of salt, its inhabitants—(1880) 3271 in number—are for the most part employed. Of its 18 salt-springs, which burst forth about 50 feet below the surface of the ground, and to which a spacious shaft has been sunk, some are so strong in the brine as to be fit for boiling at once; but generally speaking, they are subjected to a preliminary evaporating process. The strongest and most abundant spring, containing 24 per cent. of salt, and yielding 3300 cubic feet of water every 24 hours, is perhaps the most copious salt-spring in the world. From it alone about 200,000 cwts. of salt are obtained annually. A brine conduit, 60 miles in length, conveys the water of salt-springs from Berchtesgaden, through R., over mountains nearly 2000 feet high, to Traunstein and Rosenheim, in the vicinity of which abundant timber for fuel is procurable.

REICHSTADT, NAPOLEON, FRANÇOIS CHARLES JOSEPH, DUKE OF, described by the Bonapartists as NAPOLEON II., was the son of the first Napoleon by Maria Louisa of Austria, and was born at Paris, 20th March, 1811. His father's joy at his birth was unbounded. '*C'est un roi de Rome,*' he cried to the crowd of congratulators who pressed into his apartments on hearing the news. The infant prince was baptized on the 9th of June, in the cathedral of Notre Dame by Cardinal Fesch. After the reverses of 1814, Napoleon, it will be remembered, abdicatd in favor of his son, but the Senate took no notice of Napoleon II., and called Louis XVIII. to occupy the French throne; whereupon Maria Louisa and her child removed to the palace of Schönbrunn, near Vienna, where they remained till the treaty of Vienna had rearranged the affairs of Europe. Maria Louisa then proceeded to take possession of the sovereign duchy of Parma, which had been conferred upon her, while her son continued to reside at the Austrian court with his grandfather Franz I., who was much attached to him. By an imperial patent, dated 22d July, 1818, he was created Duke of R., with the rank of an Austriar prince, and received a liberal education, but never enjoyed robust health, nor exhibited a vigorous intelligence. At the July revolution in 1830, his name was mentioned as a candidate for the French throne, and Talleyrand, it is even believed, proceeded to Vienna for the purpose of advocating his cause, but was coldly received, and the project dropped. Destiny had indeed determined otherwise. The constitution of the poor youth was utterly undermined by laryngeal phthisis, and on the 22d July 1832 he expired at Schönbrunn. His last words, addressed to his mother, were very touching as an expression of almost childish despair, '*Ich gehe unter, meine Mutter, meine Mutter!*' He was interred with magnificent pomp in the imperial tomb at Vienna.

REID, THOMAS, was born on the 26th April 1710, at Strachan, a country parish in Kincardineshire, where his father was minister. His mother belonged to the well-known family of the Gregories (q. v.). R. began his education at the parish-school of Kincardine, and at the age of 12 he became a student of Marischal College in Aberdeen. His master in philosophy was Dr. G. Turnbull, one of the earliest representatives of the properly Scottish school. He took his degree of M.A. in 1726, and continued to reside in Aberdeen as college librarian, his chief studies being mathematics and the philosophy of Newton. In 1736, he left Aberdeen, and went, in company with a friend, to England, where he was introduced to the most distinguished men in Oxford, Cambridge, and London. In the following year, he was presented by the senatus of King's College to the parish-church of New Machar in Aberdeenshire. The parishioners were bitterly opposed to his appointment, but his conduct and manner grad-

ually won them over. It is said that, from distrust of his powers, instead of composing for the pulpit himself, he preached the sermons of the English divines Tillotson and Evans. In 1740, he was married to a cousin of his own, who greatly aided him in the work of his parish. In 1739, Hume's *Treatise on Human Nature* appeared; the perusal of which gave the impulse that determined his future philosophical career. He had fully adopted the idealism of Berkeley, but was now revolted by the conclusions drawn from it by Hume, and in consequence was led to seek a new foundation for the common notions as to a material world.

In 1748, he contributed to the Royal Society of London a short essay on *Quantity*, occasioned by what he considered an abusive application, by Hutcheson, of the forms of mathematical reasoning to ethics. In 1752, he was appointed one of the professors of philosophy in King's College, Aberdeen, the senatus being the patrons of the chair. Here he followed the established course of teaching in three successive years to the same students, mathematics, natural philosophy, and moral philosophy. He took an active part in all the business of the university. He was also the founder of a Literary Society in Aberdeen, which enrolled among its members, Campbell, Beattie, Gerrard, and other men of ability; to this society he submitted his first draft of the *Inquiry into the Human Mind*.

In 1763, he was chosen to succeed Adam Smith as professor of moral philosophy in the university of Glasgow. He was now rescued from the necessity of teaching physical science, and devoted himself thenceforth to metaphysical and mental speculation. In 1764, he published his *Inquiry*. His thirst for general science never left him; at the age of 55, he attended Black's lectures on Heat. He continued in the duties of his chair till 1781, when he retired to devote his remaining strength to the publication of his works on the mind. In 1785, the *Philosophy of the Intellectual Powers* appeared; and in 1788, the *Active Powers*. These treatises must always be looked upon as constituting the first complete and systematic work on the science of the human mind. In 1774, he had contributed his account of Aristotle's logic to Lord Kames's *Sketches*. The publication of the *Active Powers* was the close of his career as an author, although to the end of his life he kept up his bodily and mental vigor, and his interest in science. His only surviving daughter had married the son of Gershom Carmichael (the real founder of the Scottish school of philosophy); she it was that, after the death of his wife in 1792, cared for him in his last years. He was taken ill suddenly in the autumn of 1796, and died on the 7th October. He was under the middle size, but had great muscular strength, and was addicted to exercise in the open air.

R. had many points of resemblance to his great contemporary Kant. Both were occupied up to middle life with mathematical and physical studies; both were roused to metaphysical research by Hume, and each became in his own country the chief of a school whose aim was to deliver philosophy from scepticism, and to do so by resting finally on principles of intuitive, or *à-priori* origin.

R.'s refutation of Berkeley, notwithstanding the powerful support of Hamilton, is now considered by many to be a failure. His own account of the motives that led him to abandon Idealism, proves that he completely misconceived the real drift of that famous speculation.

REI'GATE, a municipal borough and thriving market-town of Surrey, pleasantly situated at the southern base of the North Downs, 23 miles south of London by the South-eastern Railway. From very early times, it was considered a place of strength; and after the conquest, it was granted to the Earls of Warrenne. Of the castle built by these earls, only very slight vestiges remain; but beneath the site are several large vaults or caverns, excavated in the sandstone not earlier than the 13th century. The church is in various styles of architecture—the oldest portions dating from the 12th century. Under its chancel is buried Charles Howard, Earl of Effingham, Elizabeth's Lord High Admiral, and the conqueror of the Spanish Armada. R. formerly returned a member to parliament, but was disfranchised in 1867. Pop. (1871) 15,916; (1881) 18,656.

REIGN OF TERROR, the name given to that period in the history of France when the revolutionary government, under the guidance of Maximilien Robespierre, supported itself by the pure operation of terror, exterminating with the guillotine all the enemies, or supposed enemies, of the democratic dictatorship. In the year 1793, the Convention vested the government in a 'Committee of Public Safety,' a body belonging to the party of the Mountain, and of which Robespierre, Couthon, and St. Just became the triumvirate. This Committee, to which every other authority in the country was subjected, deliberated in secret, and the Convention sanctioned all its decrees. Louis XVI. had already been brought to the scaffold; and on October 16, his queen, Marie Antoinette, after being subjected to every possible indignity, was beheaded; the Princess Elizabeth sharing the same fate on 10th May 1794. The execution of the Girondists (q. v.) followed, and that of the Duke of Orleans. The guillotine became the only instrument of government: a look or a gesture might excite suspicion, and suspicion was death. The Calendar was remodelled, and all religious rights suppressed. When the power of the Committee had attained its climax, a decree was passed abrogating every delay or usage calculated to protect an accused person; but from that moment a reaction began. A section of the Mountain party was satiated with blood, and had become impatient of the control of Robespierre. On July 28, 1794, he was denounced in the Convention for his barbarities, and his death (see ROBESPIERRE) brought to a close this sanguinary era in French history.

REI'KIAVIK. See ICELAND.

REIMARUS, HERMANN SAMUEL, a German philologist of high eminence was born in 1694 at Hamburg, where his father was Professor at the Johanneum Gymnasium. He visited the universities at Jena and Wittenberg, traveled afterwards in Holland and England, and was, on his return, elected Rector at Wismar, and subsequently Professor of Hebrew and Mathematics at the gymnasium of Hamburg. He died there in 1765. He is the author of the so-called 'Wolfenbüttelsche Fragmente eines Unbekannten,' first published by Lessing in his *Beiträge zur Geschichte und Literatur aus den Schätzen der Wolfenbüttelschen Bibliothek*. These 'Fragmente,' up to that time only known in MS. by a few of R.'s most intimate friends, produced the profoundest sensation throughout Germany; since in them, the author, in the boldest and most trenchant manner, denied the supernatural origin of Christianity. Another work, in the same direction, is his *Vornehmste Wahrheiten der Natürlichen Religion;* of a miscellaneous character are his *Primitia Wismariensia, De Vita Fabricii, Dissertatio de Assessoribus Synedrii Magni*, &c. His edition of *Dio Cassius* is one of the most valuable contributions to classical philology.

REINDEER (*Cervus tarandus* or *Tarandus rangifer*), a species of Deer (q. v.), a native chiefly of the arctic regions; by far the most valuable and important of all the species of deer, and the only one which has been thoroughly domesticated and brought into service by man. It is found wild in Europe, Asia, and America, in Spitzbergen, and in Greenland. It is not, however, a native of Iceland, but was introduced into that island by Governor Thodal in 1770, and soon became thoroughly naturalized; great herds now roaming over the wildest parts of the interior, but approached with difficulty by the hunter, and of little value to the inhabitants. It is not there known as a domestic animal. The R. attains its greatest size in the arctic regions; and in Western Europe it is not found very far to the south of the arctic circle; but in Siberia and in America its range extends much further to the south, almost to the latitude of Quebec in America; and in the west of Asia, along the whole chain of the Ural Mountains, and even to the south of Astrakhan, almost to the Caucasus.

The wild R. of Lapland is almost equal in size to the stag, but there are great differences of size in different districts, the largest size being generally attained in very polar regions. The domesticated R. is never so large as the largest wild ones; but the domesticated R. of Siberia is, like the wild one, much larger than that of Lapland. The R. is very inferior in gracefulness to the stag, and, indeed, to most species of deer, being of a rather heavy appearance, with comparatively short and stout limbs, the withers much elevated as in the elk, and the neck carried almost straight forward. The tail is very short. There is little or no mane, but the hair of the lower parts of the neck is very long and shaggy. Both sexes have long horns, those of the male being larger, and often more than four feet long. They are slender and cylindrical almost to the tip in young animals, but in old ones become palmated there, although still slender and cylindrical at the base; they are more or less branched, and from the base spring one or two branches, comparatively short, but also in old animals much palmated, so that the armature of the head is of a very peculiar appearance. The R. is said to use its horns to remove the snow from the lichens which form great part of its winter food; it also scrapes up the snow with its feet and turns it up with its snout; and by a beautiful provision of nature, the feet, forehead, and nose are protected by a remarkably hard skin. The R. is gregarious, partially migratory—its migrations, however, not being regulated by climate, but by the facility of obtaining food. To the Laplander the R. constitutes the chief part of his wealth; and many Laplanders possess herds of 2000 and upwards, which they feed chiefly in the mountainous tracts in summer, and in the lower grounds in winter.

The flesh is excellent, as is also the milk, which is much used. The skins are used for clothing, tents, and bedding. The hard skin of the face and feet is much valued by the Laplanders for making shoes. The R. is also extremely valuable as a beast of draught, for which purpose it is harnessed to sledges. It is capable of maintaining a speed of nine or ten miles an hour for a long time,

and can easily draw a weight of almost 200 lbs. besides the sledge. It is much employed for this purpose in Siberia as well as in Lapland; but in America, it is merely an object of chase, valued for its flesh, fat, and hide. Among other methods resorted to by the Esquimaux and other Indians for its capture is that of making pits in the snow, covered with a slab of ice, which revolves on its own center when the R. sets foot on it. The flesh and fat are made into Pemmican (q. v.), besides being used in a fresh state. A very thick layer of fat lies under the skin of the back of the male. The American R. is called the CARIBOU, and is sometimes regarded as a distinct variety, but the differences are very slight. Although the R. has been found to live for years when brought to Britain, the climate does not seem suitable to it.

The R. suffers grievously during summer from the attacks of various kinds of insects, and particularly of a species of Bot (q. v.), which is sometimes not merely tormenting but destructive.

REINDEER MOSS (*Cenomyce rangiferina* or *Cladonia rangiferina*), a lichen of great importance to the Laplanders and other inhabitants of the northernmost regions of Europe and Asia, as forming the chief winter food of the reindeer. It is found in almost all parts of the world, but is most abundant and luxuriant in the arctic regions. It is common in Britain, growing in moors and on mountains. It covers extensive tracts in Lapland and other very northern countries, making them even in summer as white as snow, and often thus occupies the ground in pine forests. When pine forests are destroyed by fire, it soon springs up in its greatest luxuriance. It is a very variable plant, but always consists of a much-branched erect cylindrical tubular thallus, with small perforations in the axils. It attains a height of two inches and upwards. The branches of plants which grow together usually mix very intricately into one mass. The importance of this lichen was first brought into notice by Linnæus in a beautiful passage of his *Flora Lapponica*. The reindeer reach it by scraping with their feet, even when it is covered with very deep snow. It is capable of being used for human food, and was recommended for this purpose in times of dearth by an edict of Gustavus III. of Sweden. Its taste is pleasant, although attended with a slight pungency or acridity. It is generally boiled in reindeer milk. Its nutritious qualities depend chiefly on the Lichenin (q. v.) which it contains.

REINFO'RCE, FIRST and SECOND, in Guns, are the two sections of the length which come next the breech. The gun is made thicker at these parts, so as to resist more effectually the explosive action of the powder. The thickness of metal is less at the second reinforce than at the first, the powder being considered to have already exerted its greatest disruptive force. This conclusion is, however, open to dispute. The first and second reinforce are shown (with their reinforce rings) at AC, CD in the figure under GUN.

REIS EFFE'NDI, a title formerly given to an officer of state in the Ottoman empire. He was the Chancellor of the empire, and Minister of Foreign Affairs. His duty in the first-mentioned capacity was to confer with the grand-vizier regarding the orders and instructions to be sent to the different provinces, and regarding the proper decision on any subject affecting the empire, whether internal or external; and in the latter capacity, he had the sole and exclusive charge of the relations of the Porte with foreign courts.

REJOI'NDER, in English Law, means the pleading of a defendant in answer to a plaintiff's replication. The order of pleading is declaration, plea, replication, rejoinder, surrejoinder, rebutter, surrebutter, &c.—each party alternately delivering one of these pleadings.

RELA'PSING FEVER is one of the three great species of continued fever common in this country, the two others being typhus and typhoid. Although the disease has been accurately described by several physicians during the last century (since 1739), its present name was given to it only about 1850 by Dr. Jenner. It had previously been vaguely known under the various names of *five-day fever*, *seven-day fever*, *mild yellow fever*, *short fever*, *short relapsing fever*, &c., and has often been confounded with common continued fever. It has attracted special notice since 1843—1844, when there was prevalent in Scotland 'an epidemic fever characterized by the suddenness of its onset, its wide diffusion, its short duration, and its small mortality; by its proneness to relapses, by the frequent occurrence of petechiæ, of something like black vomit, and of yellowness of the skin; by the absence of intestinal ulcers; and by profuse sweatings, whereby the fever seemed to be solved.' This fever was supposed at the time by Alison and other eminent physicians who described it, to have been a new and hitherto unknown pestilence; but Jenner's subsequent researches showed, as has been already mentioned, that in this respect they were in error; epidemics of this kind having previously occurred in Scotland or Ireland (or both simultaneously) in 1736, 1739—1741, 1800—1801, and 1816—1820.

Relapsing fever usually begins suddenly with rigors, a sense of chilliness and frontal headache. Febrile reaction soon sets in; the tongue is coated with a thick moist whitish fur; and the skin is often so yellow as to approach to jaundice (a phenomenon that never occurs in typhus or typhoid fever). By the fifth or sixth day, there is usually delirium. After the above-described symptoms have lasted for a period varying from five to eight days, generally on the seventh day, a sudden change takes place. This change commences with a copious perspiration, which is followed by a rapid falling of the pulse to its healthy rate (or even lower), and the patient appears nearly well. But from the fifth to the eighth day of this seeming convalescence, a sudden relapse occurs, and all the primary symptoms return; these run a rather shorter course than before, and again terminate in sweating and in a second convalescence, which is in most cases permanent. The relapse sometimes, however, occurs three or even four times.

Death is a rare termination of relapsing fever; and when it does occur, it is usually before the seventh day of the desease. No special anatomical lesion is observed in the bodies of those who succumb to this disease, but enlargement of the spleen is by no means uncommon.

The treatment to be adopted is simple. The bowels should be opened at the commencement of the attack by calomel and rhubarb, and if necessary, kept open subsequently with castor-oil or saline aperients. The headache must be encountered by leeches or cupping, if the patient is robust; and by blisters or dry cupping, if he cannot bear the loss of blood. The vomiting is often hard to check: if effervescing draughts fail, it may sometimes be combated by calomel and opium combined in pills.

Its cause is unknown, but it mainly attacks the poor and the ill-housed and ill-fed. Its poison appears to be a specific kind; the phenomena of the fever are very different from those of typhus and typhoid fevers; and patients recovering from these diseases may catch, by contagion, this disease, while patients convalescent from this fever may take typhus or typhoid fever. It has been said to be allied to yellow fever, but it more nearly resembles some form of Remittent Fever (q. v.), on account of the repetition of the rigors after a regular period. (It is thought by some to be a bacterial disease. See GERM-THEORY.

RE'LATIVE KEYS, in Music, the keys most nearly related to any key whose scales have the greater number of their notes in common with it. The keys which are most nearly related to a major key, taken as principal, and into which it may most easily pass, are its *dominant*, or fifth above; its *subdominant*, or fifth below—each of which differs from it only by one sharp or one flat—and its *relative minor* key, that is, the key which has the same signature, is in its descending scale the same, the ascending scale differing by two notes. In the same way, the keys most nearly related to a minor key are its *dominant* and *subdominant*, and its *relative major*. Thus the relative keys of C major, as principal key, are G major, F major, and A minor; and the relative keys of A minor are E minor, D minor, and C major. A more remote degree of relationship subsists between a major key and the dominant and subdominant of its relative minor, or between a minor key and the dominant and subdominant of its relative major. A major key is also closely connected with its tonic minor, or the minor key of the same tonic, as the two keys have the tonic, dominant, and subdominant in common.

RELATIVE PRONOUNS differ from personal and other Pronouns (q. v.) in this, that, besides standing for nouns, they at the same time have the power of conjunctions. They join sentences or clauses by *relating*, or referring back directly, to something just named. The relatives in English are *who*, *which*, and *that*. *What* is used for *that which*, thus embracing both relative and antecedent. In many cases, *who* or *which* can be resolved into a conjunction and a personal pronoun. Ex. 'At last the surgeon was called in, *who* (= *and he*) straightway amputated the limb.' 'Why consult Charles, who (= *for*, or *since he*) knows nothing of the matter?' 'Ahab seized the vineyard of Naboth, *which* (= *although—it*) he had no title to.' In cases where they are not thus resolvable, they introduce sentences or clauses to limit nouns, the relative clause serving the purpose of an adjective. Ex. 'He picked out all the men *who had blue eyes*' (= *the blue-eyed*). 'The house *which stands* (= *situated*) half-way up the hill is the most cheerful.'

Who is employed when the reference is to persons, and *which* when it is to inferior animals or things. *That* is applied to both persons and things; but it does not follow that it may be used at pleasure instead of *who* or *which*. Whenever a *who* or *which* is resolvable as above described, the substitution of *that* would alter the meaning; in the last, e. g., of the three examples given, it would make the sentence declare that Ahab seized the particular one of Naboth's vineyards to which he had not a title; implying that he had a title to some other vineyard or vineyards of Naboth. It is only when the purpose of the relative clause is to limit or define the thing meant, that *that* is ever applied; and for this

purpose, its use is in general preferable to that of *who* or *which*. It is easier and more idiomatic to say: 'All the men that had blue eyes,' than, 'All the men *who*,' &c.; and who would think of saying: 'This is the house *which* Jack built?' Besides, *that* so employed often avoids ambiguities that would attend *who* or *which*. Ex. 'His conduct surprised his English friends, *who* had not known him long.' This may mean either that his English friends generally were surprised, for the reason that they had not known him long; or that only a portion of them—those, namely, that had not known him long—were offended. If the latter is the meaning intended, it would remove all ambiguity to write: 'His English friends *that* had not known him long.'

The use of the demonstrative *that* as a relative is common to the Teutonic languages, but is unknown in Greek, and Latin, and in the Romanic languages. The relatives proper (and the many derivatives and compounds formed from them) in all the allied languages begin with *k*, or an equivalent of *k* (*qv*, *hv*, *hw* = *wh*, *w*, *h*). Sans. *kas*, Gr. *kos* or *pos* (how), Lat. *quis*, *qui*, Pol. *kto*, Goth. *hvas*, Ger. *wer*, Dan. *hvi* (pron. *vi*), Eng. *who*, *how*, Fr. *qui*, It. *chi*.

The relatives proper are also used (sometimes with a slight variation of form) to ask questions, when they are called Interrogatives.

RELATIVE RANK, in the Army and Navy, signifies the precedence which certain non-combatant officers and others are entitled to take among their combatant brethren; for instance, a controller has the relative rank of major-general, a naval surgeon that of a naval lieutenant, &c. Relative rank carries with it all precedence and advantages attaching to the military rank with which it corresponds, and regulates rates of lodging-money, number of servants, rations of fuel and light (or allowances in their stead), detention, and prize-money. Relative rank does not entitle the holder to salutes from ships or fortresses, nor to the turning out of guards, and, of course, it does not confer any right to command.

The relative rank of the several civil departments is stated under their respective headings; see MEDICAL DEPARTMENT, PURVEYORS, &c. It only remains to show the relative rank of the army and navy:

Navy.		*Army.*
Admiral of the Fleet	ranks with	Field-marshal.*
Admirals	rank "	Generals.*
Vice-admirals	" "	Lieut.-generals.*
Rear-admirals	" "	Major-generals.*
Captains of the Fleet, Commodores, 1st and 2d class	" "	Brig.-generals.*
Captains over 3 years' service	" "	Colonels.*
Captains under 3 years' service	" "	Lieut-colonels.*
Commanders	" "	Lieut-colonels.†
Lieutenants of 8 years' standing	" "	Majors.*
Lieutenants under 8 years' standing	" "	Captains.*
Sub-lieutenants	" "	Lieutenants.*
Midshipmen	" "	Sub-lieuts.

RELEA'SE, in English Law, is a discharge of some interest in land, or of some legal right. Thus, where one who is the owner of land gives or transfers his right to another, who has some prior estate in possession, the deed by which this is done is a release. Formerly, it was usual for A to give a lease of land to B, and next day to give a release conveying the rest of the estate to B. The term 'release' is also used as a discharge of all demands or rights of action in reference to a particular matter.

RE'LEVANCY, in Scotch Law, means the condition of a plea which is well founded in point of law, provided it be true in fact. An objection to the relevancy corresponds in many respects to a demurrer in English law.

RE'LICS (Gr. *leipsana*, Lat. *reliquiæ*, remains), the name given in theological and historical nomenclature to what may be in general described as the personal memorials of those among the dead who have been distinguished during life by eminent qualities, especially by sanctifying or by remarkable religious services. Under the same name are classed certain objects which are believed to be memorials of the life of our Lord upon earth, and especially of his passion and death. Such memorials of the distinguished dead have at all times and in all states of society, however rude, been held in honor among men. But the question as to relics is chiefly important in relation to Christian history, in which the name is restricted to a single class of memorials, viz., to objects which derive their value from their connection with our Lord, and with the saints; as, for example, fragments of our Lord's cross or crown of thorns, portions of the dust, the bones, the blood, the instruments of torture, the chains, &c., of the martyrs, the mortal remains, the clothes, the books, and other objects of personal use of the other saints, and even objects to which a certain indirect sacred interest is given, by their being brought into contact with the direct memorials of the distinguished dead, as by their being placed on the tombs of the martyrs, touched with the relics, or blessed at the shrine or sanctuary of the saints, &c. In all such cases, the motive of religious honor, however differently it arises, is precisely the same, viz., the association of the object which is honored with the personage whose virtues or services are the subject of grateful veneration. The merits of relics, in their theological aspect, are beyond the scope of this publication. We shall confine ourselves to an outline of the history of the veneration of relics, and to an explanation of the conflicting views of the rival Christian communions on the subject.

* According to date of commission.
† Junior of the rank.

The very earliest monuments of Christian history contain evidences of the deep and reverential affection with which martyrs of the faith, their mortal remains, and everything connected with their martyrdom, were regarded by their fellow Christians, and for which Catholics profess to find warrant in many passages of the Old and of the New Testament, as Ex. xiii. 19; Deut. xxxiv. 6; 2 Kings xiii. 21, and xxiii. 16—18; Isaiah, xi. 10; Matt. ix. 20—22; Acts v. 12—16, and xix. 11, 12. The contemporary letter of the Church of Smyrna attests this plainly as to the martyrdom of Polycarp; Pontian's *Life of Cyprian* tells of their stealing the martyr's body, and carrying it away by night in holy triumph with lights and torches. At an early period, too, miracles are described as connected with relics. Thus Ambrose (Ep. xxii. 1, 2) tells of a blind man's sight restored by his touching the bodies of the martyrs Gervasius and Protasius; and similar wonders are detailed by Gregory Nazianzen (*Orat.* xviii.), Chrysostom (*In S. Ignatium*, n. 5), Leo the Great (*Serm.* iv. 4); insomuch that the possession of relics of the martyrs, and even the occasional touching of them, was regarded as a special happiness (Gregory Naz. *Orat. in S. Theodorum*), and that not merely individuals, but, according to Theodoret the historian, even cities were content to share with each other portions of the sacred treasure (Theodoret, *Græc. Affectionum Curatio*, disp. viii.). Connected with this feeling, too, is found a belief of a certain sacred efficacy in the presence or the touch of the relics, and especially there is ascribed by Chrysostom, Basil, Theodoret, and other Fathers, to prayers offered before the relics, a virtue in dispelling or warding off sickness, diabolical machinations, and other evils. Hence we find that altars were erected over the tombs of the martyrs, or at least that relics were invariably placed on the altars, wherever erected, insomuch that the Trullan Council ordered the demolition of all altars in which no relics had been deposited. Far more sacred than the relics of Martyrs, was the cross of our Lord, which was believed to have been discovered at Jerusalem by Helena (q. v.), mother of the Emperor Constantine. Minute portions of the wood were distributed to the principal churches; and Cyril of Jerusalem, within less than a century after the discovery of the cross, describes the precious wood as dispersed throughout the world. It must be added, too, that even at this early period, many abuses and superstitions had crept in, which even the Fathers who admit the worship do not fail to condemn.

The practice of relic-worship, however, and the feeling on which it was founded, were not suffered to pass without a protest. Vigilantius, in a treatise which is now lost, but the tenor of which is learned from his adversary, Jerome, reprobated in the strongest terms the excesses to which it was carried, and indeed the essential principles on which the practice rests. But the protest fell without drawing an echo from the contemporary mind. Vigilantius had so few followers, that were it not for the refutation of his work against relics composed by Jerome, we should have no record of his opposition to the popular view; and it is urged by Catholics, as a proof of the universal acquiescence of the church of the 4th c. in the practice of relic-worship, that in an age remarkable for intellectual activity and for polemical ardor—an age which in 25 years saw nearly 30 councils in the cause of the Pelagian heresy—it was not even found necessary to call a single council to condemn Vigilantius.

The writings of Augustine, of Paulinus of Nola, of Ephrem the Syrian, of Gregory the Great, and others, are full of examples of the miraculous virtue ascribed to relics, and of the variety and the extensive multiplication of sacred memorials of all kinds. Nor was this confined to the orthodox alone; all the different parties in the controversy on the Incarnation agreed with Catholics and with one another on this subject, and even the Iconoclasts, at the very time that they most fiercely repudiated the use of images, admitted without difficulty the veneration of relics.

In the age of the Crusades, a fresh impulse was given to the worship of relics in the West, by the novelty and variety of the sacred objects brought home from the churches of Syria, Asia Minor, and Constantinople by crusaders, by palmers returning from Palestine, and by the Latin conquerors of Constantinople; and it is admitted by the most zealous Catholics, that at this period many false, and perhaps even absurd and ridiculous relics were introduced, and were successfully commended to the veneration of individuals or individual churches in the West; nor do

they venture to doubt that abuse and superstition found their way side by side with what they regard as the genuine and authorized worship of the church. Nevertheless, with the exception of the Waldenses, Wycliffe, and a few isolated individuals, the practice remained unchallenged till the 16th c., when, in common with many other doctrines and practices of the church of Rome, it was utterly repudiated by the Reformers. Catholics, however, allege that the practice, as sanctioned by the church, has nothing in common with the abuses which form the main ground of the objections alleged by Protestants. The Roman Catholic use of relics, as authorized by the church, is to serve as incentives to faith and piety, by recalling vividly to men's minds the lives, and, as it were, the corporeal presence and the earthly converse of the saints, and thus placing before them, in a more touching manner, the virtues which, in the examples, are held up for men's imitation. The decree of the Council of Trent connects the subject of relic-worship with the general question of saint-worship, and regards the relics of the saints not as possessing intrinsic virtue, but only as instruments 'through which God bestows benefits on men.' See INVOCATION OF SAINTS.

The Greek and other oriental churches, and most of the oriental sects, agree with Roman Catholics in the practice of relic-worship. On the contrary, the Reformed churches, without exception, have rejected the usage as unscriptural, calculated to withdraw from the worship of the one God, and deformed by numerous superstitions. They regard a large proportion of the relics which Roman Catholics worship as false and supposititious. and they specify several, regarding the spuriousness of which even learned Catholics appear to be satisfied. Some relics have been the subject of much controversy among Roman Catholics themselves. See HOLY COAT, HOLY PLACES, LORETTO, PILGRIM. It may be added that the practice of relic-worship forms a notable feature of the Mohammedan usage of pilgrimages. The holy cities of Mecca and Medina, and the celebrated Mosque of Omar at Jerusalem, owe most of their holiness in Mohammedian eyes, to the memorials of the Prophet, and other relics which they contain; and the celebrated *Sanjak-sherif* or Sacred Standard at Constantinople, is believed to be formed of the nether garment of Mohammed. The practice occupies a still more important place in Buddhism (q. v.—See also CEYLON).

RELIE'F, in English law, means a payment by a tenant or vassal to a lord, the theory being, according to feudal law, that relief (*relevium*, Lat. *relevare*,) is a restoration of the lands after the wardship or guardianship of the lord has ceased, and the vassal has attained majority.—Relief is also the common term used to denote the pecuniary assistance given under the poor-laws to a pauper.

RELIEF CHURCH. See UNITED PRESBYTERIAN CHURCH.

RELIEVING OFFICER is a person appointed in an English union or large parish to administer relief, or rather to inquire into the title of destitute persons to be relieved by such union or parish. He is appointed by the Board of Guardians, and his duty is to receive all applications for relief, to inquire into the truth of the facts alleged by the paupers as to their place of settlement, their state of health, ability to work, and the state of their family. In discharging this duty, he requires to visit the house where the pauper lives, to relieve cases of urgent necessity, &c., and to keep a list of all these paupers, and enter what is done with them in his book.

RELIE'VO. See ALTO-RELIEVO.

RELIGION as an element in the character of a man must be distinguished from religion as a system of beliefs, doctrines, and rites. The former—religion in its psychological aspect, or subjectively considered—is specially in the province of the philosophy of religion; the various forms of faith, historically and objectively treated, constitute the field of comparative religion. But though these branches are to be distinguished, neither can be fairly treated apart from the other; and both are included under the Science of Religion, if science it can as yet be called.

The inquiries which collectively constitute the Philosophy of Religion have been prosecuted most zealously since Kant gave new life to philosophical speculation; but since then, as before, conclusions have widely differed as to what is the essence of religion as a factor in human thought and character. By some, religion has been regarded as identical with morality; others have treated it as mainly, if not solely, intellectual adhesion to a certain body of dogmas; while its emotional nature has seldom wanted assertors.

Kant made religion a moral development, and defined it as 'the recognition of all our duties as divine commands,' as of eternal obligation, and not as merely imposed by authority or custom. Fichte denied the practical character of religion, and identified it, at least in some of his writings, with a higher form of speculative knowledge, 'which makes man clear to himself, and answers the highest questions that can be asked.' Elsewhere in Fichte, it is the recognition of God as manifested in us. Schleiermacher, one of the greatest names in the history of modern theology and religious speculation, expressly denied that religion was either theoretical knowledge or practical, ethical activity, or any mixture of either, and relegated it to the sphere of feeling, of emotion. His most famous definition, more one-sided than his view of religion ultimately was, made it consist in our consciousness of absolute dependence on something which, though it determines us, we cannot determine in turn. Hegel, protesting vehemently against this view, proclaimed religion to be perfect freedom; and taught that, passing through various stages, it is finally the divine spirit becoming conscious of himself through the finite spirit—again an intellectual process. Comte glorified religion, the religion of humanity, as reverence for and worship of the spirit of mankind. Feuerbach degraded religion to an outcome of self-love and egoism.

Religion, on its subjective side, is doubtless in its essence mainly of the nature of emotion; but it is not merely emotion. In it are combined awe, reverence, hope, fear, love; but these feelings point to an object which in all developed religions is the unseen, the infinite, God. With the feelings cardinal to the existence of religion are accordingly bound up certain beliefs; as to the nature of God, our relation to Him and his relation to the world and history, views of the nature of the soul, of the creation of man, of providence. Also, there are associated with these beliefs modes of worship, or forms of ritual for expressing man's reverence. Thus religion, as piety, faith, connects itself with creed and ritual, and assumes objective shape as a system of doctrine, in adhesion to which multitudes may unite. Beliefs reverently and confidently cherished react on practical life, and become a guide to conduct. Religion, accordingly, influences man as intellectual, ethical, and emotional, and, if really cherished, has a correspondingly deep hold on his life.

Origin and Growth of Religion and Religious Systems.—Religion is as old as human history or human language; and there is good reason for saying that it is universal, though there are and have been individual atheists and communities with little sense of religion. The temperament of certain races renders them more highly susceptible of profound religious impressions than others, and more open to religious impulses, just as some individuals have a deeper fund of religious feeling, of piety, and reverence, than their neighbors.

Most of the great religions profess to have been directly revealed to man by inspiration from God, and are thus miraculously communicated to man, who has only to hear, understand, and obey. Thus man himself contributes nothing to the religious system, which may, however, be revealed to him only by degrees, and be apprehended fully only by the remote descendants of those to whom its first truths were made known. The revelation may be completed within a certain period (as Protestants hold of their faith), or there may be a measure of permanent and progressive revelation (as Catholics believe).

On the other hand, many inquirers seek the origin of religion within man himself; nor is it necessary that those who do so should deny the truth of all religions, or reject belief in an almighty and infinite God. Acceptance of a naturalistic theory of the growth of religion does not by any means imply negation of the supernatural, or the falseness of truths as to God naturally developed. Those who believe their own faith to have been given from on high, will regard all other faiths as merely human developments more or less completely false.

It has been not unusual to regard the very lowest form of religion as the first beginning of any and every religion, or of all religions save that of the theorizer. Thus *fetichism* would be the original root of all or most religions, and be followed by the various forms of polytheism, higher and lower. Nature worship is an earlier form of belief than that in which the gods are regarded as persons with minds, wills, characters, perchance bodies, more or less like those of men. The richest mythologies belong to the anthropomorphic stage. From some polytheistic creeds, again, monotheistic faiths have sprung. Comte alleges that all knowledge has passed through three stages: one religious or theological, in which unseen causes are regarded as divine; a philosophical stage; and the final or positive one.

Again, careful investigators of old faiths such as Max Müller, not only assert that no religion consists of fetichism only, but hold fetichism to be not a primary, but a degraded form of faith; for there certainly is retrogression in religion at certain times amongst certain peoples, as well as development. Guided by the old Indian faith and its records, Max Müller teaches that religion, which he regards as the faculty for the apprehension of the infinite, was never entirely sensuous. By the use of his senses, man was brought into contact with incalculable powers, and was moved to awe by the non-finite, the infinite. This infinite power it saw first—not in tangible objects, as stones, shells, &c.—but in what he intelligibly enough calls semi-tangible, as mountains, trees, rivers; and later, in wholly intangible ob-

jects, as the sky, the stars, the sun, the moon, the dawn. From worshiping such powers of nature, men later came to worship invisible deities, manifesting various powers. Ideas of law, virtue, infinitude, and immortality were awakened. The belief in *Devas*, or single supreme beings, which Müller calls *Henotheism*, led naturally to belief in some one God presiding over the other gods, now no longer regarded as supreme, to *Polytheism;* or to something like *Monotheism*, a belief in one God, excluding the possibility of other gods. In some, the disbelief in the many gods led to atheism; or in others, to Buddhism. This development, Max Müller thinks, is well marked in the thought of India. Amongst other races the growth of belief has doubtless been to a greater or less extent different; but the case of India is, for various reasons, specially suggestive. It is still debated whether the word *religion* is to be derived, with Cicero, from *relegere*, to read again; or with Tertullian, from *religare*, to bind.

The Faiths of the World.—The principal creeds and forms of faith are separately treated in this work; the more important articles are here noted, that the reader may refer for further information. On the non-Christian religions, ancient as well as modern, there are the relevant paragraphs in the articles on Assyria, Egypt, India, Japan, &c.; independent articles—Vedas, Sanskrit Literature, Sikhs, Jainas, Zoroaster, Zend Avesta, Parsees; Roman Religion, Greek Religion; Scandinavian Mythology; Buddhism, Confucius; Laou-tsze; Mohammedanism, &c. For Christian systems—Christianity; Roman Catholic Church; Greek Church; Anglo-Catholic Church; Presbyterianism; Lutherans; Church of Scotland; Baptists; Methodists; Universalists; Unitarians; and many other articles referred to in these or suggested by them. The relation to Christianity of Mormons, Shakers, and followers of Joanna Southcott, may be debated. On subjects of religious speculation are the articles on Fetichism, Anthropomorphism, Pantheism, Materialism, Secularism, Myth and Mythology. The numerical relations of the adherents of the several faiths in various countries is indicated, when possible, in the article on each country.

The following table shows approximately the numbers professing the chief faiths of the world:

Buddhists	500,000,000
Hindus	160,000,000
Mohammedans	155,000,000
Confucians	80,000,000
Adherents of Shintoism (in Japan)	14,000,000
Jews	7,000,000
Christians—	
Roman Catholics	152,000,000
Greek Catholics	75,000,000
Other Christians	100,000 000
Not included in the a[illegible]ve	157,000,000
	1,400,000,000

In Great Britain places of meeting for religious worship have been certified to the Registrar-general on behalf of very nearly 170 different sects. The U. S. census of 1880 takes account of the organization of 27 religious bodies. The following table shows the numerical strength of the principal Protestant churches:

Lutherans	35,000,000	Universalists	650,000
Anglican Church	15,000,000	Quakers	200,000
Calvinists	15,000,000	Unitarians	185,000
Methodists	5,000,000	Mormons	180,000
Presbyterians	4,000,000	Moravians	150,000
Baptists	2,560,000	Swedenborgians	12,000
Congregationalists	1,500,000		

See Pfleiderer's *Die Religion, ihr Wesen und ihre Geschichte* (2d ed. 1878); Max Müller's *Chips from a German Workshop, Introduction to the Science of Religion*, and *Lectures on the Origin and Growth of Religion.*

RELIGION, OFFENCES AGAINST. See BRAWLING IN CHURCHES. In Scotland, the crime of blasphemy is sometimes described as the crime of treason or lese-majesty against God, which consists in denying His being and attributes, and uttering impious and profane things against God, or the authority of the Holy Scriptures. The crime was more rigorously punished by the old statutes of Scotland than by those of England; but the statute 6 Geo. IV. c. 47 declared it expedient that the punishment should be the same, and enacted accordingly. Profanity is in Scotland treated as an offence lower in degree than blasphemy, and includes profane swearing, which is punishable with a fine by justices of the peace; scoffing at religion, or the public mocking or contempt of religion, which is punishable in the same manner, and the disturbance of public worship. The first statute providing against disturbances of public worship was dated 1551, which inflicted a fine; but a later statute of 1587, added escheat of movables as part of the punishment, and applied the penalty to all cases of raising a fray or disturbance in the kirkyard equally as in the kirk, to the troubling or dispersing of the people assembled there for religious purposes.

RELIGIOUS TRACT SOCIETY, a Society for the promotion of religion by the publication and circulation of religious tracts and small books. By far the most important Religious Tract Society in the world is that of London, which was founded in 1799. There are now, indeed, numerous Religious Tract Societies in different parts of the world, comparatively limited in their field of operations; this great Society reckoning many of them as its branches and auxiliaries. The advantage likely to accrue to the cause of religious truth by the diffusion of tracts and pamphlets, was thoroughly appreciated at the time of the Reformation, but no society was formed for the purpose. In the 17th c., several traces are found of associations for printing and promoting the sale of religious works, but none of them seems to have existed long, or to have been intended for permanence. The English 'Society for Promoting Knowledge,' founded in 1701, avowed, for one of its objects, 'to disperse, both at home and abroad, Bibles and tracts of religion.' In 1750, a society was formed in England called 'The Society for Promoting Religious Knowledge among the Poor,' not, like the former, confined to the Church of England, but embracing Christians of all denominations, which published many tracts and books; and shortly after, similar societies were founded in Edinburgh and Glasgow, which, however, were of brief existence. The design of the Religious Tract Society originated with Mr. Burder, a minister at Coventry, and amongst its founders were Rowland Hill, Matthew Wilkes, and other ministers eminent in their day. It was founded on occasion of the annual meeting of the London Missionary Society. Its beginnings were humble, but it soon expanded; its income, from sales of publications and contributions of benevolence, including a small balance from the previous year, amounted in 1881 to £198,934; and the total expenditure, in trade and grant departments, to £196,426. In the same year, 664 new publications were issued, 175 of which were tracts; the issue of books, tracts, &c., since the foundation of the Society until 1881, was 2,099,210,520. Its operations have extended over all quarters of the world, and it has issued books and tracts in 140 languages and dialects. It has produced many new works, reprints, and abridgments, and has half-a-dozen thriving periodicals.

Objections are sometimes strongly urged against its mode of operations, as interfering with the natural course of the book-trade, and checking free commercial enterprise; to which it has been always replied, that the diffusion of good and cheap books has increased the demand for them, and that the influence of the Society has been favorable and not unfavorable to the book-trade in general. It is impossible, however, to accept this as any proper answer to the objections in question. For competition in trade is a sacred principle not lightly to be interfered with, and it is sufficient to say that certain members of the general publishing business complain of being encountered by a system of production which leaves them no hope of competing successfully with the Society. That tracts distinctly religious may be rendered a valuable engine of spiritual and social advancement is not to be disputed; and those impressed with the conviction cannot but regret that among the immense mass of tracts issued in Great Britain and the United States, not a few, owing to the exaggerated and mistaken views they present, not only of the facts of life but of the teaching of scripture, are perhaps more calculated to damage than promote the cause they are meant to serve.

RE'LIQUARY, a case or box to contain relics. They are made of all kinds of materials, such as wood, iron, stone, ivory, silver, &c., and are frequently ornamented with costly jewels. Shrines are of the same description. That of the 'Three Kings,' at Cologne, has jewels valued at £240,000.

REMAI'NDER is a term much used in the law of England. Thus, if the owner of the fee-simple, or freehold of lands, give them by will or deed to A for life, and after his decease to B and his heirs, the interest of B is called the remainder, because, after deducting A's life estate, all that remains belongs to B. A remainder is distinguished from a reversion in this, that in the latter case, the remainder secures to the owner of the estate himself, and so it is called, in that instance, a reversion instead of a remainder. A contingent remainder is too technical a term to be popularly explained, though it plays an important part in the law of real property in England. It is an estate which may or may not ever become vested or enjoyable.

REMBA'NG, a residency of Java, has an area of 2650 sq. m. and (Dec. 31, 1873) a pop. of 925,508, including 665 Europeans and 15,402 Chinese. There are extensive forests, containing fine timber, the haunts of wild cattle, swine, and three species of tiger. The products are chiefly coco-nuts, coffee, sugar, tobacco, and cotton. Boat-building, fishing, weaving, making earthenware and paper, gold and silver work, are occupations.—R. the capital, is a seaport. Pop. 12,000. There is a government school an institute for girls, and a Protestant church.

REMBRANDT HERMANSZOON, commonly called REMBRANDT VAN RHYN, was the son of a miller, Herman Gerritsz van Rhyn, whose house (where the painter was born) and mill were situated on an arm of the Rhine at Leyden. R. was born either on 15th July 1606, or in 1608. The former date rests on the authority of the *Description of Leyden*, published in 1641, by Orlers, burgomaster of that town, under whose custody, along with other registers of the city, were those of the registers of baptism, since lost. The latter date rests on the painter's marriage-certificate, lately discovered, dated 10th June 1634, in which R. is stated to be aged 26, and thus the year of his birth 1608. He attended for a short time the Latin School at Leyden; and after studying art three years under Jacob van Swanenburg, and for a very limited period under Pieter Lastman at Amsterdam, and Jacob Pinas at Haarlem, he returned home, and devoted himself to the study of nature. His works now attracted some attention; and about the year 1630, he was encouraged to establish himself at Amsterdam, where he soon entered on a most successful career, and executed numerous works—portraits, landscapes, historical and *genre* subjects, and those wondrous etchings, numbering above 360, which have served almost as much as his paintings to raise his reputation so high.

R. holds the chief place in the Dutch school; his power and originality are exemplified in almost every branch of art; and as examples of composition, expression, color, and light and shade, his works rank with those of the greatest artists. He had numerous pupils, many of whom, such as Gerard Dow, G. Flinck, F. Bol, N. Maas, P. de Koning, and Vanden Eeckhout, were distinguished artists. R. spent his large gains in the indulgence of a taste for works of art, arms, and objects of *vertù*, as is proved by an inventory of his effects, extracted from the registers of the Insolvents' Court at Amsterdam, for he got into difficulties, partly from his expensive habits, and partly on account of claims by the tutors of his son, after the death of his first wife. He married a second time, and left two children; his son Titus, by his first wife, predeceased him. Many interesting matters connected with the history of this great painter have been brought to light, and published so lately as 1853, by Dr. P. Scheltema, Keeper of Records at Amsterdam. The date of the painter's decease was a matter of doubt; but among other documents discovered by this author, the following extract, from the Register of Burials of the city of Amsterdam, proves that he was interred in the Westerkerk (West Church) on 8th October 1669: 'Deynsdach, 8th October 1669, Rembrant van Rijn, Schilder, op de Rosegraacht, teghenover het Doolhof. Laet na 2 Kynders.'—('This day, 8th October 1669 [was buried] Rembrandt van Rhyn, Painter, on the Rosegraacht [Rose-Canal], opposite the Labyrinth. He leaves two children.')

REMIREMONT, a small town of France, in the department of Vosges, stands on the left bank of the Moselle, 17 miles south-east of Epinal. Here, two abbeys, founded in 620, were destroyed in the 10th c., but afterwards rebuilt. Of these, the more important was for lady canonesses. Its abbess was a princess of the empire, and those over whom she presided were all descended from families which had been noble for at least four generations. The remains of the abbey are the finest buildings in the town. In the Mairie is a public library of 8000 vols.; cotton goods, leather, and iron-ware are manufactured. R. is the great mart for the neighboring mountain districts. Pop. (1872) 6014.

REMI'SSIO INJU'RIÆ, in Scotch Law, denotes a forgiveness of an injury, and it is set up in answer to an action of divorce for adultery. Forgiveness implies that the party knew of the injury, and acted as if it had never happened; and it is proved by words or acts, such as cohabitation. In English law, it is called condonation. In Scotch law, remission is an extinguishment of a crime by pardon or by act of parliament, but it does not prevent a private party recovering damages.

REMI'TTENT FEVER is one of the three varieties of fever arising from malaria or marsh-poison—the two others being Intermittent Fever, or Ague (q. v.), and Yellow Fever. In its milder forms, it scarcely differs from severe intermittent fever; while in its more serious form, it may approximate closely to yellow fever. As the nature of the poison on which it depends is sufficiently noticed in the article MIASMA, we shall at once proceed to describe the most characteristic symptoms. The attack may be either sudden or preceded by languor, chilliness, and a general feeling of *malaria*. Then comes a cold stage, similar to that occurring in ague, and usually of short duration. This is followed by a hot stage, in which the symptoms are commonly far more intense than those exhibited in the worst forms of ague. Giddiness proceeding to delirium is not uncommon, and is a bad symptom; while, in other cases, drowsiness or lethargy is one of the most marked symptoms. There is often great tenderness or pain in the region of the stomach, and vomiting—the vomited matter frequently containing bile or blood. A remission of these symptoms occurs, in mild cases, in six or seven hours; but, in severe cases, the paroxysm may continue for 24 hours or longer. The remission is sometimes, but not always, accompanied with sweating. The duration of the remission is as varied as that of the paroxysm, varying from two or three to thirty hours, or even longer. The fever then returns with increased severity, and without any cold stage; and then the paroxysms and remissions proceed, most commonly according to no recognizable law, till the case terminates either fatally or in convalescence. In favorable cases, convalescence is usually established in about a week. The severer forms of this fever are often accompanied with more or less jaundice, and hence the disease has received the name of bilious remittent fever. It is also known as jungle fever, lake fever (from its prevalence on the border of the great American lakes); and the African, Bengal, Levant, Walcheren, and other similar local fevers, are merely synonyms of this disease. In England, the disease is very rare; and when it occurs, it is usually mild. The disease is most severe in Southern Asia, Western Africa, Central America, and the West India Islands.

The first object of treatment is to reduce the circulation during the hot stage. This is done by bleeding, followed by a dose of five grains each of calomel and James's powder, and, after an interval of three or four hours, by a sharp cathartic—as, for instance, the ordinary black draught. On the morning of the following day, the remission will probably be more complete, when quinine, either alone or in combination with the purgative mixture, should be freely and repeatedly administered. A mixture of antimonial wine with acetate of potash should also be given every two or three hours, so as to soften the skin, and increase the action of the kidneys. Sir Ranald Martin—our highest authority in relation to tropical diseases—has directed attention to the fact, that the patient must be carefully watched during the period of convalescence. A timely removal from all malarious influence, by a change of climate or a sea-voyage, is of the highest importance, and is more likely than any other means to prevent fatal relapses into other forms of fever, or into dysentery, which so frequently occur to our troops at stations where miasmatic influences are rife. Although the above sketch of treatment is applicable in most cases, there are some forms of this fever in which blood-letting cannot be borne; and almost every epidemic fever of this kind requires special modifications of treatment.

The following data, extracted from a table drawn up by Sir Alexander Tulloch, will give some idea of the frequency of this disease and the variations in intensity:

	Period of Observation.	Aggregate Strength.	Number Attacked.	Died.	Ratio of Deaths to Cases Attacked.
Jamaica	20 years,	51,567	38.393	5114	1 to 8
Gibraltar	19 "	60,269	1,522	423	1 " 3⅗
Ionian Islands	20 "	70,293	6.934	623	1 " 11
Ceylon	20 "	42,978	4.643	868	1 " 5½
Madras	5 "	31,627	1,139	54	1 " 21
Bengal	5 "	38.136	1.311	89	1 " 14¾
W. Africa	18 "	1,843	1.601	739	1 " 2

REMO'NSTRANTS. See ARMINIUS.

RE'MORA, or SUCKING-FISH (*Echeneis*), a genus of fishes which Cuvier placed among the *Discoboli* (q. v.), but which Müller assigns to the order *Anacanths*, and regards as constituting an entire family, *Echeneidæ*. Their chief relation to the *Discoboli*, indeed, is in the possession of a sucker, by which to affix themselves to objects of various kinds; but the sucker itself is very different. The remoras have an elongated body, covered with very small scales; one soft-rayed dorsal fin, situated above the anal fin; the head flattened, and covered with an elongated disc extending back beyond it, which is the sucker; the mouth large, with numerous small recurved teeth on both jaws, the vomer, and the tongue. The sucker-disc exhibits numerous transverse cartilaginous laminæ directed backwards, and has a free flexible broad margin. These laminæ are formed by modification of the spinous processes of a first dorsal fin. They are moved simultaneously by sets of muscles raising or depressing them, and when they are raised after the margin of the disc has been closely applied to a smooth surface, a vacuum is created; and so powerful is this apparatus, that great weights may be dragged by a R.; whilst it obstinately refuses to let go its hold, and will even submit to be torn in pieces before it does so.

The Common R. of the Mediterranean, and of the ancients, is a small fish, seldom more than eight inches long, of a dusky-brown color. It is found in the Atlantic, and occasionally as far north as the British coast. It is frequently seen among the other fishes following ships, and often attaches itself by its suckers to some other fish, even of a kind that would make haste to devour it if it could be reached—an instance of which once occurred on

the British coast, a R. being taken affixed to a cod—often also to the rudder or bottom of a ship. The ancients imagined that it had power to impede or arrest the course of a ship, a fable which continued to be credited till recent times. Thus, it was alleged, was Anthony's ship detained from getting soon enough into action in the memorable and decisive battle of Actium. Of what use its power of adhesion is to the R., is a matter of mere conjecture. The R. is very palatable. There are about ten known species, some of the tropical ones much larger than the Common Remora. One of them is said, on the authority of Commerson, to be used on the coasts of Mozambique for the curious purpose of catching turtles. A ring is fixed round its tail, with a long cord, and the fish, placed in a vessel of sea-water; is carried out in a boat; the fishermen row gently towards a sleeping turtle, and throw the R. towards it, which seldom fails immediately to affix itself, when the cord is drawn in, and the turtle becomes an easy prey.

REMOULADE, a term in Cookery for a fine kind of salad-dressing, consisting of the yolks of two eggs, boiled hard; flour of mustard, about a teaspoonful, rubbed up with three or four tablespoonfuls of oil; when they are thoroughly incorporated, add two tablespoonfuls of vinegar and a little pepper, and other flavoring materials according to taste. It is much used in making the salad called Mayonnaise.

REMO'VAL OF GOODS by a tenant of a house to prevent the landlord distraining or seizing them in payment of rent, is attended with this consequence: if the rent is already due, and not merely current rent, then, if a tenant fraudulently or clandestinely remove the goods from the premises, the landlord may, within 30 days thereafter, take and seize these goods wherever they are found, and sell them, by way of payment of his rent. If the tenant remove the goods the day before the rent becomes due, the landlord cannot so follow the goods. Whoever assists the tenant to remove his goods frauduently, forfeits to the landlord double the value of the goods removed.

REMOVAL OF PAUPERS, in the law of England, is the technical term applied to the compulsory removal of paupers from a parish in which they have become destitute, to the parish or union settlement, and which, therefore, is bound to maintain them. The right of parochial officers to remove paupers in such circumstances has long been considered as one of doubtful wisdom, and the propriety of continuing it has latterly been much discussed. As the law stands, wherever a person becomes destitute in a parish in which he was not born, or in which he has not acquired a Settlement (q. v.), as it is called, the overseers may apply to a justice of the peace at once to remove him to his own parish. In such a case, notice must be given by the removing parish to the parish of settlement, so that the latter may oppose the proceeding; and this gives rise to frequent litigation, for the point turns on the antecedent history of the pauper, or it may be of the pauper's father or grandfather. The right of removing paupers is as old as 13 Charles II.

At first, it was in the power of the overseers, whenever a poor person came into the parish who was likely to become chargeable, to apply for a warrant to remove him after forty days. But this was thought too great a restriction on the natural liberty of poor persons to go where they like in the hope of bettering themselves, and the power of removal was restricted to cases where they have already become actually destitute, and apply for relief. Even that limitation was thought to be too oppressive on the poor man; and by a statute of 1846, whenever a poor man had lived in any parish, where he had no settlement previously, for five years, it was not allowed to remove him thereafter at all, but the expense of his maintenance fell upon the common fund of the union. By a later statute of 1865, this period was reduced to one year, and he is now irremovable not only if he has lived one year in a parish not his own, but in any one union; so that now the removability of paupers is greatly checked, and made less oppressive.

REMOVING OF TENANTS, in Scotch Law, is the giving up of possession by a tenant after the expiry of his lease or term. There must have been a previous notice to quit, or warning, before a tenant can be compelled to remove, and this notice is forty days before Whitsunday; i. e., before 15th May. If there is no express stipulation in the lease binding the tenant to remove at the end of the lease, then the landlord must give warning, which he does by summons of removing in the Sheriff Court; and if the tenant do not punctually remove, decree of removal may be obtained. If there is a stipulation to remove, then that is equivalent to a decree of removing, and a sheriff-officer, with a written authority from the landlord, can remove the tenant by force. In England, no notice to quit is necessary on either side if the lease was for a definite term; but if it was indefinite, then it is treated as a lease from year to year, and half a year's notice to quit must be given by the landlord. If, however, the tenant wrongfully refuse to quit, there is in most cases no summary mode of ejecting him, and an action of ejectment is necessary.

RE'MSCHEID, a manufacturing town of Prussia, occupies a height of 1110 feet above sea-level, in the government of Düsseldorf, and 18 miles east-south-east of the city of that name. Originally a villa, it was in possession of a church as early as 1189. It contained several iron-foundries in 1580, in which pig-iron was worked into bars by hand. Its iron trade and manufactures were advanced by the immigration of numbers of artisan Refugees (q. v.). It carries on extensive manufactures of iron wares, cutlery, &c., which are exported to all parts of the world. Pop. (1871) 22,017; (1880) 30,029.

RÉMUSAT, Charles Comte de, a French philosopher and politician, son of Auguste Laurent, Comte de Remusat, a Provençal gentleman of some note, who held various public offices during the first Empire and after the Restoration, was born at Paris, 14th March 1797, and studied with brilliant success at the Lycée Napoléon. He made his political *début* in 1818 as a Doctrinaire journalist, allying himself closely with Guizot, who, he confessed, had exercised a greater influence on the formation of his opinions than any other; but he subsequently withdrew from this connection, and became more independently liberal, though he always remained temperate and prudent in his views. Among his earlier political essays, the most important are *Sur la Responsabilité des Ministères; Sur la Liberté de la Presse; Sur la Procédure par Jurés en Matière Criminelle* (1820); and *Sur les Amendements à la Loi des Elections* (1820). On the establishment of the *Globe* in 1824, R. became one of its most indefatigable contributors, and his name appears in the list of journalists who signed the protest against the fatal 'ordonnances' of the minister Polignac, which brought about the July revolution.

After 1830, R. entered the French chambers as deputy of Muret in the Haute-Garonne, representing it till 1848. He supported the ministry of Casimir Périer, was for a brief period Under-secretary of State (1836) in that of Comte Molé; and in 1840, when the government passed into the hands of Thiers, R. was made Minister of the Interior, but soon resigned the office. After the flight of Louis Philippe, he continued a member of the Constituent and Legislative Assemblies, and was a warm supporter of the party of order. He was exiled after the *coup d'état* of Louis Napoleon, but subsequently received permission to return to France. He devoted himself to literary and scientific studies, till in August 1871, M. Thiers called him to hold the portfolio of Foreign Affairs, which he retained until 1873. He died June 6, 1875. He was long a well-known contributor to the *Revue des Deux Mondes*. Among his writings are his *Essais de Philosophie* (Paris, 2 vols. 1842); *Abelard* (2 vols. 1845); *Passé et Présent* (2 vols. 1847); *Angleterre au XVIII. Siècle* (1856); *Bacon* (1858); *Hartley* (1874); *Histoire de la Philosophie Anglaise de Bacon à Locke* (1875); and his philosophical drama, *Abélard* (1877).

REMUSAT, Jean Pierre Abel, a distinguished Chinese scholar, was born at Paris, 5th September 1788, studied medicine and took his diploma in 1813; but as early as 1811, had published an *Essai sur la Langue et la Littérature Chinoises*, the fruit of five years' arduous work. In 1813, the conscription seized him, but, instead of being compelled to serve as a common soldier, he was appointed assistant-surgeon in the Paris military hospitals, and was subsequently intrusted with the charge of fever-patients at the hospital Montaigu. In the midst of his arduous and harassing professional duties, he found time to prepare for the press his *Uranographie Mongole*, and *Dissertation sur la Nature Monosyllabique attribuée communément à la Langue Chinoise*. At last, however, the day came when he was at liberty to devote himself entirely to Sinological studies.

The Abbé Montesquiou, Minister of the Interior during the first Restoration of the Bourbons, instituted a chair of Chinese at the Collège de France, and R. was named professor, 9th November 1814. He delivered a splendid inaugural address in January 1815, an analysis of which appeared in the *Moniteur* of 1st February, executed by Silvestre de Sacy himself. Of the numerous works that he wrote subsequent to this period, we may mention *Recherches sur les Langues Tartares* (1820), a work in some sort preparatory to his *Eléments de la Grammaire Chinoise* (1822), the grandest monument of the vast Sinological erudition and labor of Remusat. Another of his important philological productions was his *Recherches sur l'Origine et la Formation de l'Ecriture Chinoise* (1827). 'Although acquainted,' says M. Walckenaer, 'with several of the most difficult languages of Asia, and with almost all the ancient and modern languages of Europe, he regarded such knowledge as only a means to an end. . . . . In a crowd of treatises, dissertations, critical analyses, and translations, either published as separate works or inserted in *Mémoires*, he has endeavored to embrace everything relating to the nations whom he proposed to make known. Religious beliefs, philosophical systems, natural history, geography, political revolutions, the origins of races, biography, literature, manners, habits, and customs—he

has treated all in an equally masterly style.' Among the works of R. which illustrate this *éloge* of M. Walckenaer are his *Etude Historique sur la Médecine des Chinois; Tableau Complet des Connaissances des Chinois en Histoire Naturelle* (unfinished); *Sur la Pierre Iu* (a curiously learned disquisiton on a crowd of historical questions and religious rites); *Notice sur la Chine et ses Habitants* (in which the author treats of the extent, administration, manners, commerce, &c., of China); *Sur l'Extension de l'Empire Chinois en Occident depuis le Premier Siècle avant Jésus-Christ jusqu'à nos Jours.* R. was the first to make known in Europe the life and opinions of the philosopher Laou-Tsze, head of the religious sect *Taou-tsé*, and wrote on the history of Buddhism. In 1818, R. became one of the editors of the *Journal des Savants;* in 1822, he founded the *Société Asiatique* of Paris; and in 1824, he was appointed curator of the Oriental Department in the Bibliothèque Royale. He died of cholera at Paris, 4th June 1832, at the early age of 44.

RÉMUSAT, MADAME DE, the mother of Count Charles de R. above mentioned, was born at Paris, 5th Jan., 1780. Her maiden name was Gravier de Vergennes. In 1796, she married the Count de R., who held various important posts under Napoleon. In 1803, Madame de R., who was remarkable for wit and ability, became maid of honor to Josephine, and remained in her service till the divorce. She left very interesting and valuable *Mémoires* of her experiences at court, and her impressions of Napoleon and his surroundings, which were published in 1879-and 1880 (2 vols.).

REMY, or REMI, ST. (Lat. *Remigius*), a saint of the Roman Catholic Church, was born of a noble family of Laon, in Picardy, in the year 438 or 439. He was appointed against his will, at the early age of 22, to the bishopric of Rheims, and his episcopate is memorable for the conversion of Clovis, who was baptized by Remy. It was on occasion of this ceremony that, contrasting our Lord and his cross with the idols whom Clovis had hitherto adored, R. used the words which afterwards became almost epigrammatic: 'Adore henceforward what thou hast hitherto burned, and burn that which thou hast adored.' R. lived to see Gaul almost entirely christianized, and died in his 93d or 94th year in 533. Some of his letters are preserved in the *Bibliotheca Patrum*, as also two documents under the title of *Testamenta*, the genuineness of which has been the subject of a curious controversy.

RENAI'SSANCE, the name given to the style of art, especially architecture, in Europe, which succeeded the Gothic, and preceded the rigid copyism of the classic revival in the first half of the present century. Under the heading ITALIAN ARCHITECTURE we have traced the rise and progress of the Renaissance in the country of its birth. The spread of classical literature during the 15th and 16th centuries created a taste for classic architecture in every country in Europe. France, from her proximity and constant intercourse with Italy, was the first to introduce the new style north of the Alps. Francis I. invited Italian artists to his court during the first half of the 16th century. The most distinguished of these were Leonardo da Vinci, Benvenuto Cellini, Primaticcio, and Serlio. These artists introduced Italian details, and native architects applied them to the old forms to which they were accustomed, and which suited the purposes of their buildings, and thus originated a style similar to, though diverse from, that of Italy.

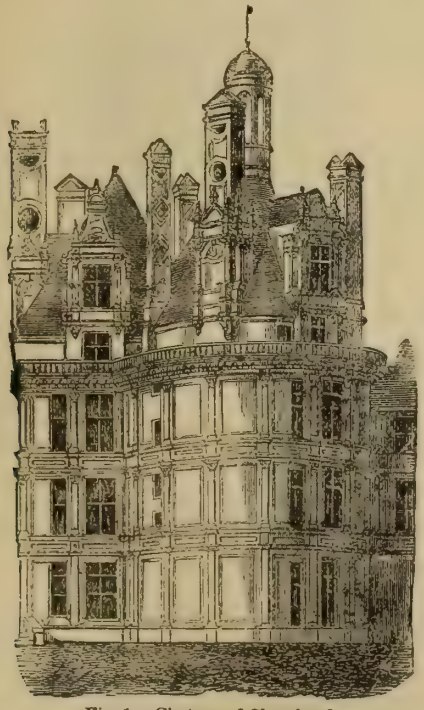


Fig. 1.—Chateau of Chambord.

The Italian buildings were chiefly churches, St. Peter's being the great model. In France (as in the other countries north of the Alps), the stock of churches was more than was required. The grand domestic buildings of Florence and Rome were actually needed for defence, and were founded in design on the old mediæval castles, which the nobles occupied within the cities. The domestic architecture of France is rather taken from the luxurious residences of the monks, and although very graceful in outline and in detail, its buildings want the force and grandeur of the Italian palaces.

In the French Renaissance, so much are the old Gothic forms and outline preserved, that the buildings of Francis I. might, at a short distance, be mistaken for Gothic designs, although, on nearer approach, all the details are found to be imitated from the classic. Such are the palaces of Chambord and Chenonceaux on the Loire, Fontainebleau, and many others. The churches of this period are the same in their principles of design. Gothic forms and construction are everywhere preserved, while the detail is as near classic as the designers could make it. St. Eustache, in Paris, is one of the finest examples of this transitional style.

From the middle of the 16th to the middle of the 17th c., a style prevailed which may be said to have combined all the defects of the Renaissance. It was neither classic nor Gothic. It had no principles of construction or decoration save the individual caprice of the designer. This style, usually known as that of the time of Henry IV., is the basest which has been adopted in France, and has no redeeming qualities. It may be distinguished by the constant use of meaningless pilasters, broken entablatures, curved, and contorted cornices, architraves, &c., all applied so as to conceal rather than to mark and dignify the real uses of the features of the buildings. The Tuileries, wrecked by the Commune, showed all these defects. From this debased and meaningless style, architecture gradually recovered, and during the 18th c., a style more becoming the dignity and importance of the *Grand Monarque* was introduced. The classic element now began to prevail, to the entire exclusion of all trace of the old Gothic forms. Many very large palaces are built in this style;

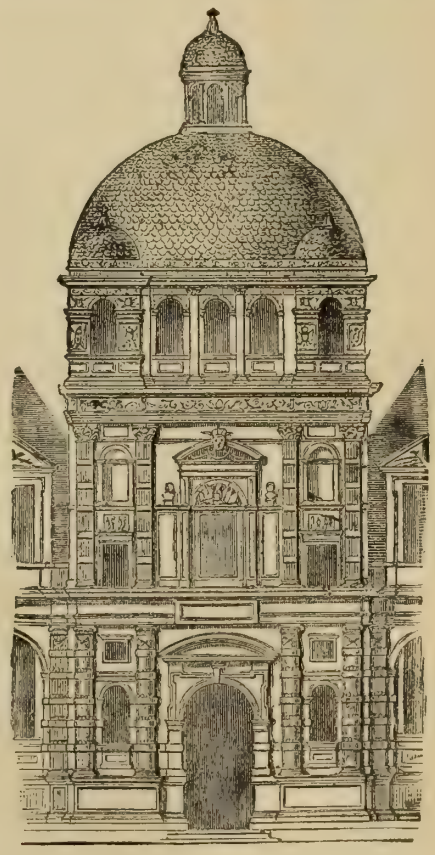


Fig. 2.—Central Pavilion of the Tuileries,
As designed by De Lorme (from Mariette).

but, although grand from their size, and striking from their richness and luxuriance, they are frequently tame and uninteresting as works of art. The palace of Versailles (q. v.) is the most prominent example. The two Mansards, one of whom designed Versailles, had great opportunities during this extravagant epoch. Their invention of giving a row of separate houses the appearance of one palace, which has ever since saved architects a world of trouble, was one of the most fatal blows which true street-architecture could have received.

The east front of the Louvre, designed by Perrault, is one of the best examples of the style of the age. Many elegant private hôtels and houses in Paris were erected at this period. The most striking peculiarity of the style of Louis XIV. is the ornament then used, called Rococo (q. v.).

The classic Renaissance was completed in the beginning of the present century by the literal copyism of ancient buildings. Hitherto, architects had attempted to apply classic architecture to the requirements of modern times; now they tried to make modern wants conform to ancient architecture. In the Madeleine, for instance, a pure peripteral temple is taken as the object to be reproduced, and the architect has then to see how he can arrange a Christian church inside it! Many buildings erected during the time of the Empire are no doubt very impressive, with noble porticoes and broad blank walls; but they are in many respects mere shams; attempts to make the religious buildings of the Greeks and Romans serve for the conveniences and requirements of the 19th century. This has been found an impossibility—people have rebelled against houses where the window-light had to be sacrificed to the reproduction of an ancient portico, and in which the height of the stories, the arrangement of the doors, windows, and, in fact, all the features were cramped, and many destroyed. The result has been that this cold and servile copyism is now entirely abandoned, and the French are working out a free kind of Renaissance of their own, which promises well for the future; and is, at the present moment, as the streets of Paris testify, the liveliest and most appropriate style in use for modern street-architecture.

In Spain, the Renaissance style took early root, and from the richness of that country at the time, many fine buildings were erected; but it soon yielded to the cold and heavy 'Greco-Romano' style, and that was followed by extravagances of style and ornament more absurd than any of the reign of Louis XIV. The later Renaissance of Spain was much influenced by the remnants of Saracenic art which everywhere abound in that country.

In England, as in the other countries of Europe, classic art accompanied the classic literature of the period; but, being at a distance from the fountain-head, it was long before the native Gothic style gave place to the classic Renaissance. It was more than a century after the foundation of St. Peter's that Henry VIII. brought over two foreign artists—John of Padua and Havenius of Cleves—to introduce the new style. Of their works, we have many early examples at Cambridge and Oxford, in the latter half of the 16th century.

Longleat, Holmby, Wallaton, and many other county mansions, built towards the end of the 16th c., are fine examples of how the new style was gradually introduced.

The course of the Renaissance in England was similar to its progress in France; it was even slower. Little classical feeling prevailed till about 1620. The general expression of all the buildings before that date is almost entirely Gothic, although an attempt is made to introduce classical details. The pointed gables, mullioned windows, oriels and dormers, and the picturesque outlines of the old style, are all retained long after the introduction of quasi-classic profiles to the mouldings. This style, which prevailed during the latter half of the 16th c., is called Elizabethan, and corresponds to the somewhat earlier style in France of the time of Francis I. This was followed in the reign of James I. by a similar but more extravagant style called Jacobean, of which Heriot's Hospital is a good example; the fantastic ornaments, broken entablatures, &c., over the windows, being characteristic of this style, as they were of that of Henry IV. in France.

The first architect who introduced real Italian feeling into the Renaissance of England was Inigo Jones. After studying abroad, he was appointed superintendent of royal buildings under James I., for whom he designed a magnificent palace at Whitehall. Of this, only one small portion was executed (1619—1621), and still exists under the name of the Banqueting House, and is a good example of the Italian style. Jones also erected several elegant mansions in this style, which then became more generally adopted.

In the latter half of the 17th c., a splendid opportunity occurred for the adoption of the Renaissance style after the great fire of London. Sir Christopher Wren rebuilt an immense number of churches in that style, of which St. Paul's (q. v.) was the most important. The spire of Bow Church and the interior of St. Stephen's, Wallbrook, are also much admired.

During the 18th c., classic feeling predominated, and gradually extended to all classes of buildings. In the early part of the century, Vanburgh built the grand but ponderous palaces of Blenheim and Castle Howard, which have a character and originality of their own. To these succeeded a vast number of noblemen's mansions, designed by Campbell, Kent, the Adamses, and others.



Fig. 3.—Park Front of Castle Howard.

Many of these, like the contemporaneous buildings of France, are of great size and magnificence; but they are usually tame and cold in design, and a sameness pervades them all. They generally consist of a rustic basement-story, with a portico over the center, and an equal number of windows on either side. The portico is considered essential, and although perfectly useless, the light and convenience of the house are invariably sacrificed for it.

The further study of the buildings of Greece and Rome led, in the beginning of the present century, to the fashion of reproducing them more literally. All important public buildings were now required to be absolute copies of ancient buildings, or parts of them or to look like such, and then the architect had to work

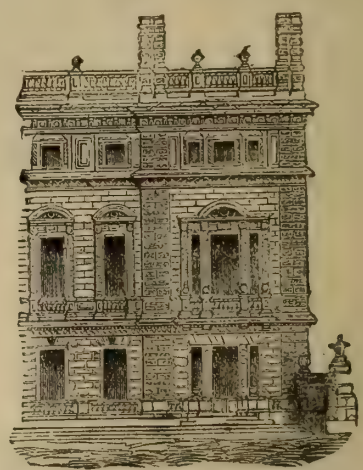


Fig. 4.—Part of Park Front of Bridgewater House.

out the accommodation as best he might. St. Pancras' Church in London is a good example. It is made up of portions from nearly every temple in Greece! Many really successful buildings, such as St. George's Hall, Liverpool, the High School and Royal Institution in Edinburgh, have been erected in this style; but they owe their effect not to their being designs well adapted to their requirements, but to the fact that they are copies from the finest buildings of antiquity.

Sir Charles Barry was the first to break away from this thraldom, and to return to the true system of designing buildings—those, namely, which have their general features arranged so as not only to express the purposes they are intended to serve, but in so doing to form the decorative as well as the useful features of the buildings. The Travelers' Club-house and Bridgewater House in London are admirable specimens of his design. There are no superfluous porticoes or obstructive pediments, but a pleasing and reasonable design is produced by simply grouping the windows, and crowning the building with an appropriate cornice.

As already noticed, a similar style of domestic architecture is now being worked out in France; but both there and in this country there has been a reaction against everything classic, and a revival of medieval architecture has superseded that of classic, especially in ecclesiastical buildings. A very large number of churches has been erected within the last 20 years in the Gothic style, but it cannot be said that these are usually well adapted to the modern Protestant service. The most magnificent example of this style is the Palace or Houses of Parliament at Westminster.

In Germany, Russia, and every country of Europe, the Renais-

sance prevailed in a manner similar to that above described. In Germany, there are few specimens of early Renaissance, the picturesque castle at Heidelberg being almost unique as an early example. The Zwinger and the Japanese palace at Dresden, which are nearly alone as edifices of the beginning of the 18th c., show how poor the architecture of Germany then was. In the domestic buildings of Nuremberg, Dresden, and other towns of the north of Germany, there are many instances of the picturesque application of classic detail to the old Gothic outlines.

One of the most striking examples of the revival of classic art occurred in Bavaria during the first half of the present century, under the auspices of King Louis. He caused all the buildings he had seen and admired in his travels to be reproduced in Bavaria. Thus, the royal palace is the Pitti Palace of Florence on a small scale; St. Mark's at Venice is imitated in the Byzantine Chapel-royal; and the Walhalla, on the banks of the Danube, is an exact copy (externally) of the Parthenon. The finest buildings of Munich are the Picture-gallery and Sculpture-gallery by Klenze, both well adapted to their purpose, and good adaptations of Italian and Grecian architecture.

In Vienna and Berlin, there are many examples of the revived Classic and Gothic styles, but the Germans have always understood the former better than the latter. The museums at Berlin, and many of the theaters of Germany, are good examples of classic buildings.—The domestic architecture of Berlin is well worthy of notice, many of the dwelling-houses being quite equal in design to those of Paris.

Of the other countries of Europe, the only one which deserves remark for its Renaissance buildings is Russia. St. Petersburg is, of all the cities of Europe, the one which best merits the title of a city of palaces. From the date at which the city was founded, these are necessarily all Renaissance in character. They are nearly all the works of German or Italian architects, and are unfortunately, for the most part, in the coldest and worst style. The ornaments of the palaces are chiefly pilasters running through two stories, with broken entablatures, &c., and ornaments of the flimsiest rococo. The New Museum, by Klenze, is, however, a marked exception.

Along with architecture, during the period of the Renaissance, Painting and Sculpture (q. v.) and all the other arts took their models from the classic remains which were so carefully sought for and studied. All ornamental work, such as carving, jewellery, and metal-work of all kinds, followed in the same track. Medieval niches and pinnacles gave place to the columns and entablatures of the classic styles, and the saints of the middle ages yielded to the gods and goddesses of ancient Rome.

RENAI'X, a town of Belgium, in the province of East Flanders, picturesquely situated, 24 miles by railway south of Ghent. Brewing, tanning, distilling, and salt-refining are carried on; and fine linen and damasks, woollen fabrics, hats, and tobacco, are extensively manufactured. Pop. (1876) 14,089.

RENAN, JOSEPH ERNEST, a renowned French theologian and orientalist, was born in 1823 at Tréguier (Côtes-du-Nord). His first education he received at the hands of the priests who directed the school of his native place. At sixteen years of age, he was sent to Paris, where he entered the seminary of Abbé Dupanloup, to prepare himself for the church. Three years later, he went to Issy, and having completed his philosophical studies there, to St. Sulpice. On leaving this, however, he declared himself unable to follow out the path traced for him. The theological and linguistical studies, to which he had devoted himself with rare industry, had led him to results which did not seem to allow him the exercise of priestly functions in his church. He took the place of *répétiteur* in a school, and here prepared himself for an academical career.

In 1847, his Memoir *Surles Langues Sémitiques* ('On the Semitic Languages') obtained the Volney Prize; and the following year, another Memoir of his, *Sur l'Etude du Grec dans l'Occident au Moyen Age* ('On the Study of Greek in the West during the Middle ages') was crowned. In 1848, he began to publish a periodical, *La Liberté de Penser* ('Liberty of thought'), in which he embodied some of his most brilliant essays on theology, philosophy, philology, history, and the many variegated branches of his studies, which, however, were all merely preparatory to the great work for which he concentrated all his energies—viz., the investigation of the origin of Christianity, which, according to him, is as human and natural, and has grown out of the history and circumstances of the times, in precisely the same manner as any other event in the records of humanity. His Memoir, *Sur les Langues Sémitiques* he expanded in 1855 into a *Histoire Generale des Langues Sémitiques* ('General History of the Semitic Languages'), which, with all its shortcomings, is the most methodical and brilliant compilation on the subject. Of the variety of subjects to which he devoted his time besides, his numerous contributions to the *Revue des Deux Mondes* and the *Journal des Débats*, bear ample witness. In 1850, he published a historical essay, *Sur Averroes et l'Averroisme*, for which he had collected materials on a scientific journey to Italy. In consequence of this he was appointed *Employé* at the Imperial Library in Paris. He further produced translations of Canticles and the Book of Job, with introductions and commentaries (*Le Cantique des Cantiques*, &c., 1860, *et Le Livre de Job*, &c., 1859). In 1860, he was sent by the Emperor on a tour of exploration to Syria and Phœnicia, the results of which were given to the world in the *Mission de Phenice* (1864) and other works. On his return, he was elected to the chair of Hebrew professorship at the Collége de France; but his inaugural lecture made him, through its too free handling of theological matters, so obnoxious to those in power, that his course was first suspended, and finally his professorship was taken from him.

His work, *La Vie de Jésus*, forming part I. of his *Origines du Christianisme*, created a profound emotion throughout Europe. An abstract of it, in a more popular form, has been published by him under the title *Jésus. Histoire des Apôtres* (1866), *Saint-Paul* (1869), *Antichrist* (1873), *Les Evangiles* (1877), *L'Eglise Chrétienne* (1879), and a volume on the reign of Marcus Aurelius, complete the series. Other works are: *Etudes d'Histoire Religieuse* (1856), *Essais de Morale et de Critique* (1859), *La Réforme Intellectuelle et Morale* (1872), *Dialogues et Fragments Philosophiques* (1876), *Mélanges d'Histoire et de Voyages* (1878), the Hibbert Lectures (1880), delivered in London, on the Influence of Roman Thought on Christianity, and his curious poem *Caliban* (1878). R. was elected a member of the Academy in 1878.

RE'NDSBURG, a town in the Prussian province of Schleswig-Holstein, stands at the junction of the Eider and the Kiel Canal, 67 miles N.N.W. of Altona. R. has an active trade. Pop. (1880) 12,776.

RENÉ, or RENATUS I., surnamed 'the Good,' titular king of Naples and Sicily, the son of Louis II., Duke of Anjou and Count of Provence, was born in 1408 at Angers. R.'s paternal grandfather, Louis I., duke of Anjou, and second son of John the Good, king of France, had been adopted in 1380 by Joanna I., queen of Naples, as her successor, and on his death, a few years afterwards, his son, R.'s father, was crowned king of Naples and Sicily. He, however, did not derive any substantial advantages from this recognition of his presumed rights; and when, on his death and that of his eldest son Louis II., R., as the next heir, endeavored to make good his pretensions to the great Neapolitan heritage, he found himself involved in disastrous disputes with numerous other aspirants to the coveted throne. R. had married Isabella of Lorraine, and through her was also a claimant of the rich territories of Lorraine, and consequently brought upon himself the enmity of his wife's brother-in-law, the Duke of Burgundy, who laid equal claim to the heritage of the ducal House of Lorraine.

The best years of R.'s life were spent in the fruitless effort to establish these pretensions; but when, in 1442, his powerful rival, Alfonso of Aragon, took Naples, after a protracted siege, the struggle was virtually decided; and R., recognizing at length the futility of his schemes, retired to his hereditary dominions in Provence, and thenceforth occupied himself with the administration of his territories, and with the cultivation of poetry and painting, in both of which he attained a degree of proficiency above the average of his age, as is shown by the poems and illuminated illustrations by his hand still preserved in the Imperial Library at Paris. In 1445, R. gave his beautiful daughter Margaret in marriage to Henry VI. of England, and at the same time obtained from his royal son-in-law the restitution of Anjou and Maine, which had remained in the hands of the English since the successful wars of Henry V. This did not, however, prevent R. from taking part in the wars of Charles VII. against the English in 1449; but after a brief stay with the army, R. wearied with the excitement and discomforts of war, retired to Aix in Provence, where for many years he attracted to his court the cultivators of song and romance, while he encouraged manufactures, and augmented the resources of the province by the introduction of improved methods of agriculture, and the importation of various useful trees and plants, and died in 1480, universally regretted by his subjects, among whom the memory of 'the good king René' was long held in great veneration. R.'s sons had died before him; and as with him the House of Anjou became extinct, its territorial dominions lapsed to the French crown, and have since that period formed an integral part of France.

RENEW'AL of a Bill of Exchange is matter of agreement between the parties, and a new bill is granted by the party liable to pay in substitution for the old one. The result is, that the former bill is suspended in its operation till the renewed one arrives at maturity. But the former one is not extinguished, for it revives if the renewed bill is not paid; and even though the renewed bill is paid, an action may be brought on the former bill to recover the interest due upon it.

RE'NFREW (anciently *Strathgryffe*), a county in Scotland, 31 miles long, by 13 broad, is bounded on the N. and W. by the river

and Firth of Clyde, on the S. by Ayrshire, and on the E. and N. by Lanarkshire. Area, 254 sq. m., or 162,428 acres; pop. (1861) 177,561; (1871) 216,947; (1881) 263,374.

R. is very unequal in its surface, and consequently in the nature and quality of its soil; the highest portion of it, composing two-thirds of its surface, reaches to the height of 1240 feet above the level of the sea, and gradually declines to a level extending to some 12,000 acres. R. was divided in 1815 into the Upper and Lower Wards, with a sheriff-substitute for each. Owing to the great demand for dairy produce in the large towns in or near the county, nearly two-thirds of the arable land is kept under grasses. There are extensive mineral deposits in the county, employing a large number of people, and constituting a great source of commerce and wealth. The minerals wrought are coal (accompanied always by iron), limestone, and sandstone. In respect of commercial and manufacturing importance, R. is second only to Lanark of Scotch counties. The manufacture of soft goods, comprising silk, cotton, and muslin fabrics, is carried on to a great extent. The center of these branches of industry is Paisley; but weaving is carried on in almost every village in the county. The good roads and railways, together with the seaports of Greenock and Port Glasgow, afford ready means of transit both for home and foreign trade. The chief towns, besides these ports, are Renfrew (q. v.), Paisley (q. v.), and Johnstone (q. v.). Besides the Clyde, and some small streams, there are three rivers of considerable size, called the Black Cart, the White Cart, and the Gryffe. Of the whole acreage of R., there were, in 1880, 94,339 acres under all kinds of crops: 17,712 acres were under corn crops, 8494 under green crops, 18,321 in clover and grasses under rotation, and 49,467 in permanent pasture. There were in the county in the same year 2300 horses kept for agricultural purposes, 25,059 cattle, 31,237 sheep, and 1310 pigs. The valued rent in 1674 was £69,172 Scots, or £5764. The valuation for 1881—1882 was £672,256, exclusive of railways and public works, valued at £78,218. The parliamentary constituency, returning one member, in 1881–82 was 6523.

R. was the chief patrimony of the Stewards of Scotland, granted to them in 1404 by Robert III., since which time the eldest son of the reigning sovereign has borne the title of Baron of Renfrew.

RENFREW, an ancient royal, parliamentary, and municipal burgh, capital of the county of the same name, stands on the south bank of the Clyde, 6 miles west-north-west of Glasgow. It contains an educational institution called the Renfrew Grammar School and Blythswood Testimonial, which was originally endowed by charter of Robert III., and is in part maintained by the Town Council. On the banks of the Clyde is a wharf, at which the Glasgow steamers touch. Silk and muslin fabrics are woven; and many of the inhabitants are employed in iron-works and in shipbuilding, which branches of industry have within recent years become important here. Pop. (1861) of royal burgh, 3412; (1871) 4163; (1881) 5115.

RE'NI, a town of Bessarabia, at the confluence of the Pruth and the Danube, on the left bank of both rivers. It carries on a considerable trade, exporting large quantities of Grain. Pop. about 8000.

RENNEL, JAMES, a well-known English geographer, was born near Chudleigh, Devonshire, in 1742, and entered the navy as a midshipman at the age of 15, distinguishing himself under Admiral Parker, at the siege of Pondicherry. At the age of 24, he left the navy, and enlisted as an officer of engineers in the East India Company's army, rising through the influence of his distinguished services under Clive to the grade of major. Soon afterwards, he was transferred to the post of surveyor-general of Bengal, an office more in keeping with his tastes. While serving in the army, he had prepared and published a *Chart of the Bank and Currents of Cape Agulhas* (1768), which attracted the general notice of geographers; and having retired from office (1782) with a pension of £600, he followed up this work by a succession of geographical works on India, the chief of which was *Memoirs of a Map of Hindustan* (Lond. 1783), new editions of which appeared in 1788, 1793, and 1800, each of which merits to be considered a distinct work. But his geographical investigations took a wider scope, for in 1792 he published a *Memoir of the Geography of Africa*, from the communications of Major Houghton, and the relations of Ledyard and Hornemann; and in 1798, he aided Mungo Park in the arrangement of his travels, illustrating them by a map. R. had been elected a member of the Royal Society in 1788.

The subject of the correctness of the ancient geographers being at that time much discussed, R., though wholly ignorant of Greek, undertook the vindication of Herodotus (whose works he became acquainted with through the medium of a translation), and published in 1800 his *Geographical History of Herodotus Examined and Explained*, a work of unrivalled merit, displaying as it does one of the grandest combinations of acuteness, sagacity, and research. A second edition was published in 1830. In 1814, appeared his *Observations on the Topography of the Plan of Troy*; and two years afterwards, *Illustrations (chiefly Geographical) of the Younger Cyrus, &c., and of the Retreat of the Ten Thousand*. After his death, which took place at London, 29th March 1830, there were found among his papers several MS. works, including the *Investigation of the Atlantic Currents and those between the Atlantic and Indian Oceans* (Lond. 1832), in the composition of which book he examined the logs of all the ships of war and Indiamen which had traversed those seas for about 40 years previous and reduced their observations to a general system; and *A Treatise on the Comparative Geography of Western Asia*, with an atlas ancient and modern (Lond. 1831), a work of great labor and research, which had been prepared by the Royal command, and the publication of which was partially defrayed at the king's expense. R. was one of the most remarkable men of his time; his works exhibit throughout the most earnest perseverance and industry, sound judgment, and wonderful sagacity.

RENNES (*Redones* of the Romans, *Condate* of the Gauls), formerly the capital of the province of Bretagne, now the chief town of the dep. of Ille-et-Vilaine, is situated at the confluence of the rivers Ille and Vilaine. It is divided into the upper or new town, and the lower or old town. It is surrounded by ancient walls, flanked with towers, beyond which lie extensive suburbs. Three bridges unite the two divisions of the town, the older portions of which lie on the left bank of the Vilaine, and are often exposed to serious damage from inundations. The most noteworthy of the public buildings are the modern cathedral, whose interior is a very spacious hall of Grecian architecture; the stately Palais de Justice; the Hôtel de Ville; and the Lycée. R. is the see of a bishop, and the seat of a High Court of Jurisdiction for Ille-de-Vilaine and several other adjacent departments, and has tribunals of First Instance and of Commerce. As the focus of main and branch-lines of railway between Paris and the north-west of the empire, and commanding good river and canal navigation, R. is favorably situated for commerce; and in addition to the transport of the abundant farm-produce of the neighboring districts, it carries on a considerable trade in its own manufactures, which include cotton and linen yarns, flannel stockings, lace, sail-cloths, earthenware, &c. R. was all but reduced to ashes by a great fire in 1720. Pop. (1876) 53,598.

RE'NNET consists of the inner lining of the true stomach (see DIGESTION) of the sucking-calf, and depends for its use upon the acid gastric juice contained in it. It is prepared by removing the stomach from the animal as soon as killed, and scraping off the outer skin and all superfluous fatty matter. The membrane is then salted for some hours, and stretched out to dry. If perfectly dried, it will keep for a long time. When used, a small piece is taken and soaked in a little whey or water, and then added to the milk intended to be curdled.

RENNETT, the common name, not only in English, but, with slight modifications, in French, German, and other languages, of a class of apples, including many of the most beautiful and pleasant varieties. They are of very regular and nearly globose shape; their skin has generally a rusty tinge, and often a kind of unctuousness to the touch; their flesh is finely granular; and besides being sweet and agreeably acid, they have a peculiar aromatic flavor. They do not keep well. The trees have a very regular habit of growth, and are very suitable for dwarf standards. The name R. seems to be originally French—*Reinette*, Little Queen.

RENNIE, JOHN, an eminent civil engineer, was born at Phantassie, near East Linton, East Lothian, 7th June 1761. His preliminary education was obtained at the parish-school of East Linton, and supplemented by two years at Dunbar, where he was indoctrinated into pure mathematics. After being for some time a workman in the employ of Mr. Andrew Meikle, celebrated in connection with the Thrashing-mill (q. v.), he proceeded to Edinburgh, where he attended the lectures on natural philosophy by Dr. Robison, and those on chemistry by Dr. Black (q. v.). Furnished with a recommendation from Professor Robison, he visited (1780) the works of Messrs Boulton and Watt at Soho, near Birmingham, and was immediately taken into employment by that eminent firm. Here his mechanical genius soon displayed itself; and so highly did Watt esteem R., that he gave him, in 1789, the sole direction of the construction and fitting-up of the machinery of the Albion Mills, London; and the ingenious improvements effected in the connecting wheel-work were so striking, that R. at once rose into general notice as an engineer of great promise.

Abundance of mill-work now flowed in upon him, and the thorough efficiency of his workmanship greatly contributed to his fame. To this branch of engineering he added, about 1799, another—the construction of bridges; and in this branch also his pre-eminent talent and ingenuity displayed themselves. The elegance and solidity of his constructions, the chief of which were raised at Kelso, Leeds, Musselburgh, Newton-Stewart, Boston, New Galloway (and at other places afterwards mentioned), were

universally admired; R.'s greatest work in this department was the Waterloo Bridge over the Thames, said to be the noblest structure of its kind in the world, and it certainly combines in the happiest proportions the qualities of grandeur and simplicity. It was commenced in 1811, and finished in less than six years, at a cost of more than £100,000,000. Another of his works is the Southwark Bridge, which was built on a new principle, cast-iron arches resting on stone piers, and was finished in four years at an expense of £800,000. He also drew up the plan for the London Bridge, which, however, was not commenced till after his death. We have only space to enumerate the rest of his great engineering achievements: he superintended the execution of the Grand Western Canal in Somerset, the Polbrook Canal in Cornwall, the canal joining the Don and Dee in Aberdeen, that between Arundel and Portsmouth, and chief of all, the Kennet and Avon Canal between Newbury and Bath. The London Docks, the East and West India Docks at Blackwall, with their goods' sheds, the Hull docks, the Prince's Dock at Liverpool, and those of Dublin, Greenock, and Leith, were all designed, and wholly or partially executed under his superintendence. He also planned many improvements on harbors and on the dockyards of Portsmouth, Chatham, Sheerness, and Plymouth; executing at the last-mentioned port the most remarkable of all his naval works, the celebrated Breakwater. R. died October 16, 1821, and was buried in St. Paul's Cathedral.

R.'s great merit as an engineer consisted in his almost intuitive perception of what was proper to be done to effect the assigned purpose. Another striking characteristic of his works is the remarkable combination in them of beauty and durability. In this respect, R. had no rival; and though his works are frequently objected to on the ground of their expensiveness, yet their lasting qualities will in the end more than compensate for this. In person, R. was of extraordinary stature and herculean strength—characteristics which have for a lengthened period distinguished his family, and with reference to which numerous tales are still current regarding many of his relatives.

RENNIE, GEORGE, an eminent English civil engineer, and the eldest son of the preceding, was born in Surrey, January 3, 1791, and at the age of 16 entered the Edinburgh University, being placed under the charge of Professor Playfair, in whose house Earl Russell, then an Edinburgh student, also at that time resided. After attending a course of classics, mathematics, chemistry, and natural philosophy, he returned to London in 1811, and commenced the practical study of engineering under his father. In 1818, he was appointed the superintendent of the machinery of the Mint, and at the same time aided his father in the planning and designing of several of his later works. After his father's death in 1821, R. entered into partnership with his younger brother, John (afterwards Sir John Rennie), as engineers and machinery constructors; and during the existence of the firm, it carried on an immense business, including the execution of most of the works which had been planned by the elder Rennie, and the completion of those which he had left unfinished.

Their operations included the construction of bridges, harbors, docks, ship-yard and dredging machinery, steam-factories, both in Great Britain and on the continent, and many of the great naval works at Sebastopol, Cronstadt, Odessa, Nicolaiev, and in the principal ports of England; they also made the coining machinery for the mints at Calcutta, Bombay, Lisbon, Mexico, and Peru; the biscuit, chocolate, and flour mills at Deptford, Gosport, and Plymouth; and furnished marine engines for the war-ships of England, Russia, France, Italy, Mexico, &c. Besides these multifarious labors, they built ships both of wood and iron, drained large tracts of land in the midland counties of England, and R. superintended the construction of several continental railways. He was elected a Fellow of the Royal Society in 1822, and was subsequently enrolled in similar societies at Dublin, Turin, Rotterdam, &c. He is the author of 'Experiments on the Strength of Materials,' 'The Frictions of Solids,' and 'The Frictions of Fluids,' published in the *Philosophical Transactions*. He also contributed Memoirs to the *Transactions* of the Civil Engineers. He died 30th March 1866.—His brother, SIR JOHN, was knighted on the occasion of the opening of the new London Bridge (1831), which he executed from his father's designs. He designed and executed Southwark and Waterloo Bridges; and completed the drainage of the Lincolnshire coast, begun by his father. He died 1874.

RENT, in Political Economy, is a term applied to the profits drawn from land, houses, or other immovable property, termed in England 'real property.' It is colloquially applied to these profits only when the property is hired by a tenant who pays for the use of it. It was long before a distinction was made between such letting and hiring and that of any other commodity, such as a ship or a wagon. But political economists found that there was a fundamental distinction, affecting large questions not only in political economy but in state politics. These are connected with the specialty that other profits, whether from the letting of articles or otherwise, arise out of the acts of those to whom the articles belong; but the rent of land is a fund that exists through external causes, over which the owner has no control, and in certain conditions *must* exist whoever may draw it.

When 'the theory of rent,' as it was termed, dawned upon the economists, and was but partially seen, they developed it in different formulas, which appeared to be different theories, but in reality were crude forms, tending, though complicated in themselves, to the simple principle, that the pressure of population on the means of subsistence creates rent on those lands where the means of subsistence can most easily be produced. In an enlarging and aggrandizing country like Britain, the phenomenon is in constant gradual operation; but it will be best illustrated by supposing an instance of sudden and extensive action. Suppose there is an island in which 1000 people find enough for their wants in the natural produce of its most fertile soil. Suddenly 500 people become added to the population, and an increase of the existing food to the extent of one-half is required. The shape in which this increase will take place will be competition, by the offer of an enhanced price for food, and that enhanced price will tempt people to bring under cultivation the inferior lands. The owners, however, of the old rich lands will not see their neighbors getting prices a third higher than themselves; they, too, will sell their produce at the market price, and the difference between this and the old value will be *rent*. It is of no moment, in the economic question of the existence of the element, that the owner of the rich soil does not let it; if he eats his bread cheaper than his neighbor, that is merely the form in which he derives the advantage of *rent*. The importance of this view, both in politics and economics, is that rent *must exist, and cannot be got rid of*. Whoever has at his command better land than the worst that is cultivated, holds rent.

It is in vain, therefore, to think of destroying the 'monopoly,' as it is sometimes called, of land-owners; it revives as naturally by an economic law, as water finds its level by a physical law. If you were to divide all the land in Britain to-morrow in equal portions among the inhabitants, the value of it would be greatly deteriorated by the change, but in time some patches would become more valuable than others, and worth 'rent,' while the frugal and industrious would gradually be absorbing the portions of the idle and extravagant, and accumulating estates. In fact, to the mere consumer, it is of no moment who has the land, provided it is in the hands that can render it most productive. To this end, it is more profitable that the land of a country should be in the market, and obtainable by those who, being ready to give most for it, are able to work it to most profit. In France, where land is divided among the owner's descendants, the consequent breaking up into small patches, not necessarily in the hands of persons able or willing to cultivate them, is detrimental to the value of the land at large. On the other hand, an entail system, such as that which predominated, and still to a certain extent exists in Scotland, is detrimental, by keeping the land out of the market, and necessitating that it shall belong to a certain person, who has perhaps neither the ability nor the capital to turn it to its best purpose. In the struggle which terminated in the establishment of free trade in 1846, the 'theory of rent' was referred to with much alarm, and it was said that when grain was brought from abroad, a reversal of the action creating rent would occur, from the inferior lands falling out of cultivation. Some free-traders admitted this as a necessary evil, but others said that the expansion given to commerce would increase the demand for the produce of the soil, while the home-growers would have a monopoly from their vicinity. In fact, the increase of trade and riches has been so great, that the value of land has greatly increased since the establishment of free trade, and that although half our bread-stuffs come from abroad. The great increase has been in the rearing of butcher-meat, which the increased wealth of the people has enabled them to buy.

RENT, in English Law, is an incident to the tenure created between a lessor and lessee. It consists not necessarily of money, but may be a quantity of corn, or a peppercorn, or a flower. Where lands are held rent-free, it is usual for the landlord to reserve some nominal rent, merely as an acknowledgment of tenancy. In the ordinary case of leases, a payment of a fixed sum of money is reserved annually for the benefit of the landlord. It is incidental to rent that the landlord can, if it is not duly paid, distrain the tenant's goods, or, indeed, any person's goods found on the premises; i. e.; the landlord can seize these and sell them without any judicial authority, in order to pay the rent. No express agreement between landlord and tenant is necessary to give the landlord this power of distress. The rule is, that rent issues out of all and every part of the premises, and whatever goods are found on any part of the premises can be distrained by the landlord. Sometimes the owner of land gives a third party a right to a certain rent out of his lands, by way of security,

and it is called a rent-charge; the party entitled to the rent-charge having power to distrain also for the rent, though having no other right to the lands. In Scotland, though the general rules as to rent do not substantially differ, the landlord's power of sequestration is not identical with the English power of distress. See LANDLORD AND TENANT.

RE'NTON, a small town in the county of Dumbarton, and two miles north of the town of that name, on the right bank of the Leven. Smollett, the novelist and historian, was born in the neighborhood, and is commemorated by a monument in the town. Pop. (1871) 3087; (1881) 4319, who are employed in the printing, dyeing, and bleaching works on the Leven.

RENUNCIA'TION, as a legal term, is the renouncing or abandoning of a right. In England, the term is used solely in reference to an executor who has been nominated in a will, but who, having an option to accept it, declines to do so, and in order to avoid any liability, expressly renounces the office. This, he may do by letter addressed to the Court of Probate.—In Scotland, the term is also used in reference to an heir, who is entitled, if he pleases, to succeed to the ownership of heritable property, but, from the extent of the incumbrances, prefers to renounce the character of heir. So the renunciation of a lease in Scotland is used in the same sense as the surrender of a lease in England.

RENWICK, JAMES, LL.D., an American author and physicist, was born about 1785, and graduated at Columbia College, New York, in 1807. In 1820, he was appointed Professor of Chemistry and Physics in that college, a position he held until 1854. In 1838, he was appointed by the United States government one of the commissioners to explore the line of the boundary, then settled by the Ashburton treaty, between Maine and New Brunswick. In addition to his collegiate duties, he wrote the biographies of Robert Fulton, David Rittenhouse, and Count Rumford, in Spark's *American Biography; a Memoir of De Witt Clinton* (1834); *Treatise on the Steam-engine* (1840—1841). His text-books, *Outlines of Natural Philosophy* (1832), and *Outlines of Geology* (1838), were the first works of their kind published in the United States, and, with his other educational works, have passed through numerous editions. R. died in 1863.

REPAI'RS is the legal as well as popular term to denote the repairs done to a house or tenement by a tenant or landlord during the currency of the lease. In England, the burden of repairs is at common law thrown on the tenant, so that unless the lease expressly say that the landlord is to do the repairs, the tenant will be bound, but generally the lease states who is to do the repairs; and it is only ordinary repairs that the tenant is bound to do. In the lease of farms, the tenant is bound only to keep the house in repair, and not the out-buildings, though he is bound to keep the fences in repair. If the landlord is bound to do the repairs, and fails to do them, the tenant is not entitled to quit the premises on that account, though he will be entitled to sue the landlord for damage caused by the want of repairs. In Scotland, the landlord is bound at common law to put the premises into tenantable repair at the commencement of the lease. The tenant is then bound to keep them in ordinary repair, but not to keep them in repair where some hurricane or extraordinary cause has done injury.

REPEA'T, in Music, a character indicating the repetition of the part or strain to which it applies. It consists of two perpendicular lines through the staff, with dots before them and between the lines of the staff placed at the close of the strain to be repeated. When a series or notes has to be repeated from the beginning of the piece, this sign is inserted at the place where we have to return to the beginning. But when the repetition is not from the beginning of the piece, a reversed repeat must be placed at the point where the repetition begins, the passage to be repeated being enclosed by the two signs. When the following strain is also to be repeated, we have the dots placed on both sides of the repeating sign. When a passage of some length is to be repeated, with an alteration at the end, a curved line with the figure 1, 1*ma*, or *prima volta* (Ital. first time) is placed over the part which is to be altered, the sign of the repeat follows, and then the altered termination with 2, 2*da* or *seconda volta* (Ital. second time) placed over it.

The words *Da Capo*, abbreviated D. C. (Ital. from the beginning), indicate that a piece is to be repeated from the beginning. But if that repetition is only to extend to a particular point, at which the movement or piece finally closes, that point is indicated by the word *Fine* (Ital. end), or the letter F. If, however, the repetition, is to begin, not from the commencement of the piece, but from another point the sign :S: is placed over the point, and the words *dal segno*, abbreviated D.S. (Ital. from the sign), are used to indicate the point after which the repetition is to begin.

REPETI'TION, in Scotch Law, means the repayment of money which had been received by mistake or ignorance. The form of action by which money is so recovered was, in the Roman law, called *condictio indebiti*, and the law of Scotland adopts the same expression. The maxim is, that if money has been paid under some mistake as to the law, it cannot be recovered; but if it was paid under a mistake as to a matter of fact, then it may be recovered. In England, the same doctrine holds, and the action is called an action for money had and received.

REPLEA'DER, in English Law, is a right to plead again, or deliver a fresh pleading, in consequence of the issue which had been joined not meeting or exhausting the real point in dispute. This right is much abridged, in consequence of the liberality now used in amending the record.

REPLE'VIN, in English Law, is a form of action by which goods which have been seized under an illegal distress are taken back (security being given to the amount for which the goods were distrained), and the action of replevin commenced, to try the legality of the seizure.

REPLICA'TION, in the English Common Law, means the pleading of the plaintiff in answer to the defendant's plea. The plaintiff's first pleading is the declaration, which is answered by the defendant's plea, and which in turn is answered by the plaintiff's replication.

REPO'RTING, PARLIAMENTARY. Accounts of single speeches, and, at times, of entire debates in the English parliament, have come down to us from a very early period, and in the voluminous work entitled the *Parliamentary History of England*, we possess the most valuable historical work in our language. The earlier volumes of the Journals of the House of Commons contain short notes of speeches, which the clerks made without the authority of the House; but all the later volumes record nothing but the votes and proceedings—the *res gestæ*, in fact. Sir Symonds d'Ewes, who may be considered our first parliamentary reporter, has left us a journal of Queen Elizabeth's parliaments. The session of 1621 was also reported from notes taken by a member. The Commons' Journals contain notes of speeches in the parliaments of James I. and James II.

Rushworth, assistant-clerk in the Long Parliament, 1640, took down in a species of short-hand any speech of importance, and furnished Charles I. with a copy of the king's own speech when he made the attempt to seize the five members. His account of *Remarkable Proceedings in Parliament* forms one of the most valuable portions of his *Historical Collections*. We are also indebted to Thurloe and Gray for notices of what occurred in parliament. During the reign of William III., a member now and then sent a copy of his speech to the newspapers, for printing which, however, they were sometimes called to account. In the reign of Queen Anne, a monthly pamphlet, called the *Political State*, gave an outline of the debates in parliament. In the reign of George I., the *Historical Register*, published annually, professed to give reports of parliamentary speeches. The *Gentleman's Magazine* began a monthly publication of the debates, the number for August 1735 containing a report of the debate in the House of Lords on the previous 23d January. Cave, the publisher continued the practice in succeeding numbers, and his systematic proceedings are thus described by Sir John Hawkins: 'Taking with him a friend or two, he found means to procure for them and himself admission into the gallery of the House of Commons, or to some concealed station in the other house, and there they privately took down notes of the several speeches, and the general tendency and substance of the arguments. Thus furnished, Cave and his associates would adjourn to a neighboring tavern, and compare and adjust their notes; by means whereof, and the help of their memories, they became enabled to fix at least the substance of what they had lately heard and remarked. The reducing this crude matter into form was the work of a future day and an abler hand —Guthrie, the historian, whom Cave retained for the purpose.'

There was, however, no publication of the debates during the sitting of the Houses; parliament was always prorogued before anything said in the course of the session was given in the magazine. At first, the names of the speakers were cautiously indicated by the first and last letter only, and in many cases the speaker's name was wholly omitted. Growing bolder by degrees, Cave printed the names at length. The House of Commons soon took the alarm. The publication of the debates of either House had been repeatedly declared to be a high breach of privilege. Sir Symonds d'Ewes gives us a resolution of the Lower House in the 31st Eliz. 1588, that 'speeches used in this House be not any of them made or used as table-talk, or any wise delivered in notes of writing to any persons whatever, not being members of this House.' In 1698, the Lords agreed to a standing order, which is still unrepealed, declaring 'that it is a breach of the privilege of this House for any person whatsoever to print, or publish in print, anything relating to the proceedings of the House, without the leave of this House.' The Commons followed up several previous resolutions to the same effect, by ordering, in 1728 'that it is an indignity to, and a breach of, the privilege of this House, for any person to presume to give, in written or printed news-

papers, any account or minute of the debates or other proceedings; that upon discovery of the authors, printers, or publishers of any such newspaper, this House will proceed against the offenders with the utmost severity.' In 1738, Speaker Onslow called the attention of the House to the breach of its standing orders by Cave and others.

Sir Thomas Winnington exhorted the Commons not to be less jealous of their privileges than the other House, which had lately punished some printers for publishing their protests. 'What will be the consequence,' he asked, 'if you allow these reports to go on unchecked? You will have the speeches of this House every day printed, even during your session, and we shall be looked upon as the most contemptible assembly on the face of the earth.' The result was another thundering resolution against the publication of debates 'either while parliament is sitting or during the recess, and a threat to proceed against offenders with the 'utmost severity.' The reports, notwithstanding, still appeared, but under the disguise of 'Debates in the Senate of Lilliput,' in the *Gentleman's Magazine;* and 'Debates in the Political Club,' in the *London Magazine.* The celebrated Dr. Johnson was employed by Cave in the composition of his parliamentary debates, and the reports from 1740 to 1743 are held to have been entirely prepared by him; sometimes with the assistance of the above-mentioned Guthrie, who had a good memory, and used to bring home as much as he could recollect from the House; and sometimes according to Boswell, with no other aid than the names of the orators and the side they took. When it was observed to Johnson that he dealt out reason and eloquence pretty equally to both parties, he remarked: 'I took care that the Whig dogs should not have the best of it.' It was not till 30 years later that the parliamentary debates descended from the magazines to the newspapers. The latter had, however, for some time resolved to report the debates (Woodfall's *Junius*, iii. 345), and they took advantage of the popular excitement arising out of the Luttrell-Wilkes election for Middlesex, to try the right of the House to interdict the publication of its proceedings.

The ever-memorable contest between parliament and the press began at the close of the year 1770. The House of Commons followed up another solemn threat by prompt action. Two printers, Thompson and Wheble, were ordered to attend at the bar, and, upon their contempt, were ordered into custody. On the 12th of March 1771, complaint was made against W. Woodfall, printer of the *Morning Chronicle;* J. Miller, of the *London Evening Post;* and four other printers of London daily papers, for printing the proceedings of the House. The debates were unusually violent; there were 23 divisions; and the House did not adjourn until four A.M. The printers were ordered to attend. Some surrendered, and on asking pardon on their knees at the bar, were discharged. Miller, not surrendering, was ordered into the custody of the serjeant-at-arms. His messenger arrested Miller within the precincts of the city of London, and was immediately given into custody by Miller for assault, and carried before the Lord Mayor, the Right Hon. Brass Crosby. The deputy serjeant-at-arms attended before the Lord Mayor, and explained the circumstances; but his lordship declared the Speaker's warrant illegal, discharged Miller from custody, and committed the messenger for assault. Wheble and Thompson had been carried respectively before Aldermen Wilkes and Oliver, who immediately discharged them, and bound them over to prosecute, and the Speaker's messenger to answer a charge of assault and false imprisonment. The House of Commons was furious. It had had enough of Wilkes, but ordered the attendance of the Lord Mayor (a member of the House) in his place, and also of Alderman Oliver.

The aldermen of London attended the House, and pleaded their own cause, alleging that their charters exempted the citizens from any law process being served upon them except by their own officers. The House ordered its various resolutions to be read, prohibiting the reporting of its proceedings by any, even its own members, and then committed Alderman Oliver to the Tower. The Lord Mayor, who was suffering from gout, was excused from further attendance that day, but Wilkes was ordered to attend at the bar on the 8th of April. The defiant alderman was ready for the fray, but the House evaded the meeting by adjourning from the 7th to the 9th. The Lord Mayor, on the 27th, was sent to join Alderman Oliver in the Tower. The city of London loudly protested against the arbitrary proceedings of the House, and the whole country responded to the appeal. The power of parliament to imprison ceases at the end of the current session, and on the day of prorogation, July 23, the Lord Mayor and Alderman Oliver marched out of the Tower in triumph, and at night the city was illuminated. A few days afterwards, the Speaker's messenger who had arrested Wheble was tried at Guildhall for the assault, found guilty, fined 1*s.*, and imprisoned for two months in the Compter. Next session, the House of Commons tacitly acknowledged itself beaten.

The printers defied the House, continued to publish their proceedings, and slept, notwithstanding, secure in their beds. In a short time, the House of Lords also conceded the point. The victory was complete, and no attempt has since been made to restrain the publication of the debates and proceedings of parliament. The resolution affirming that it is a high indignity to, and 'notorious breach of, the privileges of the House to publish the debates,' still remains unrevoked on the Journals. Although debates are now daily cited in parliament from printed reports, and galleries have been constructed for the accommodation of the reporters, yet for some years after the triumph of the press, the gallery of the Lower House was occasionally shut during debates. During the American war, the public were more than once excluded from the gallery for a whole session. It is still in the power of any member, who may call the Speaker's attention to the fact that 'strangers are present,' to exclude the public and the reporters from the House. This power has frequently been exercised during living memory, but on such occasions some one or more members who have dissented from this course have taken notes of the speeches, and have avowedly sent them to the newspapers.

The old machinery of newspaper reporting was susceptible of immense improvement. One of the Woodfalls (a brother of the Woodfall of Junius) had so retentive a memory that he went by the name of 'Memory Woodfall.' When editor of the *Morning Chronicle,* he used to listen to a debate in the gallery, and write it out next day, the taking of notes being at that time forbidden. The employment of only one reporter for the whole night necessarily caused great delay in the publication of the paper, Woodfall's journal sometimes not being ready until nine or ten o'clock at night. The first great improvement was made by Mr. Perry, a native of Aberdeen, who succeeded Woodfall in the management of the *Morning Chronicle.* He established a corps of parliamentary reporters to attend the debates of both Houses every night in succession. He thus brought out the night's debate on the following morning, anticipating his rivals by ten or twelve hours. The superior excellence of the reports thus obtained, as well as their more rapid publication, soon made the new system universal. The improvement in the reports of the debates from the period of the American war until the year 1815, was but gradual. At the close of the war, however, public attention being directed with almost exclusive anxiety to domestic affairs, the publication of parliamentary debates became an object of national importance, and in the course of a few years assumed its present full, detailed, and accurate character. Increased facilities for the discharge of their important and arduous duties were from time to time given to the reporters.

Formerly, they had no means of entering the Strangers' Gallery except those which were common to the public generally. On days when an interesting debate was expected, they were obliged to take their places on the stairs early in the forenoon, and, after standing there for many hours, to depend for their chance of getting in by battling their way in the crowd when the door opened. It happened one night during Mr. Pitt's premiership that the gallery was more than usually thronged in expectation of an important speech from the minister. The reporters, unable either by force or entreaty to obtain even tolerable accommodation, took counsel together. They left the House; and next morning, 'instead of the rounded periods of the minister, there appeared nothing but one dire blank, accompanied by a strong comment on the grievance in which it had originated.' Mr. Speaker Abbott, not, as it was believed, without concert with the vexed and aggrieved minister, immediately directed the appropriation of the uppermost bench of the gallery to the reporters' exclusive use, with a door in the center, by which they alone had a right to enter. Soon after, a small 'Reporters' Room' was added. The Lords followed the Lower House in providing accommodation for the press. During the debates on Catholic emancipation, a small space below the bar was railed off for them, and a session or two afterwards, a seat was formally set apart for the reporters.

When the Houses of Parliament were destroyed by fire in 1834, an exclusive gallery was allotted to the reporters in both chambers of the temporary structure in which the legislature held its sittings. This arrangement has been continued in the splendid new Palace of Westminster, in which the two Houses now hold their deliberations. In the House of Lords, the Reporters' Gallery faces the throne and the woolsack, and is one of the most prominent internal features of the edifice. Complaint having been made of the inaudibility of the speakers, their lordships appointed a select committee, examined the reporters, the architect, &c., and took all possible measures to make themselves heard in the gallery. In the House of Commons, the Reporters' Gallery is behind the chair. Both Houses provide them with rooms and other conveniences for transcribing their notes. In the Lower House, one of the committee rooms has been set apart for their use; and a room occupying the site of the old Star Chamber has recently been given to them for a club-room.

The modern process of parliamentary reporting may be best

described by a sketch of the arrangements made by the *Times* newspaper for a due and expeditious transcript of the debates. The *Times* parliamentary corps is sixteen in number, who are equally divided between the two Houses. When one House rises, the entire corps is available for duty in the other, so long as it sits. It thus happens that one of a series of reporters is constantly in the gallery of the Lords, and another in the Commons. Like sentinels, they cannot leave their places until they are relieved by a colleague, but this relief takes place with unvarying regularity every quarter of an hour. When both Houses are sitting, each reporter has thus an hour and three-quarters for the work of transcribing his shorthand notes for the printer—a sufficiently short interval, when it is remembered that a moderate speaker will fill three-quarters of a column, and a rapid speaker not unfrequently a column, in a quarter of an hour. When his turn again comes round, each reporter must be ready to resume the duty of note-taking, and afterwards that of transcription for the press. By maintaining this quick succession of reporters, the process of writing for the press is never interrupted until the whole debate of the evening in both Houses is in the hands of the printer. A long speech may thus be said to extend from the mouth of the speaker to Printing House Square.

A part will be wet with ink on the reporters' table; one section will be traveling over the Thames Embankment in swift relays of cabs; a portion, becoming larger every few minutes, will be in the hands of the compositors, and a proof-sheet ready printed, of the earlier passages, will be on the desk of the editor. On some few occasions, when a minister has been more than usually anxious to secure the accurate publication of important statements, a proof impression of a verbatim report of nearly the whole of his speech has been placed in his hands, to his extreme astonishment, as soon as he resumed his seat. The mechanical arrangements of the printing-office are equally designed to secure expedition and accuracy. The parliamentary system of the other morning newspapers resembles that of the *Times*, but as the numerical strength of their corps does not approach that of the leading journal in any case, the periods of note-taking and 'relief' proportionately vary.

The system of parliamentary reporting underwent a change of great importance about 1847, when the electric telegraph was brought into general use by companies formed to work it. They proposed to supply papers out of London with London news, and a report of parliamentary debates was part of the news thus supplied. In order to get this report, the Telegraph Company obtained admission to the gallery for its reporters, and thus broke the monopoly which the London daily newspapers had up to that time enjoyed. Subsequently, when the electric telegraphs passed into the hands of the government, the parliamentary reports for newspapers out of London were provided by press agencies, and the accommodation in the Reporters' Gallery had to be increased for them. With the growth of provincial newspapers, the demand for more reports than the agencies supplied was felt, and the more powerful newspapers endeavored to secure special reports for themselves by the assistance of reporters who were engaged on the London press. In this way they were able to get and publish reports often much longer than those printed in London. This, however, was only done at great inconvenience, and an effort was made to obtain for leading provincial newspapers a right of admission to the Reporters' Gallery. These claims were considered by a special committee of the House of Commons, which in 1879 reported in favor of them; and next year the long coveted privilege was granted.

A few years ago, the object desired by newspaper proprietors was not a literal report, but what may be called the spirit of a speech—a faithful abridgment, in fact, of the sentiment, matter, and style of the speaker. Parliamentary reports subsequently became more diffuse, the debates of a single evening not unfrequently occupying between 20 and 30 columns of small type. This, however, has not been maintained, and though much might be said against the reporting at great length of important speeches, there can be nothing said in favor of such condensation of all speeches as prevails in most of the London newspapers—the *Times* and the *Standard* being exceptions. This excessive condensation greatly strengthened the claim of the provincial newspapers for admission to the Reporters' Gallery, for they were not only willing but desirous of furnishing to the public fuller and better reports of the debates than the London papers supplied.

It only remains to say a few words respecting *Hansard's Parliamentary Debates*, the only publication since the *Mirror of Parliament* which professes to give all the speeches fully and accurately. We have already pointed out (see HANSARD) that no staff of reporters is engaged for this work, and that when members quote *Hansard*, for the purpose of convicting an opponent of inconsistency, they are fully aware they are citing from the report of some daily journal; but they take it for granted the passage has been specially brought under the notice of the speaker by the editor of that publication, and it is therefore presumed that the report is authentic.

In 1878 an arrangement was made between Mr. Hansard and the government, by which he undertook to supplement his reports by others taken by reporters in his employment who should have access to the gallery. This was not thought to be sufficient by some legislators, who desired an official report of the debates, that is to say, a verbatim report of all speeches. This was one of the questions submitted to the special committee to which reference has been made, and it indicated an opinion in favor of an arrangement by which Mr. Hansard's reports should be improved without being verbatim.

The constitutional importance of good and free parliamentary reporting can scarcely be overrated. It enables the entire people to be present, and in a manner to assist in the deliberations of parliament. The English orator addresses, indeed, not only the assembly of which he is a member, but, through it, the civilized world. Publicity has become one of the most important instruments of parliamentary government. Long before a measure can be adopted by the legislature, it has been approved or condemned by the public voice; and, living and acting in public, parliament under a free representation has become as sensitive to public opinion as a barometer to atmospheric pressure. See May's *Constitutional History of England*; Knight Hunt's *Fourth Estate*; Andrews' *History of British Journalism*; papers in *Chambers's Journal* in 1834; Grant's *The Newspaper Press* (1871); also article NEWSPAPER.

In continental countries enjoying constitutional government, official short-hand writers are usually appointed by the government to report the debates, and these reports may, under certain restrictions be transferred to the columns of the press. In the United States, particular speeches delivered in Congress are fully reported and generally read; but complaints are made by members that the New York and other journals do not give sufficient space to a report of the proceedings of Congress.

REPOUSSÉ, a French term applied to a peculiar method of ornamentation in metal-work, resembling embossing; but the effect is produced by hammering up the metal, which is generally thin, from the back, and when a rude resemblance of the figure to be produced is thus formed, it is worked up by pressing and chasing the front surface. The finest specimens of this art are of the *cinque-cento* or 16th c. period, by Benvenuto Cellini. Cellini carried the art to France, where it has of late been much developed. Much common repoussé work is done in Birmingham, in the soft white metals, such as pewter and Britannia metal; and as these are easily worked, and can afterwards be electroplated, so as to hide the quality of the material, they are in considerable demand. After they are hammered up from the inside, they are filled with liquid pitch, and set by until it becomes solid. Then they are modelled and chased on the surface, the pitch forming a support, which prevents the tools from pressing down more than is required. The pitch is afterwards melted and drained out, and a subsequent boiling in an alkaline lye completely cleans the work. Tea and coffee pots are the chief articles made in this manner.

REPRESENTA'TION, in Politics, the function of the delegate of a constituency in a legislative or other public assembly. The principle of representation, even when not directly recognized, must be presumed to have existed to some extent in all governments not purely democratic, in so far as the sense of the whole nation was considered to be spoken by a part, and the decisions of a part to be binding on the whole. The constitution of ecclesiastical councils, in which an express or implied representation is necessarily involved, doubtless conduced to the application of a similar principle to national assemblies; but it is in the exigences of feudalism that we trace the beginnings of an avowed and regulated system of political representation. The feudal superior who had to levy aid from his vassals, summoned a limited number of them to attend him, and confer regarding the required aid. The earliest complete system of representative institutions is to be found in the parliament of the Sicilies under the Swabian kings; but Britain is the only country in which a representative feudal assembly ripened into a legislative. As early as the reign of Henry III., we find the knights of the shire elected by the 'men of the country,' probably the king's military tenants, to consider, in the stead of each and all of them, what aid would be granted to the king for a proposed expedition into Gascony. Representatives of the burgesses were soon afterwards summoned, and were permanently ingrafted on parliament by Edward I. In Scotland, representative burgesses formed a part of the national assembly from the time of Robert Bruce's famous parliament at Cambuskenneth, in 1326; but down to a comparatively late period, the whole barons or freeholders of the country formed part of the king's council, and were entitled to attend in person.

A system of representation among them was attempted to be introduced by James I. on his return from England, but became practically inoperative; and it was not till 1587 that the represen-

tatives of the small barons came to form part of the parliament. The progress of society has led to great changes in the constitution of the elective body, the most sweeping being those introduced by the Reform acts. See PARLIAMENT, and REFORM, PARLIAMENTARY.

An important question naturally arises connected with the subject of representation: Is the delegate the mere mouthpiece of his constituents, who must give effect to all their opinions and interests, or is it his duty to exercise his trust in the first instance for the general welfare of the nation? The former idea of representation was doubtless the earlier one; but it cannot be easily vindicated on any proper theory of government; and it is now the generally recognized doctrine among English statesmen, that a member of the House of Commons is bound to the entire nation by ties higher than those which bind him to his constituents, and that he ought to support such measures as he judges most beneficial to the country, even at the risk of prejudicing the immediate local interests of the body which sends him. It is therefore not very easy to reconcile with sound principles the usage which obtains so largely of demanding pledges from candidates for representation as to how they are to vote on every public question that is likely to come before them. Yet there is practically a difficulty in preventing a system of representation from becoming one of mere delegation, so long as the constitution gives to the electors the power of making their vote depend on any conditions which they may think fit to attach to it.

Most speculative politicians of the present day consider a representative government of some description as the best ideal type of government; but all repudiate the idea of an inborn right in all citizens to participate, and still more to participate equally, in the right of choosing the governing body. Any very extensive suffrage must of necessity lead to the predominance of mere numbers over intelligence, while a very limited suffrage has been objected to as doing away with the benefits which the community at large are presumed to draw from a participation in public functions. Several intelligent political writers, while advocating a widely extended suffrage, have proposed a graduation of that suffrage by giving to each individual a number of votes corresponding, as far as practicable, to his intelligence, property, and social position. This is doubtless the perfect ideal of representative government, and the chief question is, By what test can the best approximate estimate of social value be arrived at? Two different schemes for this purpose have been proposed by Mr. J. S, Mill and Professor Lorimer respectively—the former founded mainly on intelligence as indicated by instruction, and the latter on wealth and social position. The attention of political writers has also lately been directed to the question of the representation of minorities, who at present are not even allowed a hearing in representative assemblies. The most feasible scheme for this purpose is perhaps that of Mr. Hare, which had the approval of Mr. J. S. Mill, by which those who do not like the local candidates, are to be allowed to fill up voting papers by a selection from the names of any persons on the list of candidates, with whose general political principles they sympathize. This system, along with its other advantages, would, it is supposed, bring into parliament numerous men of able and independent thought, who, by the present system, refrain from offering themselves, as having no chance of being chosen by the majority of any existing constituency. See J. S. Mill, *Representative Government* (1861); Lorimer, *Political Progress not necessarily Democratic* (1857); Hare, *The Election of Representatives* (1860); Walpole, *The Electorate and the Legislature* (1882); Traill, *Central Government* (1882).

REPRIE'VE (Fr. *reprendre*, to take back) is the suspension of punishment for a crime, and is used chiefly in connection with capital crimes. The power of suspending all sentences at any time is vested in the crown at discretion. There are also several grounds on which the judge or a court reprieves a sentence. One is, where the judge is not satisfied with the verdict, or is doubtful of the validity of the indictment, in which case he reprieves the sentence, in order to give time for some application to the crown. Moreover, an ordinary ground of reprieve is acted on generally as a matter of course, whenever the prisoner is a pregnant woman, and pleads that fact, in which case it is considered only merciful towards the offspring to put off the execution of the sentence until after her delivery. This was the law of ancient Rome; and nothing connected with the memory of Queen Mary is more detestable than the bloody proceeding in her reign of burning a pregnant woman in Guernsey, when the child, which was born at the stake, was cast into the fire as a young heretic. When a woman pleads her pregnancy as a reason for reprieve, the practice is for the judge to empanel a jury of 12 matrons, or discreet women, to inquire into the fact, and if they bring in a verdict of 'quick with child,' execution is stayed as a matter of course, from session to session until the delivery. Another cause of reprieve is the insanity of the prisoner, for if before execution it appear the prisoner is insane, whether the insanity supervened after the crime or not, the judge ought to reprieve him.

REPRI'SAL is the retaking, from an enemy, goods which he has seized, or the capture from him of other goods, as an equivalent for the damage he has wrought.—A *reprise* is a ship recaptured from an enemy or pirate. If recaptured within 24 hours of the hostile seizure, she must be wholly restored to her owners; if later, she becomes the lawful prize of her recaptors.

REPRISALS, LETTERS OF, the same as LETTERS OF MARQUE (q. v.).

REPRODU'CTION, or the propagation of organized beings in the animal kingdom, is accomplished by three different processes. The first of the three processes by which the multiplication of individuals takes place consists in the division of one organism into two, each of these, again, dividing into two others, and so on. This is termed *reproduction by fission*. The second mode of increase consists in the formation of a bud at some part of the body of the animal. This bud gradually approximates in form to that of the parent from which it springs; its pedicle or stem gradually disappears; and the liberated bud ultimately assumes a perfect form, resembling in all respects the parent from which it sprung (*gemmation*). The third mode is far the most complicated. In it the new organism results from a series of changes occurring in an impregnated egg or *ovum*. For this process, distinct sexual organs, both male and female (which, however, may be associated in the same individual, although in all the higher animals they occur in distinct individuals), are required; a female organ for the production of cells termed 'germs,' and a male organ for the production of certain cells termed 'spermatozoa.'

It is from the union (either within or without the body) and the mutual action of these cells—the germ and the spermatozoon—that the impregnated ovum results. The new resulting body is altogether different from either of the cells which took part in the production. This is the ordinary form of reproduction in all the higher animals and may be termed *true generation*, in contradistinction to the previous forms of *reproduction by multiplication*. The terms *Digenesis* and *Heterogenesis* have been applied by recent physiological writers to designate the form of reproduction in which the contact of germs and spermatozoa gives rise to fecundation; while the terms *Monogenesis* and *Homogenesis* have been similarly applied to the cases in which non-sexual reproduction takes place by fission or gemmation.

Fissiparous multiplication is best illustrated by a reference to the Infusoria. It may be either longitudinal, as commonly occurs in



Fig. 1.—Longitudinal Fission of Vorticella.

Vorticella; or transverse, as occurs in *Stentor;* or indifferently longitudinal or transverse, as in *Chilodon*, *Paramecium*, &c. The joints of tape-worms multiply in this manner, and when sufficiently developed, become free. Amongst some of the Annelids, or true worms, reproduction of this kind in a somewhat modified form is also observed. This was first noticed in a *Nais* by the

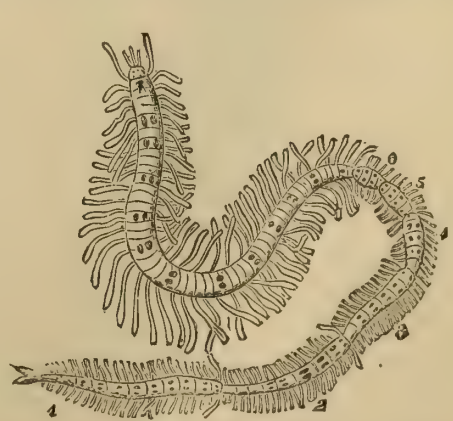


Fig. 2.—*Myriana*, with six new individuals formed on it.

Danish naturalist Müller, by whom it was regarded as a rare and accidental occurrence. The more recent researches by De Quatrefages and Milne-Edwards, have, however, shown that the process is one of far more significance than Müller supposed.

In the genus *Syllis*, De Quatrefages noticed the following

appearances: When one of these worms is about to reproduce itself by fission, a number of rings become developed at its posterior extremity, and there is a notch or groove between the first of these rings and the part in front of it. The first ring soon becomes organized into a head provided with eyes and antennæ. The two annelids, parent and offspring, continue, however, to be united by the skin and intestine in such a manner that the latter animal lives solely upon the food swallowed by the former. During this period, each possesses independent life, for a struggle may often be observed between the two, each wishing to go its own way. After the lapse of a certain time, the body of the offspring becomes distended with ova in some cases, and with spermatozoa in others, while neither of these structures is to be seen in the body of the primary animal. Complete division is at length effected, and the offspring is free. In a few days, however, their bodies burst, from the distention caused by their contents. Ova and spermatozoa are thus diffused through the water, and fecundation thus takes place. In the genus *Myrianida* (*Autolytus*, according to Grube's classification), Milne-Edwards has seen no less than six new individuals (instead of a single one, as in *Syllis*), formed in gradual succession, one before the other, between the two terminal segments of the original body. Each of these new individuals, as it arrived at maturity, and acquired the external form (in reduced dimensions) of the parents, was found to be possessed of reproductive organs, of which the original animal was totally devoid. The youngest and smallest individual is the most remote from the tail.

In these instances, multiplication by division occurs as a *natural* process, but there are many cases in which *artificial* division gives rise to multiplication. Bonnet having found that a certain kind of small worm, when cut in two, reproduced a tail at the cut extremity of the cephalic half, and formed a head upon the caudal half, increased the number of sections, and finally succeeded in dividing one worm into twenty-six parts, almost all of which acquired a head and tail, and thus became distinct individuals. Corresponding results may be obtained by dividing a planaria or actinia into many segments.

Reproduction by gemmation is a phenomonon of very frequent occurrence in the lower departments of the animal kingdom. In the lowest of the animal subkingdoms, the PROTOZOA, it occurs in the *Rhizopoda*—viz., in the *Foraminifera;* in the *Spongiæ*, being probably the most common form of reproduction in sponges; and in the *Infusoria*, as, for example, in *Vorticella*. In the CŒLENTERATA, it is of almost general occurrence in the classes *Hydrozoa* and *Actinozoa;* and in the MOLLUSCOIDS it occurs in *Polyzoa* and in *Tunicata*. In the accompanying figure (fig. 3), the process is shown as it occurs in the *Hydra fusca*, a freshwater hydra (the type of the *Hydrozoa*). If some hydras are kept for a few days in a glass of their native water, knot-like excrescences will be seen on their bodies. These are the buds or *gemmæ*, which rapidly enlarge, and each by degrees assumes the appearance of a young hydra, tentacles appearing about the mouth, just as in the original animal.

For some time, a portion of the food (minute infusoria, entomostraca, &c.), caught and digested by the parent, passes into the body of the offspring; but when the tentacles are sufficiently developed, the young polype catches food for itself, and when it is sufficiently matured to commence an independent existence, the connecting pedicle gives way, and the young animal is free and independent, its posterior aperture of communication soon closing up.

It must be distinctly understood that the fact of an organism reproducing itself by fission or gemmation does not by any means exclude the possibility that it may also be reproduced by fecundated ova. That this is the case, is indeed shown in the instance of the worm *Myriana*. The Hydra too increases by ova, and it may be cut in pieces, each of which becomes a perfect animal. Other corroborative cases might be given.

In *true generation*, two special organs are required—a female organ for producing the germ cell or ovum, and a male organ for producing the sperm-cell or spermatozoon; and each form of generative apparatus consists of two parts, of which one is a formative organ—in the female, termed an *ovarium*, or ovary, and in the male, a *testis*—in which the reproductive cells are formed, and which is essential; and an efferent duct, by which the products of secretion are carried off. The male and female organs may exist in separate individuals, or they may co-exist in the same individual, giving rise to the condition known as *Hermaphroditism* (q. v.). The former condition is termed *bisexual* or *diœcious*, and the latter *unisexual* or *monœcious*. For a general description of the changes which take place in the impregnated egg, the reader is referred to the article DEVELOPMENT OF THE EMBRYO.

We shall conclude with a brief notice of the mode or modes of reproduction in the different classes of animals, beginning with the lowest.

In the subkingdom PROTOZOA, reproduction takes place usually by fission, occasionally by gemmation; but no satisfactory instances of true sexual propagation by means of ova and spermatozoa are known, those cases described in certain Infusoria not having been confirmed by subsequent observers. It is worthy of notice, that in the Infusoria, propagation is effected in no less than three different ways—viz., by the two processes already described, and by a process known as 'encystation.' See INFUSORIA.

In the subkingdom CŒLENTERATA, it is found that both the Hydrozoa and the Anthozoa multiply by gemmation, by a true reproductive process, and in a few genera by fission.

In the ECHINODERMATA, fission has been observed in one class, the Holothuroidea, which, moreover, have distinct sexual organs combined in the same individual. In the other classes—the Echinoidea, Asteroidea, and Crinoidea—the sexes are separate, and generation only takes place by the union of germs or ova and spermatozoa.

In the ANNELIDA, true generation takes place, although as has been already shown, multiplication sometimes takes place by fission. In the lower *Mollusca* or *Molluscoids*, multiplication takes place by gemmation and by true generation; while in the higher *Mollusca*, multiplication only takes place by true generation.

In the ARTICULATA—Insects, Crustaceans, &c.—distinct generative organs are always present, and, excepting in one class of Crustaceans—the Cirrhopoda—the sexes are distinct.

In the VERTEBRATA, we meet with the highest and most complex development of the generative function. In them, with a doubtful exception in the case of one or two genera of fishes, the sexes are always distinct.

The *osseous* and *cartilaginous* fishes present important differences in their reproductive organs and in their modes of reproduction. In the osseous fishes, the essential female organ—the ovary, or roe—consists of a large membranous bag, usually in two lobes, but sometimes single. When distended with ova, this organ fills the greater part of the abdominal cavity, and its lining membrane is arranged in folds, wherein the ova are formed and retained until sufficiently ripe for expulsion. They then escape into the ovarian cavity, and are expelled in almost incredible numbers through a special opening immediately behind the anus and in front of the urinary canal. As a general rule, the ova of fishes are impregnated after their expulsion; and in order that the impregnation of a sufficient number of eggs may be secured, the male secretion of fishes—the fluid containing the spermatozoa—is very abundant; the male secreting gland, which in fishes is termed 'the milt,' or 'soft roe,' being equal in bulk to the ovary of the female. In a few instances, however, the young are hatched in the ovary, and grow to a considerable size before they are born, and in these cases—as, for example, in the viviparous blenny—impregnation must take place internally.

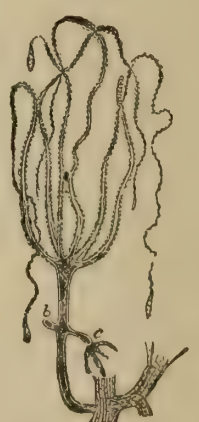


Fig. 3.—*Hydra-fusca*, with a young bud at *b*, and more advanced bud at *c*.



Fig. 4.—The Egg of Cartilaginous Fish, opened so as to show the young animal.

In the cartilaginous fishes—as the sharks and rays—the generative organs are of a higher type. The eggs are here always impregnated within the body of the female, the male having special organs by which true sexual congress is effected, and the ovaries form two large racemous bunches, placed on either side of the spine. The eggs are large in size, and comparatively small in number; and as each egg escapes from the ovary, it is seized by a true oviduct, which furnishes it with additional protective coverings. About the middle of this tube 'there is a thick glandular mass, destined to secrete a horny shell, in which the yelk and white of the egg become incased. The egg, when completed, has somewhat the shape of a pillow-case, with the four corners lengthened out into long tendril-like cords, whereby the egg is entangled amongst the seaweed at the bottom of the ocean. A

brittle egg-shell would soon be destroyed by the beating of the waves; hence the necessity for the corneous nature of the envelope; and yet how is the feeble embryo to escape from such a tough and leather-like cradle? This has likewise been provided for. The egg remains permanently open at one extremity; the slightest pressure from within, therefore, separates the valvular lips of the opening, and no sooner has the little shark thus extricated itself from its confinement, than the two sides close so accurately, that the fissure is imperceptible.'

In the *Amphibia* or *Batrachia*, the sexes are more closely associated than in the osseous fishes, the ova being generally impregnated as they escape from the oviduct. The mode of reproduction of some amphibians is remarkable and anomalous. See PIPA.

In the true *Reptiles*, the male sexual organs become more perfect, instruments being given to facilitate the impregnation of the female.

In *Birds*, the generative organs present a close analogy to those of the higher reptiles. There is only a single ovary (the left) that has a bunch-like or racemous appearance; the right, with its oviduct, being always atrophied or rudimentary—a remarkable violation of symmetry, resembling that which occurs in the lungs of serpents. As prolonged utero-gestation would be incompatible with flight, incubation here attains its highest perfection.

In *Mammals*, a new organ for the first time appears, from which that important class derives its name. In most of them (see MAMMALIA and PLACENTA), a temporary organ, termed the Placenta, is also formed, by which the fœtus is nourished during uterine existence.

Huxley's *Comp. Anat. of Invertebrated Animals*, p. 27; and Balfour's *Comparative Embryology*.

REPRODUCTION IN PLANTS. See PLANT, VEGETABLE PHYSIOLOGY, and FECUNDATION.

REPTILES (Lat. *repo*, I creep), a class of Vertebrates distinguished from Amphibians (q. v.) by never possessing gills, but by breathing by lungs throughout life, by the usual presence of an exoskeleton, by the possession of only one occipital condyle, and numerous other characters—chiefly osteological. They agree in structure much more closely with birds, which Huxley has shown to present only a modification of the reptilian type, and with which he has accordingly united them into the group *Sauropsida*. They are distinguished from birds chiefly by the exoskeleton taking the form of scales or scutes, but never of feathers, by the fore-limb possessing more than three digits, by the slight development of the pelvis, the separateness of the metatarsal bones, and the cold blood. They are divided into nine orders, of which the first four only exist at the present day, and the remaining five are extinct: 1. *Lacertilia* (lizards, chamæleons, blind-worms, &c.); 2. *Crocodilia* (alligators, crocodiles, gavials); 3. *Ophidia* (snakes); 4. *Chelonia* (tortoises and turtles); 5. *Ichthyosauria* ('fish-dragons'); 6. *Plesiosauria* (the so-called 'swan-dragons'); 7. *Dicynodontia* (with walrus-like teeth); 8. *Pterosauria*, or pterodactyls (the so-called 'flying dragons'); and 9. *Ornithoselida*, or bird-like reptiles (iguanodon, &c.), which were almost perfectly intermediate between the ordinary reptiles and the birds.

With the exception of the tortoises, the reptiles in general are of an elongated form, the body being often nearly cylindrical, and usually terminating in a very long tail. In a considerable number (as the serpents and some of the lizards) no traces of limbs are apparent; in some (as certain lizards), the limbs are rudimentary; while in the remainder the limbs are fully developed, although not to the extent to which development takes place in birds or quadrupeds, as the feet rarely suffice to keep the belly from the ground. The outer covering of the body presents several well-marked varieties. In a few of the lizards, the skin is covered with regular scales, composed of a mixture of bony and horny matter, and lying over each other like those of fishes; in most lizards and in serpents, there are scales and plates developed on the surface of the corium or true skin, and covered over with epidermis, which is thrown off at intervals, the moult forming an accurate cast of the body of the animal; while in the crocodiles and tortoises the scales are converted into true bony plates, which in the former are embedded in the tissue of the skin, and in the latter are united with the ribs, sternum, &c., of the internal skeleton, to form the complete bony case into which the head and limbs of the animal can be retracted.

The skeleton is completely ossified in all reptiles, and presents many points of interest to the philosophical anatomist, into which we have not space to enter. In the skeleton of the crocodiles and lizards, there is an obvious distinction of the regions of the neck, trunk, and tail. The total number of vertebræ is often great, but it is chiefly in the caudal region that the excess occurs; there being 36 caudal vertebræ in the crocodile, and 115 in the monster lizard. In the serpents, the vertebral column is more abundantly subdivided than in any other animal; the number of vertebræ in the python being 422, of which about six-sevenths possess ribs articulated to their bodies by a ball-and-socket joint. By the motion which is thus allowed to the ribs, they become in some degree instruments of progression. In the reptiles generally (excepting the tortoises), one surface of each centrum (or body) of the vertebræ is concave and the other convex; while in the tortoises these surfaces are flat. The true skull is small, the bulk of the head being made up by the jawbones. As the sutures separating the individual bones never become obliterated, the reptilian skull is well adapted to illustrate the true structure of the vertebral skeleton.

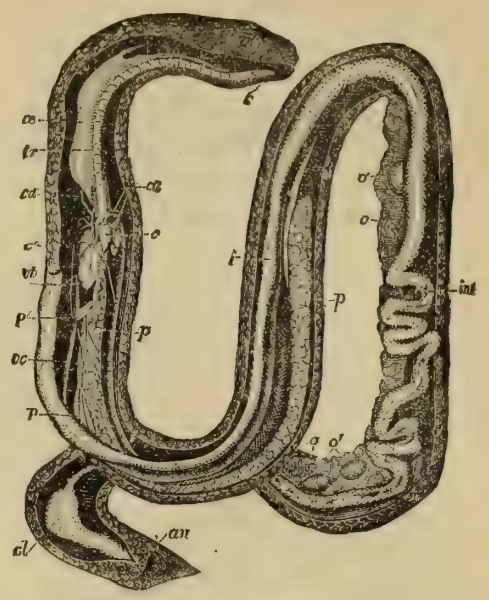


Fig. 1.—Anatomy of a Serpent:

t, tongue and glottis; *œ*, œsophagus (partly removed, to show heart, &c.); *tr*, trachea; *ca*, *ca*, carotid arteries; *c*, left auricle; *c'*, right auricle; *vt*, ventricle of heart; *vc*, vena cava inferior; *p*, *p*, principal lung; *p'*, rudimentary lung; *i*, stomach; *int*, intestines; *cl*, cloaca; *an*, anus; *o*, ovary; *o o'*, ova.

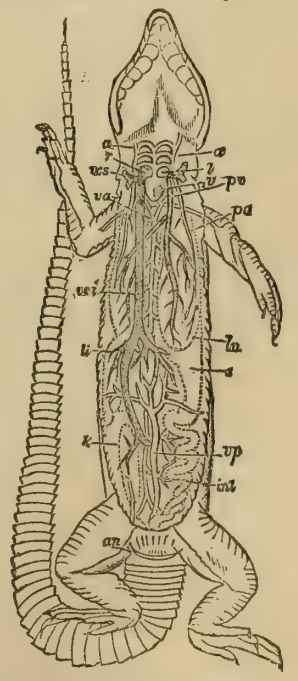


Fig. 2.—Anatomy of Lizard:

a, *a'*, arches of the aorta; *r*, right auricle; *l*, left auricle; *v*, ventricle; *vcs*, vena cava superior; *vci*, vena cava inferior; *va*, ventral aorta; *pv*, pulmonary veins; *pa*, pulmonary arteries; *lu*, lung; *li*, liver and hepatic vein; *k*, kidneys and renal vessels; *vp*, vena portæ; *s*, stomach; *int*, intestines; *an*, anus.

In fig. 3, we have the skull of the crocodile; in fig. 4, that of a serpent; and in both, the corresponding bones are indicated by the same references. 1 is the *principal frontal*, divided in the serpent into two parts; 2, 2 are the *anterior*, and 4, 4 the *posterior frontals;* 7 is the *parietal bone*, which is usually single in reptiles;

12, 12 are the *mastoid bones* (homologous to the mastoid process in man); 17, 17 are the *intermaxillaries;* 18, 18 are the *maxillaries;* 20, 20 are the *nasals;* 23 is the *temporal bone* (corresponding to the squamous portion of the human bone); 34, 35, 36, 37 are the *dental*, the *articular*, the *angular*, and the *opercular* portions of the *inferior maxilla*, or lower jaw; *a* is the *tympanic bone*, which supports the drum of the ear; *b* is the *zygomatic* or *malar* bone; and *c*, *c* the *lachrymals*. The lower jaw (except in the tortoises) presents the peculiarity of being composed of a number of separate pieces; there being four or five in each half jaw in serpents, while in crocodiles and lizards each half is divided into at least five, and generally six pieces, which are united by suture. The four most important of these are shown in fig. 3. The purpose of this



Fig 3.—Skull of Crocodile.

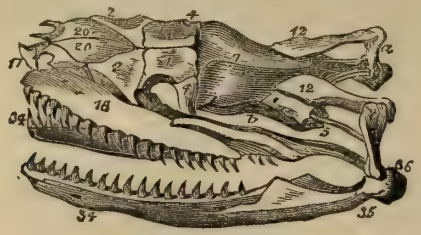


Fig. 4.—Skull of Serpent.

arrangement are probably (as Dr. Buckland suggested in his *Bridgewater Treatise*) to diminish the risk of fracture, which would otherwise attend the snapping together of their elongated jaws.

The bones of the extremities, except in the serpents, which have no limbs, correspond with those occurring in the higher vertebrata.

The mouth, except in the Chelonians, is usually provided with conical teeth, adapted rather for seizing and holding prey, than for dividing and masticating food. These teeth, like those of fishes, are successional; that is to say, new teeth are being constantly developed, whilst the older ones are regularly shed. In the crocodiles, three, or even four generations of teeth, sheathed one within the other, may often be seen in the same socket. In some instances, the teeth are attached solely to the jaws, while in others they are also attached to the pterygoid or palate bones. In Chelonians, the teeth are replaced by a horny beak, which, according to the habits of the animal, is adapted for bruising as well as cutting, and which in some species constitutes a somewhat formidable weapon.

The digestive organs present less marked differences than the osseous system. With the exception of certain Chelonians, all reptiles are carnivorous, and swallow their prey whole. Hence the jaws are adapted, by their mobility and subdivision into segments, to open very widely, and the œsophagus is capable of great dilatation. The tongue is commonly free, elongated, and bifid, except in the crocodiles, in which it is immovable; whence the popular idea that these animals do not possess this organ. The stomach is sometimes scarcely larger than the œsophagus and intestines (as in serpents), while in other cases it forms a sac of considerable size. In either case, it is capable of great dilatation. A liver, pancreas, and spleen are always present, the two former glands pouring their secretions into the upper part of the intestine, which is short, wide, and not much twisted, and divided into two portions, corresponding to the small and large intestines of mammals, by a valve. It finally terminates in a wide cloaca, into which the ducts of the urinary and generative organs usually open. The anal aperture of this cloaca is *transverse* in serpents and lizards, and *longitudinal* in crocodiles and tortoises. These peculiarities in the anal aperture are accompanied by remarkable differences in the external generative organs of the male, and seem to divide the class into two great sections.

It is in their circulating and respiratory organs that reptiles present the most marked characteristics. Like birds and mammals, they breathe air, but like fishes, they are cold-blooded. The reason why they are unable to sustain a fixed temperature above and independent of that of the surrounding medium, is due partly to the arrangement of blood-vessels (see CIRCULATION), and partly to the structure of the lungs. The lungs are usually of large size; but as they are not subdivided, as in mammals and birds, into innumerable microscopic air-cells, the real aërating surface is comparatively small. In several orders, they are merely capacious bags, whose vascular or aërating surface is but slightly increased by sacculi developed in their cells. In serpents, the pulmonary arrangement is singular, one lung (usually the right one) being of extraordinary length, while the other remains altogether rudimentary. It is in the tortoises and crocodiles that the lung is most highly developed; but if the reader will compare the accompanying figure of the lung of the turtle with a section of any mammalian lung, he will at once perceive the striking difference. This inferiority of the respiratory apparatus of reptiles is further shown in the absence of those means for the continuous introduction and expulsion of air which are observed in birds, and still more in mammals, and which are described in the article RESPIRATION.

The cerebral portion of the *nervous* system in many respects resembles that of fishes, but the cerebral hemispheres are larger in proportion to the optic lobes, while the cerebellum is usually smaller. The organs of the senses are better developed than in fishes. The eye is always present in reptiles, and presents no remarkable peculiarity. We here first meet with a special arrangement for the protection of this delicate organ; 'for while in serpents the skin of the head passes continuously in front of the



Fig. 5.—Section of the Lung of the Turtle (reduced).

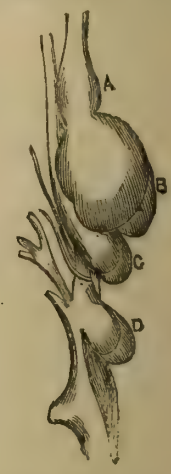


Fig. 6.—Brain of Turtle: A, olfactive ganglia; B, cerebral hemispheres; C, optic ganglia; D, cerebellum.

eyes, merely becoming transparent where it covers the cornea, it is doubled in most other reptiles into two folds, constituting the upper and lower eyelids, which can be drawn together by a sphincter muscle; and we also find a rudiment of a third eyelid, formed by an additional fold of membrane at the inner angle, which is so completely developed in crocodiles as to form a nictitating membrane, that can be drawn completely across the eye as in birds, by a muscle specially adapted for that purpose.'—Carpenter's *General and Comparative Physiology*, 3d ed. p. 495. The organ of hearing is more highly developed than in fishes or amphibia. There is no external auditory canal, the membrane of the tympanum being covered externally by the integument of the head. The senses of taste and touch are probably obtuse in most animals of this class, and from its structure, the tongue is probably rather an organ of touch than of true taste.

All reptiles are *oviparous* animals. Certain species, however, retain their ova in a sort of uterine cavity, formed by a dilatation of the oviduct near its termination in the cloaca, until the development of the embryo is so far advanced that the enveloping membrane bursts previously to the expulsion of the ovum, so that the young are actually born alive—a mode of generation to which the term *ovo-viviparous* is applied. The eggs are relatively large, and are furnished with a very large yelk, for the nutrition of the young animal. They are enclosed in a parchment-like shell, which contains very little calcareous matter. They are usually deposited in warm sandy places, well exposed to the sun, or in dunghills, in which the heat induced by the putrefactive process facilitates the final stage of embryonic development. Lizards lay from 8 to 12 eggs, serpents from 10 to 50, tortoises from 20 to 26, and crocodiles from 20 to 60. In this respect they differ widely from the amphibia, some of which lay as many as 1200 eggs. The common opinion that, after the expulsion of the eggs, the reptiles take no further care of their progeny, is erroneous. Crocodiles and lizards have been observed to watch the places which they have chosen as their nest; and the pythons (at all events, when in captivity) coil themselves around their eggs, and keep up a temperature very considerably above that of the

surrounding medium. The sexes are always separate; and the male generative organs, which are far more highly developed than in amphibians, present peculiarities which, in association with the position of the anal aperture, have been adopted by zoologists as a basis of classification.

In relation to their *habitat*, it may be observed that most of the tortoises and certain serpents are essentially aquatic animals (some inhabiting fresh, and some salt water), which rarely seek the land except for the purpose of laying their eggs. Serpents, however, as a general rule, affect moist places in the neighborhood of water, although some are inhabitants of dry sandy deserts. Lizards for the most part frequent the sandy districts of hot and tropical regions, and either burrow in the ground or live in holes in trees, walls, &c. Reptiles generally predominate in the warmer regions of the globe, in which alone the largest kinds are to be found. In the northern countries, comparatively few species are found, and these pass a great portion of the year in a state of Hibernation (q. v.) or torpidity. Dr. Carpenter puts down 2000 as about the probable number of existing species of reptiles. Schinz states that in Europe there are 7 tortoises, 33 serpents, and 35 lizards. See Dumeril and Bibron, *Erpétologie Générale, ou Hist. Nat. Complète des Reptiles* (Paris, 1834—1854, 9 vols.); also (see summary) Huxley, *Anatomy of Vertebrated Animals* (London, 1871.)

REPU'BLIC (Lat. *res publica*, the public good), a political community in which the sovereign power is lodged, not in a hereditary chief, but either in certain privileged members of the community, or in the whole community. According to the constitution of the governing body, a republic may therefore vary from the most exclusive oligarchy to a pure democracy. The several republics of Greece, and that of Rome were, at the outset at least, aristocratic communities. The medieval republics of Venice, Genoa, and the other Italian towns were also more or less aristocratic.

The sovereign power was held to be vested in the franchised citizens, and every function—legislative, executive, or judicial—not exercised directly by that body, could only be exercised by parties deriving their authority from it. But the extent of the franchise, and the mode of exercising it, varied much in these civic communities; and the most prosperous and long-lived was Venice, which was also the most aristocratic of them all. In the 16th c., the Seven Provinces of the Netherlands, on their revolt from Spain, adopted a republican form of government, as did Switzerland on becoming independent of the German empire. Great Britain was nominally a republic for eleven years (from 1649 to 1660). France was a republic from 1793 to 1805, and from 1848 to 1853; and the republic was again proclaimed 4th Sept. 1870. Such government as Spain had between Feb. 1873 and Dec. 31, 1871, was of a republican form. Switzerland is also a republic; since 1848 more democratic than formerly. The other republics of Europe are the diminutive states of San Marino and Andorra; and, in certain respects, the free cities of Hamburg, Bremen, and Kübeck. The most important of modern republics is that of the United States of America—dating from its separation from Great Britain—where pure democracy has been tried on a scale unknown elsewhere. Except during the short-lived empire from 1863—1867, Mexico has been a republic since 1824.

Nine republics at present exist in South America—Peru, Chili, Paraguay, Bolivia, Colombia or New Granada, Venezuela, Ecuador, Uruguay, and the Argentine Confederation. In the republics of the ancient world, the franchised classes exercised their power directly without any system of delegation or representation. The same was at first the case in the Swiss cantons, where, however, representative government has been gradually introduced. Modern republics have been founded on the representative, not the direct system, which can hardly exist except in a community that is very small and concentrated as to space. Switzerland and the United States of America are *federal* republics, consisting of a number of states bound together by a treaty, so as to present to the external world the appearance of one state with a central government, which has the power of enacting laws and issuing orders which are directly binding on the individual citizens.

REPU'BLICAN, a party name in American politics, which has had at different times different significations. At the adoption of the Federal Constitution in 1787, and while its ratification by the several states was under discussion, the country was divided into two parties—the Federalists, headed by Washington and the elder Adams; and the Anti-federalists (who afterwards took the name of Republicans), under the lead of Jefferson and Madison. The Federalists were in favor of a strong centralized government; the Republicans advocated the sovereignty of the States and the rights of the people; and finally secured those amendments and additions to the Constitution which were intended to guarantee state rights, and which declared that all powers not expressly granted to Congress by the Constitution, are retained by the States or the people.

During the French Revolution and the wars which succeeded it, the Federal party sympathized with England, while the Republicans favored the French; and being in power, under the presidency of Mr. Madison, declared war against England in 1812, a measure which the Federalists violently opposed, going so far in the Hartford Convention as to threaten a dissolution of the union. During the political excitement of this period, when the excesses of the French revolution had thrown a certain degree of odium upon its supporters, the Republicans were stigmatized by their opponents as Democrats. The name, given as a reproach, was soon adopted; and the party of Jefferson and Jackson called itself Democratic Republican, and its members were usually called Democrats; while the name of Federalist having become unpopular by the opposition of the party to the war with England, it adopted the designation of National Republicans, and some years later, of Whigs, which was the name taken by the 'disloyal' party in the War of Independence, the 'loyal' party being called Tories. The Whigs of 1840 repudiated alike the principles and name of the Federalists; they professed to be followers of Jefferson, and called themselves Democratic Whigs.

In the effort to elect Mr. Fremont in 1856, and in the election of Mr. Lincoln in 1860, the Whig party, deserted by many of its more conservative members, known as Old Whigs, but reinforced by a larger number of Free-soil Democrats and Abolitionists, adopted the name of Republicans, and were called by their opponents Black Republicans, from their anti-slavery tendencies. In the presidential contest of 1864, the Republicans, hoping to secure the support of the War or Union Democrats, adopted the name of the 'Union Party,' while they went further than the ancient Federalists in support of a strong centralized government. The Federalist, National Republican, Whig, and Republican party, has been essentially the same, and for the most part a New England or Northern party—its principal leaders having been John Adams, Josiah Quincy, Alex. Hamilton, Daniel Webster, Henry Clay, Wm. H. Seward, Abraham Lincoln, and Ulysses Grant. The Democratic party has its centers in Virginia and New York, and was the party of Jefferson, Madison, Jackson, Calhoun, Van Buren, Polk, Pierce, Buchanan. The former party advocated a construction of the Constitution favorable to the powers of the Federal government, a national bank, and a high protective tariff; the Democratic party, on the other hand, held to a strict construction of the Constitution, a careful limitation of the powers of the central government, an independent treasury, a specie currency, and free-trade, or a tariff for revenue only. There was, 30 years ago, a respectable Whig minority in most of the Southern States, and in two or three, Whig majorities; but when the Whig party adopted abolition, and took the name Republican, every southern state voted with the Democratic party.

Since the civil war, the people of the Southern States have been still more closely attached to the Democrats.—Other party names met with in American political writings are of a local, factional, or temporary character. 'Blue-light Federalist' was a name given to those who were believed to have made friendly signals to British ships in the war of 1812. 'Barnburner' was applied as a term of reproach to a section of the democracy supposed to be in sympathy with the 'Anti-renters.' The 'Soft Shells' were 'Free-soil' Democrats, in favor of excluding slavery from the territories and future states of the Union; while the 'Hard Shells' were in favor of what they held to be the rights of the South. The more widely known name of 'Locofoco,' applied to, and good-naturedly accepted by the Democratic party, arose from the fact, that a meeting of a section of the party in Tammany Hall, its New York headquarters, having been deprived of light by the turning off of the gas, at the order of the party-managers, lighted up the hall with candles, by the aid of lucifer or loco-foco matches, and so passed its resolutions. 'Copperhead,' the name of a venomous serpent, was applied to the peace party by the advocates of the war for the Union.

REPU'LSION, like Caloric, Luminous Corpuscles, and other crude hypotheses of medieval times appears to be doomed to speedy extinction. The apparent repulsion between the particles of a gas, in virtue of which it exerts pressure on the containing vessel, is now known to be due to motion (see HEAT). A wet cork and an oiled one, floating on water, repel each other—a phenomenon fully accounted for by capillary *attraction;* as is that of the apparent repulsion of mercury by glass, which is shown to be due to the fact, that mercury attracts itself more than it attracts glass. No one now believes that a balloon rises while a stone falls, because the former is repelled, and the latter attracted, by the earth. The last is a very good example, because it clearly shows how apparent repulsion may be the result of attraction. The earth attracts the balloon *less* than it attracts an equal bulk of the medium (air) in which it floats; and, consequently, the pressure of the air on the balloon is more than sufficient to support its weight. The moon raises tides not only on the side of the earth nearest her, but also on that furthest from

her. No one imagines that she attracts the nearer water, and repels the further. We know that she attracts the nearer water more, and the further less, than she attracts the earth; and that the apparent repulsion is thus merely a difference of attractions.

It is not quite so clear how we are to account generally for repulsion in Electricity (q. v.), Magnetism (q. v.), and Electro-magnetism (q. v.), though many of these phenomena are known (especially by the beautiful experimental researches of Faraday) to bear explanations precisely analogous to that of the balloon above alluded to. There are also very curious problems, apparently involving repulsion, connected with the behavior of the tails of comets. But it is reasonable to suppose that, in all probability, we shall soon be able to account for all these phenomena by simple differences of attraction on the body influenced and the medium which surrounds it. Our real difficulty will thus be reduced to the explanation of attraction itself, which promises to be a problem of a far higher order of complexity. For an account of some of the modern speculations on this subject, see FORCE.

REPU'TE, in Scotch Law, is used sometimes as a technical term, which it is not in English law. Thus, a habit and repute thief is one who, as a matter of fact, is notoriously a thief. So habit and repute marriage is a marriage constituted between parties who have notoriously lived as man and wife, and are supposed by neighbors and friends to be married, though there never was a regular marriage.

REPU'TED O'WNERSHIP is a phrase used in the English Bankruptcy Law to denote that the bankrupt at the time of his bankruptcy was apparently the owner of goods in his possession. The general rule is, that whatever belonged to the bankrupt at that date goes to his assignees in bankruptcy, for the purpose of sale, and distribution of the proceeds among his creditors. But as a trader often has the goods of others in his possession with their consent, and thus has the appearance of a greater capital or stock than he possesses, and thereby obtains greater credit than he would otherwise do, it is provided by the Bankrupt Act that if the bankrupt at the date of his bankruptcy shall, with the consent of the true owner, have in his possession, order, or disposition any goods or chattels whereof he was the reputed owner, or whereof he had taken upon him the sale, alteration, or disposition as owner, the Bankruptcy Court shall have power to order the same to be sold and disposed of for the benefit of the creditors under the bankruptcy. The object of this is to prevent deceit by a trader from the apparent possession of property to which he is not entitled; as it makes the real owners of goods who intrust them to a trader, careful, that they run the risk of the goods being seized for the general benefit of the creditors. Where, however, the articles in possession of the bankrupt are of that peculiar description that they are naturally calculated to excite an inquiry on the part of creditors as to whose they are, it is otherwise. Thus, pictures deposited with a bankrupt to take charge of, as they do not lead to any erroneous belief on the part of persons dealing with him, so they do not fall to be sold and divided as part of his assets. A similar doctrine exists in Scotland by the common law, and is therefore applied to other cases than bankruptcy. By the Mercantile Amendment Act, 19 and 20 Vict. c. 60, s. 1, in order to assimilate the law to that of England, it was declared that goods sold, but not delivered, shall not be attachable by the creditors of the seller, to the effect of preventing the purchaser or others from enforcing delivery of the same, and the right of the purchaser to demand delivery of such goods from and after the date of the sale, shall be attachable by the creditors of the purchaser

REQUE'ÑA, a town of Spain, in the modern province of Cuença, and about 80 miles south-east of the town of that name. It contains an industrious population, amounting to 10,500, who are employed in the manufacture of woollen, cotton, and silk fabrics.

REQUE'STS, COURT OF, an ancient court of equity in England, inferior to the Court of Chancery, and presided over by the Lord Privy Seal. It was abolished by 16 and 17 Char. I. c. 10. Also, a local tribunal (known likewise by the name of Court of Conscience) instituted in London by Henry VIII. for the recovery of small debts, with jurisdiction between citizens and freemen in questions of debt or damage under 40s., afterwards extended to questions under £5. Similar local tribunals were instituted by act of parliament in other parts of the kingdom; but they have all been superseded by the county courts.

RE'QUIEM (Lat. *requies*, rest), a dirge or solemn service for the dead in the Roman Catholic Church. It consists in the celebration of the mass *Pro Fidelibus Defunctis* (For the Faithful Departed), the first words of the Introit of which are *Requiem æternam*.

RE'REDOS (Fr., behind the back), the wall at the back of an altar, seat, large fireplace, &c. In churches, the reredos, is usually in the form of a screen detached from the east wall, and is invariably ornamented with niches, statues, &c., or with paintings or tapestry. Very fine examples exist at Durham, St. Albans, &c.

RE'SCRIPTS (Lat. *rescripta*), answers of the popes and emperors to questions in jurisprudence officially propounded to them. *Rescripta principis* were one of the authoritative sources of the civil law, and consisted of the answers of the emperor to those who consulted him, either as public functionaries or as individuals, on questions of law. They were often applied for by private persons, more especially women and soldiers, to solve their doubts or grant them privileges. The rescripts directed to corporate and municipal bodies were known as *Pragmaticæ sanctiones*, a name which has found its way into the public law of Europe. See PRAGMATIC SANCTION. Rescripts might gradually come to have the force of law, in so far as their determinations in particular cases were of general application.

RE'SCUE, in English Law, is the illegal delivery and discharge of a prisoner or of goods out of the custody of the law. If, for example, a tenant whose goods are distrained for rent, take them by force from the bailiff, the distrainer has a right of action against the tenant or person who rescues the goods. When a prisoner is in custody for felony, and is rescued, the rescuer commits a felony. So the rescue of a prisoner for debt is an indictable offence, punishable by imprisonment for life, and forfeiture of lands and goods.

RESE'CTION or EXCISION OF JOINTS is an operation in which the diseased bone of a joint is cut out, in place of cutting off the whole limb. Dr. Druitt, in his able summary on this subject in *The Surgeon's Vade-mecum*, remarks, that 'it seems to be established that excision is on the whole safer than amputation; less violence is done to the body, fewer great arteries and nerves are injured, and, what is of more consequence, fewer large veins are divided, and as the articular end of the bone only is sawn off, and the medullary canal not touched, there is less chance of pyæmia. Lastly, the patient is left with an imperfect limb, it is true, but with one which, in most cases, is highly useful.' The operation has been performed on the ankle-joint, the elbow, hip-joint, knee, and shoulder. Few subjects have in recent times excited more discussion among surgeons than the application of this operation to the knee-joint. The operation was first performed in 1762; and up to the year 1830, there are records of 19 cases, out of which 11 died. From 1830 to 1850, the operation was never performed, and was generally condemned; but in the last-named year it was revived by Professor Fergusson, and is now a frequent and regularly-recognized operation. 'The cases,' says Dr. Druitt, 'in which it ought to be performed are, generally speaking, such cases of injury or disease as would otherwise be submitted to amputation.

The *object* of the operation is to produce a firm and useful limb, slightly shortened, and with entire bony union or fibrous union, admitting of some small degree of motion at the situation of the joint. But all cases are not suitable for excision; and those cases are unsuitable and better adapted for amputation in which either the *quantity* of the diseased bone is very great (for then the case will probably not do well, or, if it proceed to recovery, and the patient be young, the future growth of the limb will be prevented), or the *quality* of the disease may be such as experience has shown to be incompatible with the exudation of healthy material of repair.' In at least 50 per cent., the operation results in a good useful leg. It has already saved so many limbs that it must be regarded as one of the greatest triumphs of modern surgery.—Further information on this subject may be found in Professor Fergusson's *Lectures on Conservative Surgery*, delivered in 1864 at the Royal College of Surgeons, and reports in *The Lancet*.

RESEDA'CEÆ, a natural order of exogenous plants, mostly herbaceous; having alternate leaves; terminal spikes of hermaphrodite irregular flowers; the calyx of 4—7 unequal segments; the corolla of 4—7 petals, alternate with the segments of the calyx, the lower petals entire, the upper much cut; the stamens 10—30, inserted on a fleshy receptacle; the germen free, one-celled; the fruit a many-seeded capsule, three-horned, and often open at the apex, so as to expose the seeds, which are kidney-shaped. There are about forty known species, mostly natives of Europe and the west of Asia, and mostly mere weeds. Weld (q. v.) and Mignonette (q. v.) are the species most worthy of notice.

RESERVA'TION is a term used in lease and also in grants of a less estate than the fee-simple. Thus, if A, the owner in fee-simple of real estate, grant a lease to B, a third party, he does not give away his whole interest but merely a part of it, and that part not given away is said to be reserved or excepted. The word reservation is, however, chiefly used in reference to rent, it being said that a landlord on letting his land, reserves to himself a rent out of the premises, and he has certain well-known remedies for the recovery of such Rent (q. v.).

RESERVATION, MENTAL (Lat. *reservatio* or *restrictio mentalis*) the act of reserving or holding back some word or clause which

is necessary to convey fully the meaning really intended by the speaker. It differs from equivocation (Lat. *equivocatio* or *amphibolia*) in this, that in the latter the words employed, although doubtful, and perhaps not fitted naturally to convey the real meaning of the speaker, are yet, absolutely speaking, and without the addition of any further word or clause, susceptible of that meaning. Thus, an example of an equivocation would be: 'I did not write this libel,' meaning, 'I did not perform the mechanical operation of *writing it with a pen*,' although I had really *composed* and issued it. A mental reservation might be involved in the same words, if one were to say: 'I did not write this libel,' mentally withholding the word 'to-day,' although he had written it 'yesterday,' or on some earlier day. Few questions in casuistry have excited more controversy, or have been the subject of fiercer recrimination, than that of the lawfulness of equivocation and mental reservation.

In the celebrated *Letters* of Pascal (q. v.) against the Jesuits, it was one of the most prominent, and used as he employed it, the most effective topics; and Pascal's charges against the Jesuit casuistry of that day have been repeated in almost every popular controversy on the subject which has since arisen. There are several varieties of mental reservation, differing from each other, and all differing from equivocation under its several forms. But as regards the morality of the subject, all the forms of language calculated to deceive may be classed together, and may be treated according to the same common principles. Mental reservation is of two kinds, *purely mental* and *not purely mental*. By the former designation is meant a mental reservation which cannot be detected, whether in the words themselves, or in the circumstances in which they are spoken. Of this kind, would be the mental reservation implied if a person, on being asked if he had seen A. B. (whom he really had just seen *walking* by), were to reply: 'I have not seen him,' meaning '*riding on horseback*.' A 'not purely mental' reservation is that which, although not naturally implied or contained in the words, may nevertheless be inferred or suspected, either from them or the circumstances in which they are used. Of this kind would be the mental reservation of a servant, in giving the ordinary answer to a visitor's inquiry for his master: 'Not at home,' although his master were really in the house; or that of a confessor, who, in a country where the privileges of the secret of the confessional are known and admitted, on being asked whether a certain person had committed a crime, which the confessor knew from his confession that he had committed, should answer: 'I do not know,' meaning 'outside of the confessional.' And, in general, all such doubtful forms, whether of mental reservation or of equivocation, may be divided into *discoverable* and *undiscoverable*.

Much, although certainly not all the odium which has been excited against the casuists for their teaching on this head, has arisen from the confusion of their views as to these two classes of mental reservation; and the witty ingenuity with which Pascal mixed up examples of both, and applied to one what was really said of the other, did far more to damage the theological reputation of his adversaries, as a school, than any of the genuine really objectionable decisions which he cited from the writings of individual divines. Mental reservation has formed a subject of discussion for Protestant as well as Catholic divines; but without entering into a detailed history of this curious branch of casuistry, we shall content ourselves with stating briefly the chief principles on which the decisions of the most approved writers, especially of the Roman Catholic School, are founded.

First 'purely mental' reservations, and 'absolutely undiscoverable' equivocations, are held to be in all cases unlawful, such forms of speech being in truth lies; inasmuch as they have but one real sense, which is not the sense intended by the person who uses them, and hence can only serve to deceive. This doctrine is held by all sound Catholic casuists, and the contradictory doctrine is expressly condemned by Pope Innocent XI. (Propp. 26, 27). On the contrary, mental reservations 'not purely mental,' and 'discoverable' equivocations, are held to be not inconsistent with truth, and, in certain circumstances, when there is necessity or weighty reason for resorting to them, allowable.

For the absolute admissibility of the expedient of mental reservation and of equivocation in such circumstances, casuists allege scriptural precedent from Genesis xx. 12, Matt. xi. 14, Acts xxiii. 6, and other passages; and the principles on which their use, in such case, is defended, are (1), that there is supposed to be in the circumstances justification, and even necessity, for not making known the whole truth; and (2) that the mental reservation in the case supposed does not amount to more than a mere *withholding the entire truth*, inasmuch as what is stated is absolutely true, and the real meaning of the speaker is absolutely *contained in it, and discoverable from it;* and the false construction put upon it by the hearer, although permitted through necessity or grave reason by the speaker, is not *positively* put forward by him. A historical example of such equivocation or reservation is in the well-known answer of St. Athanasius to the question of the party who were in pursuit of him, and who, overtaking him, but not knowing his person, asked what way Athanasius had gone. '*He is not far off*,' replied Athanasius, and the party passed on in pursuit. A less easily discoverable equivocation is ascribed to St. Francis of Assisi, who, when a gang of robbers in pursuit of a traveler asked him whether he had seen the traveler pass by, put his hand up the sleeve of his habit, and replied: 'He did not pass *this* way,' meaning, 'up his sleeve.' And an ordinary example of discoverable mental reservation is that of a person who, on being asked by one to whom he could not with safety give a refusal, whether he has any money, should reply: 'No,' meaning, 'none to lend to you.'

In order, however, to justify the use of these devises of speech casuists require that there shall be some grave and urgent reason on the speaker's part; as, for example, the necessity of keeping a state secret, or a secret of the confessional, or of a professional character, or even the confidence intrusted by a friend, or the ordinary and fitting privacy which is required for the comfort and security of domestic life, and of the peaceful intercourse of society; and that the concealed sense of the form of speech employed, although it may be *actually undiscovered*, and even unlikely to be discovered, may yet be, in all the circumstances, *really discoverable*. On these two leading theoretical principles, the majority of casuists are agreed. But a wide field for practical discussion lies between them, in the variety of senses which may be attached to the phrases 'not purely mental' and 'discoverable;' and it is in the practical interpretation of these terms that some of the casuists have found scope for the introduction of the lax decisions which have brought odium upon casuistry. Much of this odium has fallen upon the Society of the Jesuits, to such a degree, that their name has been popularly associated with the worst forms of the practice of mental reservation. See JESUITS and PASCAL.—See Scavini, *Theologia Moralis*, ii. 23; Murray, *Theological Essays*, iv. 274, and foll.

RESERVA'TUM ECCLESIA'STICUM, a provision of the religious Peace of Westphalia, so very celebrated in Germany history, that a brief explanation seems necessary. By this clause of the Treaty of Westphalia (1549), it was enacted, that if the holder of any ecclesiastical dignity, or of any territorial jurisdiction or property annexed to such ecclesiastical dignity, should change his religion, the dignity, territorial jurisdiction, or property held by him, should not be thereby alienated from the church from which he seceded, but should be still 'reserved' for that church, and for the legitimate successors of the seceder. It was chiefly out of the disputes regarding the violations of the R. E., that the Thirty Years' War arose.

RESE'RVE, in Army affairs, has several meanings. First, in a battle, the reserve is a body of troops held somewhere in the rear, generally out of fire, and kept fresh, in order that they may interfere with decisive force at any point where yielding troops require support, or an advantage gained needs powerful following up. The *reserve* of ammunition is a magazine of warlike stores, situated between an army and its base of operations, sufficiently retired from the front to be safe from sudden raids of the enemy, and at the same time advanced enough to allow of the supply actually in the field being speedily replenished.

The reserve of a nation is that force upon which the national defence is thrown, when its regular armies have failed in securing its safety. This reserve may be the *levée en masse* of the whole adult male population, or it may consist of a smaller section of the people duly trained to arms. The latter is, of course, the preferable system, when the arms of scientific modern warfare are to be brought into action. In different countries, the reserves are organized on very different principles. In Great Britain, they comprise the army reserve, the enrolled pensioners—both of which consist of soldiers who have served in the army—the militia, yeomanry, volunteers, and trained constabulary. The numbers of the reserve forces provided for in the army estimates of 1880—1881 were as follows:

Militia	139,111
Yeomanry Cavalry	14,511
Volunteers	245,648
Army Reserve Force (including Enrolled Pensioners)—First Class	23,000
Second Class	24,000
	446,270

Of the volunteers, 43,499 were artillery volunteers, 600 light horse, 9870 engineers, 120 mounted rifles, 1440 permanent staff, and 190,119 rifle volunteers.

The scheme of army reorganizations, which has been carried out during the past few years, has had a very important bearing on the reserve forces. In 1870, it was attempted, by modifying somewhat the conditions of enlistment into the regular army, to make the provisions for securing and maintaining a numerically strong army reserve more efficient than they had hitherto

been. Enlistment continued as before to be for twelve years; but service in regiments going abroad was to be for six years, while the remaining six years' service was to be in the reserve, the men being liable to be called out like the naval reserve, and receiving a pay of 4*d.* a day. In 1876, men commenced to pass from the colors into the Reserve which is expected ultimately to reach about 80,000 men.

By an order in council of the 31st March 1871, the power of the Lord Lieutenants ceases, and the management of the reserve forces in counties is vested in the ministers of the crown.

One of the objects chiefly kept in view in the comprehensive scheme of 1872 for the reorganization of the army, was the bringing of the auxiliary forces into closer and more mutually helpful relations with the regular army. The main feature of that scheme is the localization of the combined military forces in certain territorial districts, so that there shall belong to each such district two line battalions, two militia battalions, and volunteers, formed into an administrative brigade, the whole to rest on the brigade depot as center. Arrangements were made to secure that a larger number of officers of the line regiments should pass into the militia and the yeomanry, and that the efficiency of the reserve should increase. The aim of the measure was 'to unite the spontaneity and all the other advantages of the auxiliary forces with the highest amount of training that the regular army could furnish to any other body of men.

RESE'RVED LIST, in the Royal Navy, a device for expediting the promotion of officers who are still of an age for active service. Under certain Orders in Council of 1851 and 1853, old officers of good service were selected for promotion to the next grade on the Reserved List. This formed a bar to any other promotion; and removed the officer from active employment, except in the remote contingency of the Active List being exhausted, when these 'reserved' officers would be liable to be called upon to serve. For all practical purposes, however, the Reserved List was a retired list. The officers placed on it obtained the half-pay of the rank to which they were promoted, and their removal gave vacancies for the promotion of younger and more efficient men. In the navy estimates for 1882—1883 while provision was made for 547 naval officers on the unemployed active list, and for 2267 on the retired list, a sum of £21,435 was allotted to 96 naval officers on the reserved list. The list is dying out, as, under the Retirement Scheme of 1870, absolute retirement according to age was substituted.

RE'SERVOIR, a receptacle for storing water for any purpose, but chiefly for the supply of towns, for driving machinery, feeding canals, irrigation, or for some process of manufactures. Generally, every water-works' establishment, for the supply of a town, requires to construct one or more reservoirs for providing compensation to the mills situated on the stream, for the water that is abstracted from any of its feeders.

The most advantageous position for a store reservoir is that where there is a narrow gorge in a valley widening out upwards into a flat expanse, thereby enabling a comparatively small dam or embankment formed in the gorge, to impound a large body of water; but in many cases where there is no such choice the embankment may require to be placed across a wide part of a valley which narrows as it ascends, thereby requiring a great embankment, in proportion to the quantity of water impounded. Sometimes reservoirs have to be formed on flattish ground affording no great natural facilities for storing water; and in such cases they may require to be embanked wholly or nearly round and round. Where a reservoir requires to be constructed on perfectly level ground, the excavation must be calculated to be exactly equal to the embanking. The worst possible situation for a store reservoir is on the slope of a hill.

In many cases, natural lakes are used as reservoirs, means being adopted for raising or lowering the surface of the water, the difference between the lowest and the highest level of the lake's surface, multiplied by its area, being the measure of the available storage. Instances of this occur in Loch Leven, Kinross-shire, for the supply of the mills on the river Leven; in Loch Katrine and Loch Vennachar, for the supply of the city of Glasgow, and for the compensation required by the millers on the river Teith, in consequence of the abstraction of the Loch Katrine water; and in many other similar cases both for the use of towns and for water-power.

The capacity of a reservoir necessary for making nearly the whole water of a district available for use, depends much on the climate. Where droughts are of long continuance, its capacity requires to be proportionally large, but generally in Great Britain a capacity of six or seven months' supply is reckoned sufficient.

As illustrative of the very different facilities afforded by different sites for storing water, an instance occurs of two reservoirs of the Edinburgh Water Trust, whereof one with an embankment containing 175,000 cubic yards of earthwork impounds only 17 millions of cubic feet of water; while another, with an embankment of 53,000 cubic yards, impounds 85 millions of cubic feet, there being a single embankment across a valley in both cases. Generally, the structure for impounding water is an earthwork embankment, with a slope towards the water of 3 or 4 horizontal to 1 perpendicular, a breadth across the top of from 6 to 12 feet, the height being from 4 to 7 feet above the water, and

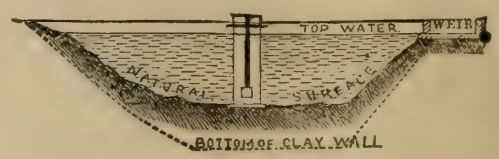


Fig. 1.—Elevation of Reservoir.

an outside slope of from 2 to 2½ horizontal to 1 perpendicular. The earthwork ought to be formed in thin layers well rammed, and to have a puddle-wall of good well-worked clay in the center, the foundation of the puddle being a trench dug down to impervious rock or clay. The face towards the water requires to be pro-

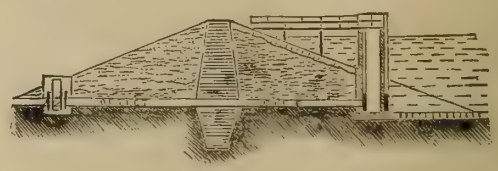


Fig. 2 —Transvers Section of Reservoir.

tected by stones; and when a reservoir is large, these stones must be 'pitched' i. e., regularly set by hand—so as to be able to resist the lash of the wave. In all cases, there is imperatively required a waste-weir, to allow flood-waters to escape without risk of overflowing the dam. It ought, if possible, be placed on the solid ground; and if it can be cut through solid rock, that is best, and saves a great expense for masonry.

The width of the waste-weir must be regulated by the catchment or extent of gathering-ground of the reservoir, and by the rainfall of the district; but for a given catchment and rainfall, a reservoir having a small area ought to have a larger waste-weir than one having a larger area, as the latter would allow flood-water to accumulate without rising to so high a level as it would in the former. Generally, however, from 12 to 20 feet of length of waste-weir may suffice for a square mile of catchment. In some cases, dams across gorges, for the purpose of forming reservoirs, are constructed of walls of heavy masonry, instead of earthwork embankments. Those across rivers for diverting the water into mill-lades, and for retaining the water which would otherwise be wasted at meal-hours, are generally constructed of stone, but sometimes of timber or iron.

The word dam is very often used incorrectly in Scotland to indicate a reservoir or sheet of water, instead of the structure made use of to form the reservoir, which is its proper meaning. A reservoir requires a sufficient outlet at the bottom by means of a tunnel, culvert, or iron pipes provided with suitable sluices, and these ought properly to be so arranged as that access can be had to them even when the reservoir is full.

Most of the disasters from the bursting of reservoirs have arisen from the want of sufficient waste-weirs, and from the embankments being overtopped in consequence by the water, and the outer slope being washed away, so as to deprive the puddle-wall of its support; but some accidents have occurred from the outlet being by a wooden box or trough through the embankment, and that being neglected and allowed to get rotten. The bursting of the Bilberry Reservoir, above Holmfirth, which occurred in 1852, arose from the embankment having sunk to, and being allowed to remain at, a level actually below that of the waste-weir, so that it was over topped; but the Bradfield Reservoir embankment of the Sheffield Water-works which burst in 1864, gave way before the water had risen to the level of the waste-weir; and much difference of opinion exists as to the cause; some engineers contending that the disaster was caused by bad workmanship in the embankment itself, and others that it was owing to a landslip under the embankment.

Distributing reservoirs for towns, used chiefly for storing up the surplus water during the night, which otherwise might mostly go to waste, ought to hold at least half a day's supply, and ought to be placed high enough to command the highest parts of the town. They are generally built of masonry or brickwork, but are sometimes made of cast iron, and now occasionally of boiler-plate —in which last case they are best of circular form. There is one of that description on the highest part of Edinburgh Castle. In

India and in the south of Europe, where long droughts prevail, very large reservoirs have been constructed for supplying water for the purpose of irrigation.

RESHD, one of the most industrious and extensively commercial towns in Persia, capital of the maritime province of Ghilan, stands on the Bay of Enzelli, a lagoon on the south-west shore of the Caspian Sea, 150 miles north-west of Teheran. It is in great part covered with trees, so that no accurate idea of its extent can be obtained by viewing it from any one point. The houses are all tiled and are neatly built, and the streets paved; water is supplied by an aqueduct, and there are a palace, vast, gloomy, and ruinous; numerous caravanseras, large bazaars, and about 1200 shops and warehouses. Indian wares are imported from Belfrush, in Mazanderan, and European manufactures from Russian Armenia. Extensive manufactures of deservedly celebrated embroideries are carried on. Pop. upwards of 20,000 Enzelli, the port of R., on the Caspian Sea, about 18 miles distant, has 2500 inhabitants.—Eastwick's *Diplomate's Residence in Persia* (London, 1864.)

RESI'DUARY LEGACY is a legacy of all that remains after the debts and legacies have been paid out of the estate of a deceased person. Debts must always be paid before legacies, and the next thing to be done is to pay all the express legacies; and as these seldom absorb the whole of the free assets, the residuary legacy is more or less valuable according as the express legacies are smaller than the free assets. If the express legacies swallow up all the funds, the residuary legacy is worth nothing.

RESI'NA, a town of Southern Italy, in the province of Naples, situated at the foot of Vesuvius, and facing the sea. Pop. (1871) 12,175. R. is built on the site of ancient Herculaneum. Exquisite fruits are grown, and the famous *Lacrimæ Christi* wine is made in the vicinity. It is surrounded by country houses, and is a place of recreation for the Neapolitans, on account of its salubrity. The ascent of Mount Vesuvius is begun at Resina.

RE'SINS, a class of natural vegetable products composed of carbon, hydrogen, and oxygen. They are closely allied to the essential oils, all of which, when exposed to the air, absorb oxygen, and finally become converted into substances having the characters of resin; and in most cases, they are obtained from the plants which yield them, mixed with and dissolved in a corresponding essential oil. Like the natural oils, the natural resins are usually mixtures of two or more distinct resins, which admit of separation by their unequal solubility in different fluids.

The following are the general characters of this class of compounds. At ordinary temperatures they are solid, translucent, and for the most part colored, although some are coloriess and transparent. Some are devoid of odor, while others give off an aromatic fragrance from the admixture of an essential oil. In their crude state, they never crystallize, but are amorphous and brittle, breaking with a conchoidal fracture; when pure, several of them may, however, be obtained in the crystalline form. They are readily melted by the action of heat, and are inflammable, burning with a white smoky flame. They are usually described as non-volatile, but it has been recently shown that common resin may be distilled in a current of super-heated steam. They are insoluble in water, but dissolve in alcohol, ether, and the essential and fixed oils. They are insulators or nonconductors of electricity, and become negatively electric by friction. Many of them possess acid properties, in which case their alcoholic solutions redden litmus. These resins combine with the alkalies, and form frothy soap-like solutions in alkaline lyes. The resinous soaps thus formed differ from ordinary soap in not being precipitated by chloride of sodium.

The resins are divisible into the *hard resins*, the *soft resins*, and the *gum resins*.—The hard resins are at ordinary temperatures solid and brittle; they are easily pulverized, and contain little or no essential oil. Under this head are included copal, the varieties of lac, mastic, and sandarach, and the resins of benzoin (commonly called gum-benzoin), jalap, guaiacum, &c.—The soft resins admit of being moulded by the hand, and some of them are viscous and semi-fluid, in which case they are termed *balsams*. They consist essentially of solutions of hard resins in essential oils, or admixtures of the two. They become oxidized and hardened by exposure to the air into the first class of resins. Under this head are placed turpentine, storax, balsam of copaiva, and the balsams of Canada, Peru, and Tolu.

The gum resins are the milky juices of certain plants solidified by exposure to the air. They consist of a mixture of resins and essential oils with a considerable proportion of gum; and on this account, when rubbed up with water, they yield a turbid or milky fluid from the dissolved gum, retaining the resin and oil in suspension, and are only partly soluble in alcohol. Some of them, as ammoniacum, asafœtida, euphorbium, galbanum, gamboge, myrrh, olibanum, &c., are valuable medicinal agents; while others, as caoutchouc (or india-rubber) and gutta percha, are of great value in the arts and in manufactures.

The resins are very widely diffused throughout the vegetable kingdom. But there are certain families of plants which are especially rich in them. They are generally obtained by making incisions into the wood of the trees which produce them; sometimes, however, they exude spontaneously, and in other cases require to be extracted from the wood by boiling alcohol. The crude resins are separated from the essential oils with which they are usually mixed, by distillation with water, the resin remaining while the oil and water pass off; and from the gummy and mucilaginous matters, by alcohol, which dissolves out the pure resins, which can be precipitated from their alcoholic solution by the addition of water.

The resins are extensively employed in medicine; and in addition to the almost innumerable applications of caoutchouc and gutta percha, various resins are of service in the preparation of varnishes, soaps, pigments, artificial light (resin-gas), &c.

Various fossil resins are known, of which the most important is amber. Some chemists place bitumen and asphalt amongst this class; and amongst the fossil resins described by mineralogists may be mentioded Fichtelite, Hartite, Idrialite, Ozokerite, Scheereite, Xyloretin, &c.

The common resin, or rosin, of commerce exudes in a semi-fluid state from several species of pine, especially *Pinus tæda*, *P. mitis*, *P. palustris*, and *P. rigida* of North America, *P. pinaster*, *P. pinea*, and *P. Laricio* of Southern Europe, and *P. sylvestris* of Northern Europe. The process of collecting it is very simple: a longitudinal slice of the bark and wood (A, fig. 1), about a foot

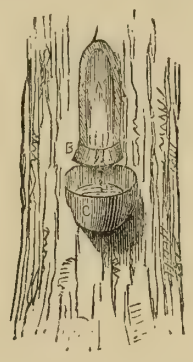


Fig. 1.



Fig. 2.

in length, is taken off by means of an axe with a curved blade (fig. 2); and at the bottom of the groove thus made, a small piece of bent wood or thin metal, as tin or zinc, is driven into a curved cut, made by one blow of the axe (B, fig. 1); this forms a sort of spout, which catches the liquid resin as it runs from the wound, and guides it into a small pot, made of common clay burned. At certain periods, these pots are emptied and their contents put into casks, for transport to the distilleries, where the volatile essential oil is removed from the resin. The resin thus procured is used very extensively in the manufacture of common yellow soap, also for sizing paper and various other purposes, including the preparation of ointments and plasters in pharmacy.

The other resins most generally known and used in Europe are Anime (q. v.), Copal (q. v.), Dammar (q. v.), Mastic (q. v.), Sandarach (q. v.), Frankincense (q. v.), Lac (q. v.). In addition to these, there are many which are of essential service in other countries, as the Piny Resin or Dhoop, obtained from *Vateria indica;* Black Dammar, obtained from *Canarium strictum;* Saul Resin, or Dammar Batu, from *Shorea robusta*—all of which serve many useful purposes in India, China, Japan, and other Asiatic countries. The forest of South America furnish many others.

RESI'STING A CONSTABLE is an offence punishable by justices of the peace in a summary manner.

RES JUDICA'TA, in Law, means that the subject-matter of an action has been already decided by a court of competent jurisdiction, and if so, a plea setting up the *res judicata* is a sufficient defence. In order to be binding, however, the suit in the former case must have been between the same parties.

RESOLU'TION, in Music. In the progression of chords in a musical composition, there are certain chords that require to be followed by certain others, or, as it is called, *resolved* into them, otherwise, a sense of incompleteness is left on the ear. Thus the chord of the dominant seventh must be resolved by the tonic harmony, the major third ascending a semitone to the key-note, and the seventh descending one degree to the third of the key.

The diminished triad is similarly resolved, and all chords immediately derived from the dominant harmony. The chord of the added ninth is resolved by descending a second to the fifth of the tonic.

RESOLUTION OF FORCES. See COMPOSITION.

RE'SOLUTIVE CLAUSE is the technical name given by the law of Scotland to a clause in a deed of entail, the object of which is to declare that if the heir of entail in possession do any of the things which he is expressly prohibited from doing, such as attempting to sell the estate, or alter the order of succession, his right to the estate shall cease, and the estate shall pass on to the next heir.

RESPE'CTING, or RESPECTANT, in Heraldry, a term used to describe two animals borne face to face. Beasts of prey rampant when so borne, are, however, said to be *rampant combatant*.

RESPIRA'TION, ORGANS AND PROCESS OF. The great objects of respiration or breathing are, first, the introduction into the system of oxygen, by which the products resulting from the disintegration or breaking up of the muscular, nervous, and other tissues of the body are converted into compounds, which are easily eliminated or removed by the excreting organs (as the kidneys, lungs, skin, &c.); and, secondly, the removal of the most noxious, and consequently, the most important of these products, carbonic acid, through special respiratory organs, which, in most air-breathing animals, except insects, are lungs; while in water-breathing animals, excepting those very low in the scale of organization, they take the form of *branchiæ*, or gills. In all the vertebrated animals, excepting in fishes, and in the amphibians during their young state,* the respiratory organs are more or less complicated internal air-sacs, communicating through the throat with the external atmosphere. The simplest known form in which these LUNGS or internal air-sacs exist is as a pair of elastic membranous bags placed close beneath the vertebral column, communicating with the surrounding atmosphere by a tube known as the windpipe, or *trachea*, which opens through the larynx, or organ of voice, into the throat. These bags are lined by a delicate, thin, and moist membrane, called a mucous membrane, embedded in, and partly beneath which is a vascular network, through which all the blood in the animal's body is in turn driven by the heart. The moist partition between the blood in this network and the air in the interior of the lungs is so thin, that after having (by its moisture) dissolved the oxygen of the air, it permits of its passage into the moving current of blood, whilst through the same agencies carbonic acid simultaneously passes in an opposite direction from the blood into the air.

To complete the apparatus, there are certain muscles under whose action the bags are emptied of their vitiated contents, and refilled with pure air. Such are the respiratory organs as they occur in that remarkable animal, the *Proteus anguinus*, found in the dark caves of Carinthia, and belonging to the order *Amphipneusta*, referred to in the foot-note. In the more highly organized animals and in man, we find these elementary essential parts complicated and modified in a great variety of ways. Confining our remarks for the present to the respiratory process as it occurs in man and mammals, we may consider the anatomical details under three different heads. *First*, There must be a special respiratory organ—the lungs—affording by its internal arrangement an immense extent of internal surface, covered by vascular network, through which the blood flows in innumerable minute streamlets, only separated by an extremely thin membrane from the atmospheric air that has been inhaled; *secondly*, There must be such an arrangement of the circulating system that fresh blood may be perpetually driven from the right side of the heart through the lungs, and onward to the left side of the heart; and *thirdly*, There must be arrangements for the frequent and regular change of the air contained in the lungs. These three points will be considered in the order in which we have placed them.

A sufficiently large internal aërating surface might of course be obtained by increasing the size of the air-bags themselves, but this would involve an increase of size in the animal. In examining the lungs of different animals, two plans are observed for increasing the internal surface without increasing the total bulk of the lungs.

According to one plan, the internal surface is, as it were, moulded into cells, separated laterally by partitions, somewhat like the cells as seen in a section of honeycomb, or more like the appearance presented by the second or honeycomb stomach of ruminating animals; according to the other, enormous multitudes of little lung-sacs partitioned, as will be presently shown, in their interior, are clustered round the ultimate branch of a common air-tube, which communicates with all of them. If we can conceive a bunch of grapes with its stem and all its minute branches, and the grapes attached to the ends of these branches completely hollowed, we get a good idea of this second plan, except in so far as the partitioning of the terminal cells (the grapes in the illustration) is concerned. By the former method, which occurs in amphibians and reptiles, the lung-sacs are merely rendered more cellular in their interior; whilst, by the latter plan, compound lungs are formed, such as occur in birds and mammals, including man. Hence these two varieties of lung-structure correspond to the so-called cold-blooded and warm-blooded animals respectively. In fig. 1, representing a section of the

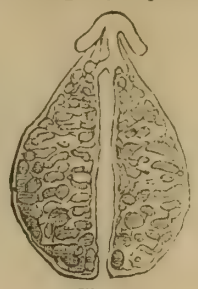


Fig. 1.

lungs of the frog (magnified), and in fig. 5 of the art. REPTILES, representing a section of the lungs of a turtle (diminished), we have illustrations of the first plan (the cellular lung-sac), while in figures 2 and 3 we have diogrammatic illustrations of the human lung. Figure 2 is a shaded diagram (copied from Mr.

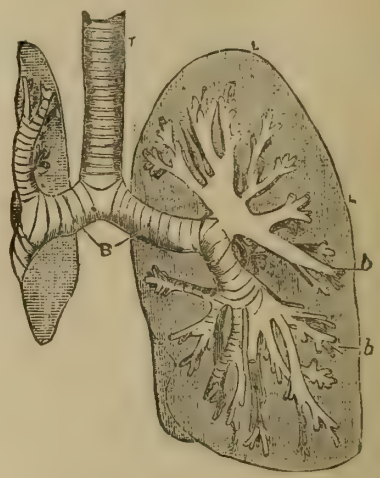


Fig. 2.

Marshall's admirable series of *Physiological Diagrams*), to show the ramifications of the air-tubes in the human lungs. L is an outline representing the left lung; T, the main air-tube, called the windpipe or *trachea* (so called from the Greek word *tracheia*, rough, and similarly termed in Latin the *Arteria aspera*, although not an artery, as we now employ the word), descends through the neck from the larynx or organ of voice into the chest; B shows the right and left *bronchi*, or primary divisions into which the windpipe separates, one for each lung.

Each bronchus enters the lung at the so-called root, and divides and subdivides into smaller branches, which never coalesce, but continue separate like the branches and twigs of a tree. These are the *bronchial tubes*, or the *bronchiæ* of some writers; the smallest shown in this diagram, *b*, *b*, undergo many further subdivisions, until (to use Mr. Marshall's own description) 'at length they form an immense number of minute tubes, not more than $\frac{1}{70}$th of an inch in diameter, each of which ends in a cluster of cells, or, as it may otherwise be described, opens into a small membranous sac a little wider than itself, having a cellular internal surface very similar to that of the frog's lung, but of course on a microscopic scale.' In fig. 3 (also copied from Mr. Marshall's diagrams), there is a representation, magnified about 100 diameters, of three of these clusters of cells or little lung-sacs, from the human lung. In this figure *b* is a small air-tube, or bronchial tube, from which several of the finest or ultimate tubes proceed; *c* shows the outer surface of one of the lung-sacs, or *lobules*, as they are commonly termed; *d*, the inner surface of another, which has been cut open, so as to show the ultimate recesses of the lung to which the air has access—viz., the *air-cells*. According to Rossignol, the ultimate bronchial ramifications terminate in a shape resembling that of an inverted funnel, and hence he applies the term *infundibula* to these endings. In fig. 4 (copied from Rossignol's *Memoir*), there is a representation of the termination of an ultimate bronchial tube in the lung of a dog: *a* represents an ultimate tube, or lobular passage, branching towards the infundibula; *b* is the interior of one of the seven in-

* A few of the amphibians, such as the species of the genera *Proteus* and *Siren*, retain their branchiæ during their whole life; hence they are placed in the order *Amphipneusta*, a term indicating their double mode of breathing.

fundibula shown in the figure; while *c* represents one of the numerous septa or partitions projecting inwards on the infundibular wall, and forming the air-cells.



Fig. 3.



Fig. 4.

According to Todd and Bowman, the diameter of the lobular passages is from $\frac{1}{100}$th to $\frac{1}{300}$th of an inch, while that of the cells ranges from $\frac{1}{200}$th to $\frac{1}{300}$th of an inch. It is on the inner surface of these air-cells that the network of minute capillaries is spread in which the act of aëration takes place. Each lobule receives air through its own bronchial tube alone, and consequently there is no direct communication between the air-cells of adjacent lobules. These lobules are closely compressed upon one another; and collectively, together with the connective tissue which unites them to one another, make up the great mass of the lungs. To such an extent is the process of subdivision carried out, that, according to calculation, the lungs of an adult man contain at least 600 millions of these air-cells. It is in consequence of the air included in these cells that the pulmonary tissue has a soft spongy feel, and crackles when compressed between the fingers (see RESPIRATORY SOUNDS); and for the same reason, the lungs and even small portions of them, even after strong pressure, float in water, it being extremely difficult to drive all the air out of the cells. The lungs (except in the fœtal state, when no air enters them) are thus the lightest organs, in relation to their size, in the body.

Although their bulk is so great that, with the heart, they occupy almost the whole of the cavity of the chest, they only weigh about three pounds and a half in men, and two pounds and three-quarters in women. Their color varies at different ages. At birth, they are of a pinkish white tint; in adult life, they are of a slate color, and present a mottled appearance; and in old age, they become a still darker tint. The polygonal markings which are seen on the surface correspond to the outer surface of the lobules already noticed. Their shape is adapted to that of the cavity in which they are lodged, each lung being conical in form, with its apex rising into the neck; while its base, which is broad and concave, rests upon the convex surface of the diaphragm; and between the two lungs lie the heart and the great vessels that proceed from it. During life (except in certain diseases, as for instance, PERICARDITIS, q. v.), the inner margins of the lungs nearly overlap the heart, leaving only a roundish space, less than two inches in diameter, of that organ uncovered, while their lower borders extend to the cartilages of the ribs, and fit into the angle formed between those cartilages and the diaphragm. Each lung is invested by its own serous membrane, the PLEURA (q. v.), which serves the double purpose of facilitating the movements which the lungs undergo in the act of respiration, and of suspending each lung in its proper position. In the latter function, the pleuræ are essentially assisted by the great air-tubes and blood-vessels, which collectively form what are termed the roots of the lungs.

The structure of the air-tubes and the lungs themselves next requires consideration. Beginning with the upper portion, we have to consider the *trachea*, or windpipe, which in the human subject descends in the middle line from the Larynx (q. v.) to the level of the third dorsal vertebra, where it divides into the right and left bronchi (as seen in fig. 2). It is kept permanently open by from 16 to 20 cartilaginous rings, which surround two-thirds of the tube, and are incomplete behind, where the tube is completed by the same fibrous membrane which covers and unites the cartilages in front and on the sides. In this fibrous membrane are numerous tracheal glands (which probably furnish much of the vapor of the breath, and may occasion its odor), together with unstriped muscular fibre, to which the term *trachealis* muscle has been given. The trachea measures about 4½ inches in length, and is about three-quarters of an inch wide. Its mucous membrane is continuous through the glottis with that of the pharynx or throat, and is covered with ciliated columnar Epithelium (q. v.). Of the bronchi, the right is wider, shorter, and more horizontal than the left. Their walls are composed on the same plan as those of the trachea. Upon entering the lung, each bronchus divides in the method already described, The walls of these bronchial tubes become thinner as they approach the air-cells. The cartilaginous portions which, in the primary divisions of each bronchus, partially retained the annular form, become gradually reduced to mere flakes, and finally cease in tubes of $\frac{1}{8}$th or $\frac{1}{10}$th of an inch in diameter. The unstriped muscular fibres occurring in the trachea are continued downwards to the minutest tubes, forming a very thin layer, completely surrounding the canal, and the cilinated epithelium extends equally far. The terminal bronchial tube loses its epithelium and muscular coat at about $\frac{1}{3}$th of an inch from the most distant air-cell to which it leads, and is thus reduced to a single coat, consisting of a basement membrane (see MUCOUS MEMBRANE), with yellow elastic fibres blended with it. Of this structure, the interlobular passages and the air-cells are composed.



Fig. 5.—A separated Tracheal Ring.

r, representing the cartilaginous, and *m* the posterior flattened membraneous portion.

The mode in which the blood is perpetually changed in the lungs next demands consideration. The venous or impure blood collected from all parts of the body in the right side of the heart, is conveyed to the lungs by the pulmonary artery, which is about the size of the aorta, and, like that vessel, is furnished with three semilunar valves at its origin, which prevent the blood from regurgitating into the right ventricle of the Heart (see CIRCULATION). The pulmonary artery divides, before entering the lungs, into a right and a left branch, which ramify as far as the lobules in company with the bronchial tubes. At this point, they distribute themselves on the outside of the lobules, in the so-called *interlobular fissures*, and penetrating between the air-cells, form a capillary network on and in the walls of the cells and of the lobular passages. This network empties its blood, which is now aërated, into minute venous radicles, which converge to form larger veins, and these finally form the four pulmonary veins, which discharge their arterialized blood into the left side of the heart. The walls which support the capillary network of the lungs are (as Todd and Bowman observe) 'for the most part much too thin to enclose the capillaries between the two layers of their substance, and therefore the capillaries project fairly into the air cells by a great part of their circumference, being adherent to the wall by a narrow line only. The capillary wall is thus exposed and bare, in contact with the air of the cell, and nothing besides the delicate membrane of the capillary intervenes between the air and the blood.

'A capillary frequently passes through an aperture in the cell-wall, so as first to project into one cell, and further on into a contiguous one, but never becomes altogether free from the wall.'—*Phys. Anat.* v. ii. p. 393. The diameter of these capillaries is about $\frac{1}{1800}$th of an inch, which is comparatively large, and admits of the passage of blood freely; and the air and the blood may be said to be in contact, since they are only separated by a delicate capillary wall, less than $\frac{1}{2000}$th of an inch in thickness. If the rate of the blood in the capillaries be taken at an inch and three-quarters per minute (according to the estimate of Valentin, drawn from observation of the frog's foot), it has been calculated that the blood would at each circuit remain in contact with the air about one second and a half. In all probability, however, the motion of the blood is quicker in the pulmonary capillaries of man and other mammals and of birds than in those of the frog's foot.

In addition to the pulmonary artery and pulmonary veins, which convey the blood to and from the lungs for the purpose of aëration, there are other vessels, known as the bronchial vessels, for the nutrition of the lung itself, the distribution of which, and their mode of communication with the pulmonary vessels already described, have been subjects of much discussion; but into this we need not enter. The lungs are supplied with nerves from the anterior and posterior pulmonary plexuses, lying at the root of the organ, and composed of filaments of the pneumogastric and sympathetic nerves. The filaments from these plexuses accompany the bronchial tubes, in which they are finally lost. The part which these nerves play in the respiratory process will be considered after we have described the *movements of respiration*, by which the air in the lungs is being perpetually changed.

For a description of the shape and framework of the chest, see CHEST. The chest (or thorax, as it is termed by anatomists) is so constructed as to be capable of enlargement in height (vertically), in depth (or from the front backwards), and in width (or from side to side). Its height is increased mainly by the descent of the diaphragm, and to a certain extent by the elevation of the ribs, and the widening of the intercostal spaces; while its depth and width are increased by the elevation of the ribs, which carry forward and elevate the breast-bone (or sternum), especially at its lowest end, and are slightly rotated on an imaginary axis, joining their extremities, by which their central portion is raised, and slightly removed from the mesial plane of the chest. It is only in forced or deep inspiration that all these means of enlarging the chest are called into play. An ordinary inspiration is at-

tended in men with very slight elevation of the ribs (about one-twentieth of an inch), while in women the elevation is much greater, especially in the upper ribs; the cause of this difference in the sexes probably lying in the narrower waist of the female requiring a compensation in the upper part of the chest. MM. Beau and Maissiat describe three varieties of ordinary respiration —viz., 1. Abdominal, or that chiefly effected by the diaphragm, and seen in the motion of the walls of the belly; 2. Costo-inferior, or that in which the seven lower ribs are observed to act; and 3. Costo-superior, or that effected in a considerable degree by the upper ribs.

The first variety occurs in infants up to the end of the third year, and in males generally; the second in boys after the age of



Fig. 6.

Diagrams (by Hutchinson) showing the extent of anteroposterior movement in ordinary, and in forced respiration in male and female. The back is supposed to be fixed, in order to throw forward the movement as much as possible. The black line indicates, by its two margins, the limits of *ordinary inspiration* and *expiration*. In *forced inspiration*, the body comes up to the dotted line, while in *forced expiration* it recedes to the smallest space indicated.

three, and in men; and the third in adult females. The difference between the depth of a forced and an ordinary inspiration is shown in the accompanying figures. Our limited space precludes a detailed notice of the various muscles which are concerned in respiration. The total power of the respiratory muscles has been measured by several physiologists, among whom Dr. Hutchinson deserves special notice. He finds, as the average of 1500 experiments, that the power of expiration is nearly one-third stronger than that of inspiration, and he is of opinion that when the expiratory are not stronger than the inspiratory muscles, some disease is present. He tested the force of the two classes of respiratory muscles by causing persons to make the most powerful efforts of which they were capable, when breathing through the nose into an instrument termed a spirometer, and by this means he found that men of five feet seven or eight inches in height have the greatest inspiratory power, it being equal, on an average, to a column of mercury of 2·75 inches, while their expiratory power was equal to 3·97 inches. The following table is given by him as exhibiting the range through which these powers may vary within the limits of health :

Power of Inspiration.		Power of Expiration.
1·5 inches	Weak	2·0 inches.
2·0 "	Ordinary	2·5 "
4 5 "	Remarkable	5·8 "
7·0 "	Very extraordinary	10·0 "

The co-operation of the resilience of the lungs and the elasticity of the walls of the chest with the expiratory muscular movement is probably the cause why the expiratory power, as tested by the height of a column of mercury, is greater than the inspiratory power. Dr. Hutchinson calculates that a man who raises three inches of mercury by an effort of inspiration exerts a force equal to 1000 lbs.; while the one remarkable case in which the mercury rose to seven inches, indicated a force of 2200 lbs., or nearly two tons.

The following points in connection with the respiratory movements require notice. Every complete act of respiration is divisible into four parts—viz., 1. Inspiration; 2. A short pause, not always observed; 3. Expiration; and 4. A considerable pause, occupying, according to Vierordt, about one-fifth of the whole time required for one complete respiratory act. The act of expiration is always more prolonged than that of inspiration, the former being to the latter in the ratio of 12 : 10 in adult males, and as 14 : 10 in children, women, and aged persons. The number of respiratory acts performed in a minute varies at different ages. According to Quetelet, at birth there are 44 respirations in one minute; at 5 years of age, 26; from 15 to 20, 20; from 20 to 25, 18·7; from 25 to 30, 16; from 30 to 50, 18·1 : so that from 16 to 20 may be taken as the ordinary range for healthy adults, although Hutchinson gives the wide range of from 6 to 40. The average ratio which the number of respirations bears to the number of pulsations in a given time is about 1 : 4½, and if there is any great deviation from this ratio, there is probably some obstruction to the aëration of the blood, or some disorder of the nervous system. Thus, in pneumonia (or inflammation of the lungs), in which a greater or less amount of pulmonary tissue is unfitted for its office, the number of the respirations increases in a more rapid proportion than the number of pulsations, so that the ratio becomes as 1 : 3, or even as 1 : 2. In hysteria, a similar or even greater deviation from the normal ratio may occur; and Elliotson records a case in which the respiratory movements were 98, or even 106, whilst the pulse was 104. On the other hand, in certain typhoid conditions, and in narcotic poisoning, the respiratory acts are diminished in number; the ratio of respiration to pulsations being 1 : 6, or even 1 : 8.

We have next to inquire into the mode in which the muscular movements of respiration are kept up by nervous power. 'There can be no doubt,' says Dr. Carpenter, 'that these movements, though partly under the control of the will, are essentially "automatic" in their nature. Their chief centers consist of two ganglia; corresponding to the origins of the pneumogastric nerves, which are the principal excitor nerves which convey the stimulus on which these movements are dependent; whilst from the adjacent parts of the medulla oblongata and spinalis proceed the chief motor nerves by which they are carried into effect. And thus it happens that the whole of the encephalon may be removed from above, and the spinal cord (as far up as the origin of the phrenic nerve) from below, without suspending the most essential of the respiratory movements.'—*Principles of Human Physiology* (6th edit., 1864, p. 274). It would carry us far beyond our assigned limits to notice the interesting series of phenomena that follow the division or irritation of the various branches of the pneumogastric nerve. We may, however, mention that when the trunks of this nerve are divided on both sides, the respiratory movements still go on, although with diminished activity. Hence, there must be other excitors to the action of the respiratory muscles. Amongst these, the nerves distributed to the general surface, and particularly to the face, probably perform an important part; and in exciting the first inspiration, the fifth pair seem the principal agent. In support of this view, Dr. Carpenter adduces the well-known fact, that the first inspiratory effort of the new-born infant is most vigorously performed when the cool external air comes in contact with its face.

Dr. Marshall Hall, in his *New Memoir on the True Spinal Marrow*, p. 29, relates a case in which the first inspiration was delayed simply because the face was protected from the atmosphere by the bedclothes; the instant they were lifted up, the infant breathed. Many familiar facts demonstrate the influence of the superficial nerves on the respiratory system in the adult as well as in the infant. 'Every one,' to use Dr. Carpenter's words, 'knows that the first plunge into cold water, or the first descent of the stream of the shower-bath, or even the dashing of a glass of cold water in the face, will produce inspiratory efforts; and this fact has many important practical applications. Thus, in the treatment of asphyxia, whether congenital or the result of narcotic poisoning, drowning, &c., the alternate application of cold and heat is found to be one of the most efficacious means of restoring the respiratory movements; and a paroxysm of hysterical laughter may be cut short by dashing a glass of cold water in the face.' The principal motor or efferent nerves concerned in bringing out the respiratory movements are the phrenic, going to the diaphragm; the intercostal, supplying the intercostal muscles; the facial and the spinal accessory nerves; although, as has been already mentioned, the superficial nerves generally exert a motor or efferent action.

How far the respiratory movements are under the influence of the will, is a question which has given rise to much discussion. That, in their ordinary mode of performance, they are independent of the will, is obvious from their systematic occurrence during sleep, in cases of paralysis in which the power of the will is lost, in apoplexy, &c. At the same time, universal experience teaches us that these movements are partly, but not entirely, under the control of the will. We can, with little inconvenience, suspend the respiratory actions for a minute or even longer, if we have previously introduced into the lungs a full supply of fresh air; but if the suspension be further prolonged, the stimulus conveyed by the excitor nerves to the nervous centers becomes so

strong, that by no effort of the will can we avoid making inspiratory efforts. It is asserted by M. Bourdon, an eminent French physiologist, in his *Recherches sur le Mécanisme de la Respiration*, that no person ever succeeded in committing suicide by simply holding the breath, but that such persons have attained their object by holding the face under water, because here another set of muscles is called into play, which are much more under the control of the will than those of respiration. If we may venture to seek for the reason why, in man and the higher animals, the respiratory actions are placed under the direction of the will, it may probably be found in the necessary physiological connection that exists between them and the production of those vocal sounds by which individuals (whether men or animals) can communicate their feelings and wishes to one another.

We shall complete the subject in so far as human physiology is concerned, by noting (1) the greatest quantity of air that can be expelled by a forcible expiration; (2) the total quantity that passes through the lungs in a given time; (3) the effects of respiration on the air; and (4) the effects of suspension or deficiency of respiration.

When the lungs have been emptied as much as possible of air by the most powerful expiratory effort, they still contain a quantity over which we have no control, and which may be estimated at about 40 cubic inches.* To this portion of the contents of the lungs the term *Residual Air* is applied. In addition to the residual air, physiologists distinguish, in connection with the respiratory process, *Supplemental Air*, which is that portion which remains in the chest after an ordinary gentle expiration, but which may be displaced at will; *Breathing* or *Tidal Air*, which is the volume that is displaced by the constant gentle inspiration and expiration; and *Complemental Air*, or the quantity which can be inhaled by the deepest possible inspiration, over and above that which is introduced in ordinary breathing. The greatest volume of air that can be expelled by the most powerful expiration, which is obviously the sum of the supplemental, breathing, and complemental air, is designated as the *Vital Capacity*—a term originally introduced by Dr. Hutchinson, the inventor of the spirometer, who found, from nearly 5000 observations, that of all the elements or factors which might be supposed to influence it, *height* alone stood in a definite and constant relation to it, this relation being expressed by the rule, that, 'for every inch of stature from 5 to 6 feet, 8 additional cubic inches of air (at 60° Fahr.) are given out by a forced expiration after a full inspiration.'

Thus, the vital capacity for a man from 5 feet to 5 feet 1 inch being 174 cubic inches, that for a man from 5 feet 1 inch to 5 feet 2 inches is 182 cubic inches; and so on. With regard to bodily weight as a factor, Dr. Hutchinson found, that 'when the man exceeds the average weight (at each height) by 7 per cent., the vital capacity decreases 1 cubic inch per pound for the next 35 lbs. above this weight.' Age and muscular development do not influence the result so much as might have been expected. It has been not unfrequently observed that the vital capacity is small in athletic men, and that it has been in excess in persons by no means remarkable for physical power. The *maximum* vital capacity met with by Dr. Hutchinson was 464 cubic inches; this was in a man 7 feet high, whose weight was 308 lbs.: the *minimum* was 46 cubic inches, and occurred in the case of a dwarf whose height was only 29 inches, and who weighed 40 lbs.

In estimating the effects of the respiratory process upon the air which passes through the lungs, we shall adopt the *data* afforded by the recent observations by Dr. Edward Smith, who has arranged a spirometer by which the quantity of air inspired may be registered from 1 to 100,000 cubic inches, and therefore for any period. This instrument, says Dr. Carpenter (to whom Dr. Smith has communicated many of the following statements for insertion in the new edition of his *Human Physiology*), 'he has used for 24 hours without intermission, except for meals, and he has ascertained the quantity of air inspired during sleep and in almost every condition met with during the day. From numerous experiments upon several persons, each extending over a whole day, he found that the average depth of inspiration was 33·6 cubic inches when at rest; and when walking at 1, 2, 3, and 4 miles an hour, 52, 60, 75, and 91 cubic inches, and even 107 cubic inches when working the treadmill.

'If we take 30 or 40 cubic inches as the average quantity exchanged at each respiration, we cannot but observe how small a proportion it bears to the entire amount which the lungs usually contain, for the "residual air" which cannot be expelled is estimated by Dr. Hutchinson at from 75 to 100 cubic inches; and the "supplemental air," which can only be expelled by a forced expiration, is about as much more; the sum of the two being from 150 to 200 cubic inches, or from 5 to 7 times the "breathing volume."' Now, it is obvious that if no provision existed for mingling the air inspired with the air already occupying the lungs, the former would penetrate no further than the larger air-passages, and as this would be again thrown out at the next expiration, the bulk of the air contained in the lungs would remain altogether without renewal, and the expired air would not be found to have undergone any change. The law of the *Diffusion of Gasses* (q. v.) here comes in play, for the air in the air-cells and finer tubes being charged by the respiratory process with a great excess of carbonic acid, as compared with the inspired air contained in the larger tubes, a diffusion of the carbonic acid necessarily takes place in the outward direction, while the oxygen from the air, or the air itself, similarly diffuses itself in an opposite direction, towards and into the air-cells themselves.

The *total amount* of air which passes through the lungs in 24 hours must obviously vary with the extent and frequency of the respiratory movements. Dr. Smith found that during the day (6 A.M. to 12 P.M.), the average quantity of air inspired by several persons at rest was 502 cubic inches per minute, or a total of 542,160 cubic inches; and as the average quantity during the night was about 400 inches per minute, the total daily amount was 686,000 cubic inches. This quantity is largely increased by exertion, and Dr. Smith computes that the total amount actually respired by the unoccupied gentleman, the ordinary tradesman, and the hard-working laborer, would be 804,780, 1,065,840, and 1,568,390 cubic inches respectively.

The *alterations* in the inspired air effected by respiration consist essentially in the removal of a portion of the oxygen, and its replacement by a nearly corresponding bulk of carbonic acid. The amount of carbonic acid in the expired air varies inversely with the number of respirations; it reaches 5·5 per cent. (or more) when the respirations are only 6 in the minute, while it falls as low as about 2·6 per cent. when the respirations are 96 in the minute.

About 4·35 per cent. of carbonic acid is, on an average, added to the air in ordinary respiration; whilst about 4·782 per cent. of oxygen is removed; the actual diminution of bulk of the expired air (after the removal of the moisture obtained from the lungs) being about $\frac{1}{25}$th of its volume. Hence, unless where there is free ventilation, the air in an apartment containing men or animals must soon become vitiated by containing a great excess of carbonic acid (for ordinary atmospheric air only contains about one part of carbonic acid in 2500 parts), and a deficiency of oxygen. The absolute quantity of carbonic acid (and consequently of carbon) exhaled in 24 hours is liable to great variations, caused by the temperature and moisture of the air, age, sex, muscular development, the nature and quantity of the food, muscular exercise, sleep, state of health, &c. Dr. Smith calculates that an adult man in a state of rest exhales in 24 hours an amount of carbonic acid equivalent to 7·144 oz. of carbon; and he estimates that it should be increased to 8·68 and 11·7 oz. for the non-laboring and laborious classes respectively, at their ordinary rate of exertion.

We may add, that the total amount of carbonic acid is greatly increased by external cold, and diminished by heat; that it is increased by a moist, and diminished by a dry atmosphere; that it increases in both sexes to about the 30th year, when it remains stationary for 15 years, after which it diminishes; that at all ages beyond 8 years it is greater in males than in females, and that it increases during pregnancy; that it is greater in robust than in slender men, the quantity of carbon expired per diem to each 1 lb. of bodily weight being (according to Smith) 17·07, 17·51, and 17·99 grains at 48, 39, and 33 years of age respectively; that it is greatly increased by eating (see MUSCULAR FORCE), and is diminished by fasting; that it is increased by muscular exertion (Smith found that when walking three miles an hour he excreted 2·6 more carbonic acid than when at rest; while tread-wheel labor occasioned about double the excretion that was caused by walking); that it is diminished by sleep; and that it is increased in the exanthematous fevers (measels, small-pox, scarlatina, &c.), and in chlorosis; while it is diminished in typhus and in chronic diseases of the respiratory organs.

There has been much discussion with regard to the extent to which the nitrogen of the air is affected by respiration. Usually a small amount of this gas is given off, but the quantities absorbed and exhaled so nearly balance each other, that its special action on the organism must be very trifling, further than as being a diluter of the oxygen, which would be too stimulating if breathed in a pure state. We therefore proceed to the consideration of the watery vapor with which the exhaled air is saturated. The amount of this fluid exhaled in 24 hours may range from about 6 to 27 oz., its usual range being between 7 and 11 oz. It is not pure water, but holds in solution a considerable amount of carbonic acid and all albuminous substance in a state of decomposition, which, on exposing the fluid to an elevated temperature, occasions a very evident putrid odor.

For the disease of the lungs and other respiratory organs, see the articles PNEUMONIA, PLEURISY, BRONCHITIS, CONSUMPTION, TUBERCLE; also INFLAMMATION, CONGESTION, HÆMATOPTYSIS, &c.

* According to Hutchinson, as will be presently seen, this estimate is far too small.

RESPIRATION, ARTIFICIAL, is required in all cases of suspended animation, from drowning, noxious gases, chloroform, &c. It may be performed either by forcing air into the lungs by means of a pipe passed through the mouth or the nostril into the glottis, or (which is usually preferable) by imitating the natural expansion of the chest by muscular effort, as by the methods invented by the late Dr. Marshall Hall and by Dr. Sylvester.

The best mode of forcing air into the lungs is by the use of a small pair of bellows, with the nozzle inserted in one of the patient's nostrils. The air should be driven into the lungs with extreme gentleness, the larynx being pressed backwards against the spine, so that the air may not go into the œsophagus and stomach. Gentle but firm pressure must be then applied to the chest to expel the introduced air, and fresh air again driven in; and this process of introducing and expelling the air alternately must be continued until either natural respiratory efforts appear, or the case becomes hopeless.

In the article ASPHYXIA, it is stated that one of the best methods of filling the lungs of an asphyxiated person with fresh air, is that of Dr. Marshall Hall. Dr. Sylvester's method (*The True Physiological Method of Restoring Persons apparently Drowned or Dead, and of Resuscitating Still-born Children;* London, 1859) is, however, generally regarded as decidedly preferable to that of Dr. Marshall Hall, although the same in principle. The following are Dr. Sylvester's rules, as slightly modified by a committee, whose investigations will be presently noticed. The patient is laid on his back on a plane, inclined a little from the feet up-



Fig. 1.

wards; the shoulders are gently raised by a firm cushion being placed under them; the tongue is brought forward, so as to project a little from the side of the mouth. The operator then grasps the patient's arms just above the elbows, and raises them



Fig. 2.

till they nearly meet above the head. This action imitates inspiration. The patient's arms are then turned down, and firmly pressed for a moment against the sides of the chest. A deep expiration is thus imitated; and these two sets of movements should be perseveringly continued at the rate of about 15 times in a minute.

Special reference must be made to two important documents among the publications on this subject. The first of these is the *Reports of the Scientific Committee on Suspended Animation*, presented to the Royal Medical and Chirurgical Society of London in July 1862; and when it is stated that this Report was signed by 'C. J. B. Williams, *Chairman*, W. S. Kirkes, George Harley, J. B. Sanderson, C. E. Brown Sequard, H. Hyde Salter, E. H. Sieveking, and W. S. Savory, *Honorary Secretary*,' its scientific claims to our attention are undeniable. The following are their suggestions in relation to treatment: 1. That all obstruction to the passage of air to and from the lungs be at once, so far as is practicable, removed; that the mouth and nostrils, e. g. be cleansed from all foreign matters or adherent mucus. 2. That in the absence of natural respiration, artificial respiration by Dr. Sylvester's method (as already described) should be employed. 3. That if no natural respiratory efforts supervene, a dash of hot water (120° Fah.) or cold water be employed, for the purpose of exciting respiratory efforts. 4. That the temperature of the body be maintained by friction, warm blankets, the warm bath, &c. [Whether the warm bath is serviceable or positively hurtful is, however, still an open question]; and 5. That in the case of drowning, in addition to the foregoing suggestions, the following plan may, in the first instance, be practiced: Place the body with the face downwards, and hanging a little over the edge of a table, shutter, or board, raised at an angle of about 30°, so that the head may be lower than the feet. Open the mouth, and draw the tongue forward. Keep the body in this posture for a few seconds, or a little longer if fluid escapes. The escape of fluid may be assisted by pressing once or twice upon the back.

The other document to which we referred is entitled *Instructions for the Restoration of the apparently Dead from Drowning*, and was issued in 1864 by 'The National Lifeboat Institution.' In these *Instructions* (a copy of which should be in the possession of every family), it is recommended, that if breathing cannot be excited by the application of stimulants to the nostrils, or by dashing water on the face, Marshall Hall's method should be tried; and that if this do not prove successful in from two to five minutes, Dr. Sylvestor's method should be resorted to.

In conclusion, a reference must also be made to the *Reports of the Scientific Committee* [of the members of the Royal Medical and Chirurgical Society] *on the Uses and Effects of Chloroform.* The committee decide that the most certain means of restoring life after poisoning with anæsthetics is by artificial respiration. 'By this means, resuscitating may generally be accomplished after natural respiration has ceased, provided the heart continue to act; and it may *sometimes* be effected even after the cessation of the heart's action. Galvanism resuscitates within the same limits as artificial respiration; it is, however, far less to be relied on in equal cases. Galvanism may be used in addition to artificial respiration; but the latter is on no account to be delayed or suspended, in order that galvanism may be tried.'—*Proceedings of the Royal Medical and Chirurgical Society*, vol. iv.

RE'SPIRATOR, is the name given by its inventor, Mr. Jeffreys, to an instrument which gives warmth to the air drawn into the lungs in breathing. It is attached to the mouth, and is composed of several layers of very fine wire, fixed so near together, that the exhaled air passing through them is diffused over a very large amount of surface, its warmth being absorbed by the metal, which, being an excellent conductor of heat, freely returns it to the cold air, drawn in through it in the act of respiration. Mr. Jeffreys considers it necessary that about twenty layers of metal-work should be used, and in order to make the instrument as light and compact as possible, each layer must be extremely thin. The apparatus usually consists of from eight to twelve frames of sheet-silver or other metal, about 3½ inches long, 1½ inch wide, and $\frac{1}{500}$th of an inch thick, the metal of which is pierced away by machinery so as to leave only a narrow framework, consisting of six vertical bars $\frac{1}{30}$th of an inch wide, and five horizontal bars, with a width of $\frac{1}{30}$th of an inch thick. To each side of each of these frames is soldered a layer of wires 1½ inch long, and $\frac{1}{1000}$th of an inch thick. These wires are laid at about $\frac{1}{500}$th of an inch apart, and are so numerous, that a large respirator of high power contains 2000 feet of wire, divided into about 12,000 pieces, and soldered to the frames at more than 80,000 points.

The frames, of wire-work, are fixed parallel to each other, and kept a small distance apart by small knots of a bad conductor of heat, so that the inner layer is always kept at almost the temperature of the expired air, and each successive layer diminishes in warmth, till the outer one is nearly as cold as the external air. By this arrangement, the air that is inhaled meeting with layers of wire of gradually increasing heat, is raised in the most powerful respirators to the highest attainable temporature. Such respirators have twenty-four layers of wire-work, those of medium power sixteen, and the weakest eight. The whole of the wire-work is curved, so as to fit closely to the face, and is enclosed in a border or case of soft leather; and an outer coat, usually of a very fine and open woollen fabric, is added. The form of instrument chiefly used is fixed over the mouth, and is named *The Oral Respirator*. For an instrument to cover both the mouth and nostrils, the term *Orinasal Respirator* is used. The use of these instruments in allowing persons with delicate lungs to take out-of-door exercise with safety and advantage in comparatively severe weather, is now universally recognized. Tyndall invented a *Smoke Respirator* for firemen; there are respirators for keeping out dust and metal-filings from the lungs of factory operatives; and respirators containing a sponge soaked with creosote or carbolic acid for excluding or destroying bacteria germs.

RESPI'RATORY SOUNDS, are of the greatest importance in the diagnosis of the diseases of the lungs. They may be divided into (1) those directly resulting from inspiration and expiration, and (2) those of the voice, including coughing.

In the healthy state of the lungs, two distinct sounds are heard, on applying the ear, either directly or through the intervention of the stethoscope, to the walls of the chest—one called the *vesicular sound*, because it is supposed to be caused by the passage of the air from the ultimate tubes into the air-cells or vesicles; and the other the *bronchial sound*, because it is generated in the bronchial tubes by the air moving through them.

The vesicular sound, known also as the *respiratory murmur*, is

mainly produced during inspiration, being very faint, and sometimes scarcely perceptible during expiration. It is rather a rustle than a murmur, and has been compared to the sighing of a gentle breeze amongst leaves, to the sound made in the deep inspiration of a sleepy person, &c.; but a single minute's application of the ear to the chest of a healthy person below the collar-bone, will give a clearer idea of its true nature than any mere description could convey. The sound is more distinct in thin than in fat persons, in women than in men, and in children than in adults. Indeed, it is so loud in children, that when an unusually noisy sound is heard in an adult, it is said to be *puerile*. The *bronchial sound* has a blowing character, such as may be produced by blowing air quickly through a tube, and it is altogether distinct from the former. It may be mostly clearly heard over the trachea or windpipe, and at the upper part of the sternum or breast-bone.

Such are the sounds as they occur in the healthy lungs. In disease, any change which tends to impair the respiratory function in one part of the lungs, will make the vesicular murmur abnormally weak there, and abnormally louder in the remainder; and there are other changes, besides a mere increase or decrease of intensity, that sometimes occur, and into which we have no space to enter. The bronchial sound is also liable to morbid alteration; for example, it may be heard in parts of the chest where it is usually inaudible, in consequence of condensation of the surrounding pulmonary tissue, or from dilitation of the tubes, independently of condensation; and in violent dyspnœa, it may sometimes be heard over the whole chest without any change of structure. These morbid sounds are only modifications of those which occur in health. There are, however, other sounds generated by disease which are highly important in diagnosis. These are termed *Râles* by the French, and *Rattles, Sibilus, Rhonchus*, &c., by those English writers who do not adopt the French term. They may be briefly divided into the *dry* and the *moist râles*, the former being caused by the passage of the air, with increased rapidity, through narrow portions of the bronchial tubes; while the latter are formed by the passage of air through a fluid of more or less tenacity in the bronchial tubes, causing the formation of a succession of bubbles, whose bursting occasions the sound.

There are two other morbid sounds connected with the respiratory system which deserve to be named in this list, viz., *metallic tinkling* and the *friction sound*. Metallic tinkling is a quick and sharp sound, resembling that produced by striking a glass vessel with a pin. Its occurrence affords evidence of the existence of a cavity of considerable size, containing air, and surrounded by firm walls; but how the sound is produced is not definitely settled. The friction sound is produced by the rubbing together of the pulmonary and costa pleuræ when rough from inflammatory action, and is indicative of pleurisy.

RESPO'ND, in Gothic Architecture, a half-pier attached to a wall, and supporting an arch, &c.

RESPO'NDENT is the name of the party against whom another party presents a petition to a court which requires to be answered. The word is used in Scotland as well as in England, but more frequently in England.

RESPONDE'NTIA is a mode of raising money by a master of the ship in critical and desperate circumstances, when he has no other means of doing so, and when the object is to rescue or save the ship and cargo for the benefit of all parties. He goes to a person who advances a sum of money, and takes a mortgage of the goods or cargo, but in such a way that if the goods never arrive, the creditor loses his whole security, and cannot claim repayment from the owner of the ship. When money is borrowed in a similar way on the security of the ship itself, it is called Bottomry (q. v.). In both cases the security is in the form of a bond.

RESPO'NSORIES (Lat. *responsorium*, a response), short sentences, generally verses or portions of verses from Scripture, which are assigned in the church services, to be answered by the people to the officiating clergyman. Responsories are appended to lessons, to chapters, and to versicles, in common with which they are either chanted or simply repeated, according to the nature of the service. They are found in all the ancient liturgies, and occur also in the Book of Common Prayer. In the latter the name given to them is RESPONSE; but in the ancient service-books, as well as in the modern Breviary, they are called as above.

REST, in Heraldry, the name usually given to a charge of the form indicated in the subjoined figure, varying, however, considerably in different representations. It appears at too early a date to be what it is often said to be—a spear-rest. It is sometimes called an organ-rest, and in old rolls, a clarion—and is most likely a representation of some musical instrument like the Pandean pipe. It was a rebus-badge of the Clares.

REST, in Music, an interval of silence occurring in the course of a movement between one sound and another. The duration of a rest, like the duration of a note, is indicated by the form of the character representing it.

For rests of a still longer duration, it is now usual to draw one or two oblique lines across the staff, and write on them in figures the number of measures during which the voice or instrument is to be silent. A rest, like a note, may be prolonged by one or more dots.

REST-HARROW (*Ononis*), a genus of plants in the natural order *Leguminosæ*, suborder *Papilionaceæ*, having a 5-cleft, bell-shaped calyx, the standard of the corolla large and striated, the keel beeked, the pod turgid and few-seeded. There are many species, chiefly natives of Europe, and generally herbaceous or half-shrubby.—The COMMON R. (*O. arvensis*) is abundant in pastures and by waysides in Britain. Its lower leaves have three leaflets, the upper are simple; the flowers are axillary and rose-colored, or occasionally white. The plant is half-shruby, with somewhat spiny stems; viscid; and its smell strong and unpleasant. The roots are tough and woody, whence its English name. It is sometime a troublesome weed, but only in neglected pastures, and disappears before careful cultivation.

RESTIA'CEÆ, a natural order of endogenous plants, nearly allied to *Cyperaceæ*, mostly natives of the southern hemisphere, and abounding at the Cape of Good Hope and in Australia. They are herbaceous plants, or sometimes half-shrubby, have simple stems, and narrow leaves; and are hard, wiry, and rush-like. They have generally a creeping root-stock. The flowers are in heads or spikes, generally unisexual, with 2–6 glumes, sometimes with none, two or three stamens, an ovary with 1—3 cells, one ovule in each cell, the fruit a capsule or nut. *Restio tectorum* is much used for thatching houses at the Cape of Good Hope. *Wildenowia teres* is used for making baskets and brooms.

RESTIGOUCHE, a river in the north-west of New-Brunswick, Canada, forms for about 50 miles the boundary between that province and the province of Quebec. It is 200 miles in length, and falls into Chaleur Bay, which opens into the Gulf of St. Lawrence. For the last 18 miles it is navigable for the largest ships.

RESTITU'TION, in Scotch Law, is the obligation of the purchaser of a movable, which really belongs to a third party, to deliver it up to such real owner without claiming repayment of price. An action lies to recover restitution of money paid in mistake. See REPETITION.—In English Law, the word restitution is used in similar circumstances to denote delivery up of possession to the rightful owner. Thus, in case of goods stolen, the criminal court may order restitution of the goods to the owner.

RESTORA'TION, a term applied, in English history, to the resumption of monarchical government, on the accession of Charles II., May 29, 1660, after an interval of eleven years, from 30th January 1649, when Charles I. was beheaded, during which the government of Great Britain was republican. The Restoration was appointed by various statutes to be observed as a festival in the Church of England, with special religious services; but its observance was abolished in 1859 by act 22 Vict. c. 3.

RESTORA'TIONISTS, a sect which, under a new name, has revived a very ancient doctrine, which has found advocates at all times since the days of Origen (q. v.). One of the most remarkable doctrines of that Father was his belief of a general *apokatastasis*, or 'restoration' of all things, in which, after a purgation proportioned to the various moral conditions of their souls at the time of death, all men, however wicked, and all the evil angels, even Lucifer himself, would be restored to the favor of God, and reunited to Him in heaven. This doctrine was condemned at the time, and has since been repeatedly rejected by the churches of the East as well as of the West. The doctrine has been renewed in more than one form since the Reformation by various classes, who have taken the name of Universalists (q. v.). The particular title of R. was given in America to the followers of a preacher named Ballow, who, in addition to the tenet above explained, held that all retribution is confined to this life, and who, although he denied the immortality of the soul, yet taught that at the resurrection all men will be admitted to everlasting happiness. The R. are said to exist chiefly in Massachusetts.

RESURRE'CTION. This expression denotes the revival of the human body in a future state after it has been consigned to the grave. We find traces of this doctrine in other religions, and especially in later Judaism, but the doctrine is peculiarly Christian. In the earlier Hebrew Scriptures, there is no mention of it. It is not to be found in the Pentateuch, in the Psalms, nor even in the earlier prophecies. It is supposed to be alluded to in Isaiah (xxvi. 19), and in Ezekiel (xxxvii.) in the well-known chapter as to the revival of dry bones in the valley of vision; and in the last chapter of Daniel (xii. 2), there is the distinct affirmation that 'many that sleep in the dust of the earth shall awake, some to everlasting life, and some to shame and everlasting contempt.' There is also a well-known passage in Job (xix. 25—27) which has been thought by some to refer to the doctrine of the resurrection of the body. Almost all recent criticism, however, denies

the validity of this reference, as unsupported by a correct rendering of the words themselves; and especially by the whole scope of the argument of the book, which confines its view of retribution to the present life. The idea of a future resurrection would have presented to the mind of the patriarch a more conspicuous solution of the enigmas of Providence which perplexed him, and could not have failed to be introduced into the argument by some of the speakers, had it formed an element of their religious knowledge; but they nowhere allude to it. It is only, therefore, in the later Judaism that the doctrine appears. In the time of our Lord, it had become a formal doctrine of the Pharisees. The general body of the Jewish people seem also to have believed in it. The Sadducees alone disputed it (Matt. xxii. 23, sq.; Luke xx. 27, sq.; Acts xxiii. 6—8). It appears, in fact, to have become bound up in the Jewish mind with the idea of a future life, so that an argument which proved the one proved the other; and the Sadducees not merely denied the distinctive idea of the resurrection, but further denied that there was any 'angel or spirit.'

It remained for Christ and his apostles to reveal clearly the doctrine of the resurrection of the body, and to connect it with the fact of Christ's own resurrection as its special evidence and pledge. The following may be stated as the main points involved in the doctrine as revealed in the New Testament: 1. The resurrection of the dead is ascribed to Christ himself; it will complete his work of redemption for the human race (John v. 21; 1 Cor. xv. 22, sq.; 1 Thess. iv. 14; Rev. i. 18). 2. All the dead will be raised indiscriminately to receive judgment according to their works, 'they that have done good, unto the resurrection of life; and they that have done evil, unto the resurrection of damnation' (John v. 51—29; 1 Cor. xv. 22; Rev. xx. 11). 3. The resurrection will take place at 'the last day,' by which seems to be meant the close of the present world (John vi. 39, 40, xi. 24; 1 Thess. iv. 15). 4. The great event is represented as being ushered in by the sound of a trumpet, a representation probably borrowed from the Jewish practice of convening assemblies by sound of trumpet (1 Cor. xv. 52; 1 Thess. iv. 16). 5. As to the character of the change through which our bodies are raised after the lapse of ages, and get their identity preserved, there is nothing distinctly made known. The impossibility of such a change was evidently a subject of argument in the primitive Christian age, and the apostle argues strongly in its favor (1 Cor. xv. 32, sq.) from occurrences which are scarcely less mysterious in the natural world, It is not professed, however, that such occurrences really explain or throw light upon the fact of the resurrection. The apostle designs rather to silence cavils, and to invigorate faith, than to render an account of the actual manner of the resurrection.

Arguing from God's infinite power as displayed in the processes of creation, he would, as it were, press the question which he asks elsewhere: 'Why should it be thought a thing incredible with you that God should raise the dead?' (Acts xxvi. 8), rather than attempt any explanation of which the subject does not really admit. And this is the only becoming spirit in which this great doctrine can be contemplated by any mind. The fact of a resurrection of the dead is clearly revealed; but the *mode* of the fact necessarily transcends our present intelligence.

RETAI'NER is, in English Law, the act of engaging an attorney or counsel to attend to a certain suit or case. The retainer of an attorney may be either verbal or in writing; but the retainer of a counsel is always by writing; i. e., by a written memorandum delivered by the attorney to the counsel. The retaining of a counsel is generally a precautionary measure resorted to only in the case of eminent counsel, the effect of it being to prevent the other party from securing the services of such counsel; and this is considered a prudent precaution in most cases of importance. The usual fee, however, must be paid over and above the retaining fee, which is a small fee varying with the court in which the litigation arises.

RETAI'NING WALLS. These, as their name implies, are walls built to retain earth, sand, or other incoherent substances in positions and forms which without their aid they could not maintain.

These substances, if left to themselves, will not stand with vertical sides, but will fall down till they assume a certain slope. The angle which this slope makes with the horizontal is called the 'angle of repose.' This angle varies according to the nature of the material; for example, that of moist soil is about 45°, while fine sand assumes an angle of about 30°.

In fig. 1, E represents a section of a mass of earth, which it is desired to retain by means of the wall ABCD.

If we draw BG from B at the angle of repose, it is evident, from what has been said, that the prism ABG is kept in position by means of the retaining wall; and if the earth began to give way, it would do so by slipping on some line, BF. The wedge-shaped piece, ABF, which has the greatest tendency to separate itself from the rest of the mass, is called the 'prism of greatest pressure;' and the retaining wall ABCD must be made of sufficient weight and thickness to prop it up and resist its tendency to slide. The line BF is found to bisect the angle ABG.

In estimating the requisite thickness of the wall, it must be taken into account that the wall may give way in various manners; it may be overturned, or it may slide as a whole along its base DB, or the upper parts may give way, while the base remains.

From these data, mathematical formulæ have been worked out, which determine the thickness requisite for different situations and materials, such as that given by M. Poncelet for ordinary materials, and within ordinary limits:

$$x = \cdot 285(H + h).$$

Where H, the height of the wall, and h, the additional height of the bank above the top of the wall, being given, x, the thickness of the wall, can be found.

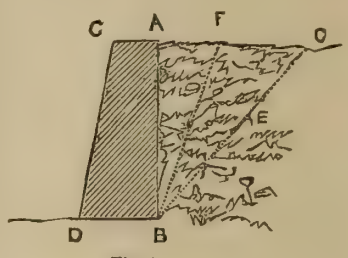


Fig. 1.

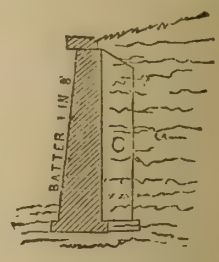


Fig. 2.

These formulæ, however, are not of much practical value, on account of the varying nature of the data on which they are founded, and of the excess of strength requisite in all such constructions, to allow for causes of failure, which cannot be foreseen or provided for in the calculations. Practical experience is found to be the only safe guide in all such considerations.

Figs. 2, 3, and 4 represent sections of forms of retaining walls in common use. Figs. 2 and 3 are used in retaining earth-works, while fig. 4 is a common form of dock-wall.

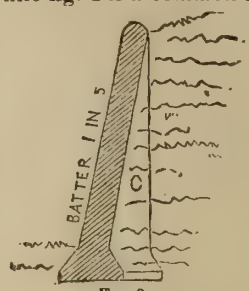


Fig. 3.

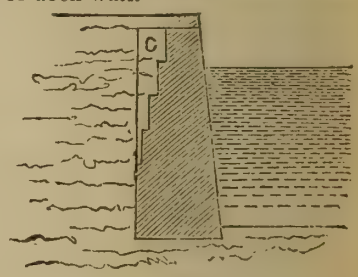


Fig. 4.

In that shown by fig. 2, the thickness at the top is made from 2 to 3 feet; the back is vertical, and the front is sloped out 1 foot for every 8 feet in height; so that the thickness increases with the height, in the same manner as the pressure of the earth, which it is required to resist.

The foundation is made of large stones, extending beyond the sides of the wall, so as to distribute the pressure on as large a surface as possible. It is also sunk for 2 or 3 feet below the adjoining surface, so as to resist its tendency to slip on its base.

At its back are placed counterforts, C, which are built up with the wall, and are about 3 feet long by 2½ feet wide, placed from 8 to 10 feet apart. These counterforts stiffen the wall like ribs; they put its center of gravity further back, and so resist the tendency to heeling or overturning; they also act advantageously in dividing the earth, and so diminishing the length of the mass, which can act together against this wall. This form of wall is very simple in construction.

The form of wall shown in fig. 3 is that which requires the least material; it also, on account of its thinness, dries and consolidates rapidly, but is not so easily built as that shown in fig. 2.

The dock-wall shown in fig. 4 is made much heavier than the simple pressure of the earth behind it would require; for it has many strains to bear of an exceptional character due to its situation; such are the machinery and goods deposited on the quays, and the possible accident of the dock being suddenly emptied of water, while the earth behind the wall is full of water.

In the construction of a retaining wall, a great desideratum is, that the earth behind it be well drained; for if water be allowed to accumulate behind the wall, the earth gets into a semi-fluid state, in which it gives a very much increased pressure on the wall. For this purpose, holes are left through the wall called 'weeping-holes;' these holes are about 9 inches high and 2 inches wide, and are generally placed about 1 for every 36 square feet of wall.

Also stones without mortar are frequently built up behind the wall, so forming an open stratum, into which the water drains, and is thence carried off through the weeping-holes.

RETE'NTION OF URINE is the term employed in medicine to signify a want of power to discharge the urine from the bladder, and it must be carefully distinguished from a far more serious affection known as *suppression of urine*, in which also no urine is passed, because in this case there is none in the bladder.

Retention may arise either from change of structure of the parts concerned in the expulsion of the urine, or from mere disordered function unaccompanied by change. The former are termed *organic*, and the latter *functional* causes of retention.

Amongst the chief organic causes are: 1. Permanent stricture of the urethra (q. v.). 2. Contraction of the urethra, in consequence of a blow on the perinæum, or other external injury. 3. Tumors within the urethra. 4. Foreign bodies in the urethra, as calculi, clots of blood, or mucus, &c., which have entered it from the bladder, or fragments of bougies, &c., introduced from without. 5. Enlargement of the prostate gland, especially in aged men. The treatment in retention from these causes must be entirely left in the hands of the surgeon.

The principal functional causes are: 1. Spasm of the urethra, often termed spasmodic stricture; and 2. Want of power in the muscular coat of the bladder and urethra.

Spasm of the urethra is most likely to occur in those who have a slight permanent stricture, or a urethra irritable from other causes. The spasm usually follows exposure to cold or wet, but it may likewise be excited by piles or other sources of irritation in the lower bowel, or by the use of cantharides either taken internally as a medicine, or absorbed from blisters applied to the skin. The patient finds himself unable to pass his water, although he has a great desire and makes strong efforts to do so. The bladder soon becomes so distended that it can be felt as a tense round tumor above the pubes. If relief be not speedily afforded, the bladder may burst, and discharge its contents into the peritoneal cavity, in which case death rapidly ensues; or the urethra behind the stricture gives way, and the urine is extravasated into the cellular tissue of the adjacent parts—a condition which, if not promptly relieved by surgical interference, is likely to be followed by gangrene, typhoid symptoms, and death.

If the symptoms are not very severe, and there is no evidence of old permanent stricture, a hot bath, combined with the administration of the tincture of muriate of iron, in doses of ten minims, taken every ten minutes in thin gruel or in barley-water, will often give relief. Sometimes a full opiate administered by the mouth, or preferably as an enema, or the inhalation of a few whiffs of chloroform, will, by allaying the spasmodic action, give immediate relief. If these means fail, surgical assistance must be at once procured, and the bladder evacuated by a catheter—an operation often requiring very delicate manipulation. If these means fail, which only happens when the spasm is associated with old-standing diseases of the urethra, the surgeon must either puncture the bladder through the rectum, or above the pubes, or make an incision into the urethra either at or behind the seat of the stricture.

Paralysis of the muscular coat of the bladder may arise from the debility of old age, from the depressed state of the nervous system in fevers of the typhoid type, from injury or disease of the head or spine, and from various other causes. In a temporary form, it is often a result of over-distention of the bladder from stricture or prostatic disease, and it sometimes occurs in the case of nervous sedentary persons, if they have allowed rather more than the usual time to elapse without evacuating the bladder. It should be generally known that retention of urine from paralysis is sometimes accompanied with dribbling away of the water, so that the retention might at first sight be mistaken for *incontinence* of urine. On examination, however, it will be found that the bladder is abnormally distended, and cannot be evacuated by the act and will of the patient.

In these cases, the urine must for a time be regularly drawn away by the catheter. General tonics, such as the cold-bath (or sometimes preferably the sitz-bath) and chalybeates, must be given to improve the general health; while medicines which are supposed to act locally on the mucous coat of the bladder or on the spinal cord, must be simultaneously administered.

A peculiar form of retention sometimes occurs in women of hysterical temperament, in which the will rather than the power is at fault. The treatment should here be directed towards the general hysterical tendency, rather than to this special manifestation of it.

RETFORD, EAST, a small municipal and parliamentary borough and market-town in the county of Notts, on the right bank of the Idle, an affluent of the Trent, 138 miles north-north-west of London by the Great Northern Railway. West R., on the other side of the river, and connected with East R. by a strong bridge of five arches, is a more modern and much smaller town. Tanning and coachmaking are carried on to some extent. Pop. of municipal borough (1881), 9748; of parliamentary borough, which returns two members to parliament, and which includes several districts, 49,257; and in 1881, 50,031.

RETHEL, a town of France, in the department of Ardennes, prettily situated on the right bank of the Aisne. Woollen and other manufactures are carried on. Pop. (1876) 7364.

RETI'MO, a seaport town of the island of Crete, on its north coast, 35 miles west from Candia. The neighborhood is productive both of oil and wine. Pop. about 6000, of whom two-thirds are Turks, and the rest Greeks.

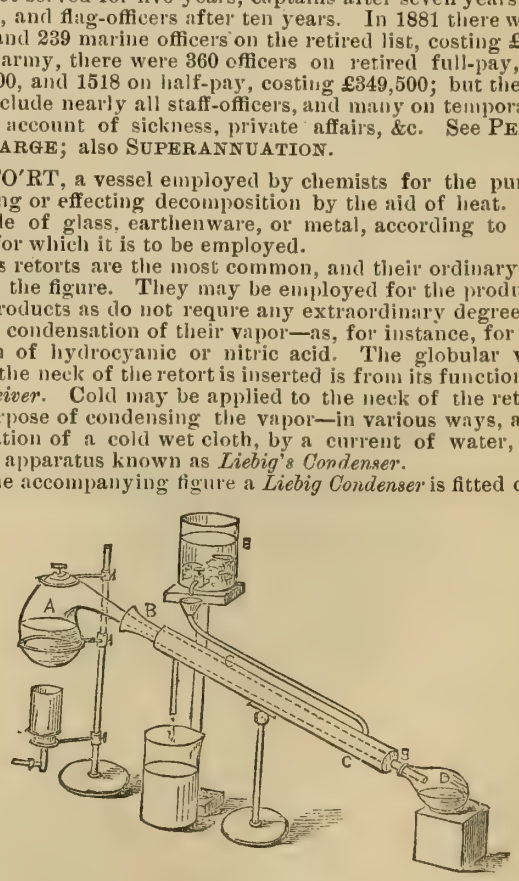
RE'TINA. See EYE.

RETI'REMENT, ARMY AND NAVY. A Royal Warrant introducing and regulating compulsory retirement from the army was issued in 1877. Voluntary retirement on half-pay is allowed to officers after not less than 12 years' service. Officers below the rank of major, who have served in their present rank for seven years without promotion are to be placed on half-pay after a total service of 20 years; majors after 27 years, and higher officers after varying periods. As to age, a colonel who has not retired on other grounds, must, unless special exception be made, retire at the age of 63 years, lieutenant-colonel at 60 years, major at 58 years, and officers of lower rank at 55 years—the pension varying according to circumstances. In the navy, officers are placed on the retired list at 65 years of age if admirals or vice-admirals, 60 for rear-admirals, 55 for captains, 50 for commanders, and 45 for lieutenants, with the option in each case of retiring five years earlier. Lieutenants and commanders are also retired compulsorily if they have not served for five years, captains after seven years without service, and flag-officers after ten years. In 1881 there were 2048 naval and 239 marine officers on the retired list, costing £616,518. In the army, there were 360 officers on retired full-pay, costing £131,000, and 1518 on half-pay, costing £349,500; but these numbers include nearly all staff-officers, and many on temporary half-pay on account of sickness, private affairs, &c. See PENSIONS, DISCHARGE; also SUPERANNUATION.

RETO'RT, a vessel employed by chemists for the purpose of distilling or effecting decomposition by the aid of heat. It may be made of glass, earthenware, or metal, according to the purposes for which it is to be employed.

Glass retorts are the most common, and their ordinary form is seen in the figure. They may be employed for the production of such products as do not requre any extraordinary degree of cold for the condensation of their vapor—as, for instance, for the production of hydrocyanic or nitric acid. The globular vessel in which the neck of the retort is inserted is from its function termed *the receiver*. Cold may be applied to the neck of the retort—for the purpose of condensing the vapor—in various ways, as by the application of a cold wet cloth, by a current of water, or by a special apparatus known as *Liebig's Condenser*.

In the accompanying figure a *Liebig Condenser* is fitted on to the retort. A is the bulb of the retort, into which the matter to be distilled is inserted. It can be opened or closed at will at the top by a ground-glass stopper. From the bulb the neck proceeds, and its termination is seen in the receiver D. The condenser, BB, embraces the greater part of the neck of the retort. It consists of a glass tube, tapering from end to end, fixed in the center of a metal pipe, provided with tubes, so arranged that a current of cold water may circulate through the apparatus. By putting a few pieces of ice into the little cistern, E, the temperature of this water may be kept at 32° and extremely volatile liquids condensed.



Liebig's Condenser.

The retort may be heated in various ways—as by means of a lamp, or by placing its body in a sand-bath, or even in the fire; in the last case, the retort is usually protected by a coating of lute.

In ordinary cases requiring a higher temperature than glass could bear, earthen retorts are used; for the preparation of hydrofluoric acid, retorts of lead are employed; while for the preparation of strong sulphuric acid, platinum is the best material for the retort. Iron retorts are employed in the laboratory for the preparation of oxygen from black oxide of manganese and some other processes; and in gas-works, for the destructive distillation of coal.

RETREA'T, in Military Language, signifies a retrograde movement of a force, with the intention of avoiding an encounter with a hostile body in the front. The greatest exertion of talent is requisite in a general to conduct an able retreat, more depending on arrangement and coolness than even in the preliminaries of a battle. When the enemy pursue, if the retreat is not to degenerate into a rout, the retreating army must be covered by a powerful rear-guard, which from time to time must hold the pursuers at bay, while the artillery-train and baggage pass defiles, cross streams, and overcome other special obstacles. A strong retreat is made when the rear is formed by a line of solid battalions, of which alternate masses retreat, while those intervening face about and oppose the enemy; the latter afterwards retreating between and to the rear of those which retreated in the first instance. The retreat is thus continued by alternate halting and falling back on the part of each corps.

RETRE'NCHMENT, in Fortification, is a defensive work, comprising at least ditch and parapet within some other work of a fortress, and intended as a place of retreat for the defenders, whence they may prolong the defence, or capitulate after the faces of the work itself have fallen into the enemy's hands. The retrenchment bears a considerable resemblance to the *réduit*, except that it is almost always of earth. Retrenchments are made in ravelins, and the re-entering *places d'armes* at the time of constructing those works. A retrenchment is thrown across the gorge of a redan or bastion, or from shoulder to shoulder, when it is apprehended that the salient angle will fall into the possession of the besiegers; these retrenchments are usually made when wanted. Such a retrenchment across the interior of the Redan at Sebastopol caused the sanguinary repluse of the British on the 8th September, 1855.

RETRIE'VER, a dog specially trained to go in quest of game which a sportsman has shot, and particularly useful in fatiguing ground or marshy places. The retriever is generally cross-bred,

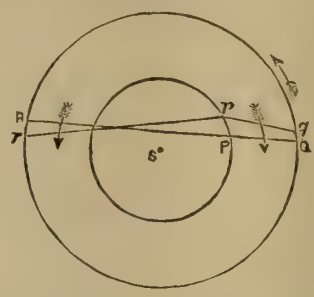


Retriever.

the two recognized crosses being that between the Newfoundland and setter, which has the coat smooth and wavy, and that between the Newfoundland and water-spaniel, which has the coat curly. The favorite color is black. Spaniels, crosses of the terrier and spaniel, and terriers are also used as retrievers; and even fox-hounds, blood-hounds, and setters. The training requires much assiduity and patience, the dog being apt at first to be drawn from the proper quest by any water-rat or other creature that presents itself, and also to bite the game too hard, so as to injure it. A thoroughly trained R. therefore commands a high price, being of great use to the sportsman. A high degree of intelligence is requisite in a R.; it is very often the attached companion of its master, and an inmate of the mansion rather than of the kennel.

RE'TROGRADE. This is a term applied to the motion of the planets and comets among the fixed stars, when they appear to move in the *reverse* order of the signs of the Zodiac (q. v.). All the planets move in the same direction round the sun, and therefore their retrograde motions must be due to their motion relative to the earth. In the case of comets, however, we have instances of motion about the sun in the opposite direction to that of the planets, and in such orbits the motion (referred now to the sun, not to the earth) is said to be retrograde.

In the case of planets, which is thus the only one we need consider, let S be the sun, and let the two circles represent the orbits of two planets. First, let the planets be, as at P and Q, towards the same side of the sun. The inferior planet has of course the greater velocity; and therefore, if p and q represent their positions after a lapse of a given time (second, hour, day, &c.), Pp is greater than Qq, and therefore the *direction* of the line pq (in which



one is seen from the other) has rotated in the *opposite* direction to that in which either planet revolves about the sun. Hence, when a superior planet is in opposition (i. e., if Q be Jupiter, and P the earth), it *appears* to move backward among the stars. When an inferior planet is between the earth and sun (i. e., if Q be the earth, and P Venus), it *appears* to move backward also. If the planets be on opposite sides of the sun, as at P and R in the figure, let p and r be their positions after a given time; then pr has turned from the direction PR in the direction in which the planets revolve about the sun. Hence any planet, superior or inferior, appears to move *directly* when the sun is between it and the earth. Between these two opposite cases, there must, of course, be points at which the apparent motion is neither retrograde nor direct—then the planet is said to be *stationary*. This case occurs whenever, for an instant, the lines PQ and pq are parallel; that is, when the two planets are moving with equal velocities transverse to the line joining them, these velocities being parallel, and towards the same side of the joining line.

RETZSCH, Friedrich August Moritz, an eminent German painter and engraver, was born in Dresden, 9th December 1779, studied at the academy of his native city, where he became a professor in 1824. R. died 11th July 1857. He has acquired great celebrity by his illustrations in outline of the great German poets, Schiller, Goethe, &c.—those of Goethe's *Faust* being particularly well known, not only in his own country, but also in France and England. His illustrations of Fouqué's charming romances, *Undine* and *Sintram*, are singularly beautiful. R. likewise executed several fine works, the subjects of which are taken from the classical mythology, as 'The Child Bacchus asleep on a Panther,' 'Diana,' 'Love and Psyche embracing in the Clouds,' 'A Satyr and Nymph,' 'The Four Epochs of Human Life;' &c. Among his other works of conspicuous merit are—'The Struggle of Light and Darkness,' 'The Chess-players,' and 'Fantasies.' R. ranks as one of the most original, thoughtful, and vigorous artists of modern Germany. His works display the presence of a strong, inventive, and cultured imagination, whose efforts at expression never degenerated into a weak sentimentalism. As a miniature oil-painter, R. was also very successful.

REUCHLIN, Johann, also known by his Græcized name of *Capnio*, one of the first and most active promoters of Hebrew studies in Germany, whose labors and struggles in no small degree helped to bring about the Reformation, was born at Pforzheim in Baden, 28th December 1455. He received his earliest education at Schlettstadt, and in 1473, was appointed traveling companion to Prince Friedrich of Baden, in which capacity he visited Paris, made the acquaintance of the celebrated Wessel (q. v.), and studied Greek under Hermonymus of Sparta, besides assiduously practising the composition of Latin. Two years later, R. went to Basel, where he continued his study of Greek, and wrote his Latin dictionary. *Vocabularius Latinus Breviloquus Dictus* (Basel, 1478). In the same year he paid a second visit to France, studied law at Orleans (1479), and fought at Poitiers (1480), then returned to Germany, married, and set up at Tübingen as a teacher of jurisprudence and literature. Subsequently, he was raised to the rank of a count of the German empire in 1492, and about the same time began the study of Hebrew under a learned Jew, Jacob Jehiel Loans, the imperial physician. In 1496, R. went to Heidelberg, where he wrote a satirical comedy entitled *Sergius, sine Capitis Caput*, directed against the unworthy Augustinian monk Holzinger, who had been made chancellor of Würtemberg. In 1498, he was sent to Rome by Philip the Elector-palatine, and delivered a Latin oration before the pope.

While remaining there, he applied himself more vigorously than ever to the study of Hebrew and Greek, and with such success, that his Greek master, Argyropulus, exclaimed in wonderment at his proficiency: 'Our persecuted Greece has taken refuge beyond the Alps.' R. returned to Würtemberg in 1499.

In 1506 appeared his *Rudimenta Linguæ Hebraicæ*, a work of which he was justly proud. He made it, as he said in his preface, 'without any foreign help,' declares it to be 'the first attempt to execute a grammar of the Hebrew tongue,' and finishes with the Horatian boast, *Exegi monumentum ære perennius*. His Hebraic studies, which embraced the post-biblical Jewish literature, were—in their consequences—the most important of his life, drawing him into bitter strife with learned Jews, Jewish proselytes, and the Dominicans, and directly and powerfully helping on the Reformation. It was in the year 1510 that the struggle between Light and Darkness, as the Germans regard it, broke out. In that year, Johann Pfefferkorn, a Jewish proselyte, in the true spirit of a renegade, called upon princes and subjects to persecute the religion of his fathers, and especially urged the emperor to burn or confiscate all Jewish books except the Bible. R. remonstrated, maintaining that no Jewish books should be destroyed except those directly written against Christianity. This tolerant attitude drew upon R. the enmity of the Dominicans, and particularly the inquisitor, Jakob van Hoogstraten. These enemies of R. held possession of the universities of Paris, Louvain, Erfurt, and Mainz; but all the distinguished and independent thinkers in Germany, were on the side of the brave and humane scholar. Among the *Reuchlinists*, as they were termed, we may especially mention the names of Ulrich von Hutten (q. v.) and Franz von Sickingen (q. v.), to the first of whom (in conjunction with Rubeanus, &c.), we owe the *Epistolæ Obscurorum Virorum* (q. v.), and to the second of whom R. owed his safety, for he threatened (1519) Hoogstraten and his monks with his most terrible vengeance if they did not cease to persecute 'his teacher, Doctor Reuchlin, that wise, experienced, pious, and ingenious man.'

When the Reformation was inaugurated by the burning of the papal bull (1517), R. instinctively felt that a crisis had come, and exulted in the heroism of Luther. 'God be praised!' he said: 'we have now got a man who will give them [the monks] mighty hard work.' Luther, in a letter to R. (1518), tells the latter that he had longed to take part with him in his noble struggle, but had never found an opportunity. But the end of the scholar's troubles was not yet come. A quarrel broke out between Ulrich Duke of Würtemberg and the Swabian League, in the course of which R. became a prisoner of Duke Wilhelm of Bavaria, who, however, generously restored him his freedom, and in 1520, appointed him professor at the university of Ingolstadt. While here, he received a call to Würtemberg, which he declined, but sent Philip Melanchthon in his stead. In 1522 the plague broke out at Ingolstadt, and R. again withdrew to Tübingen, intending to devote himself exclusively to learned studies, but soon after he fell sick, and died at Stuttgart on the 30th of June. R.'s life has been written by Gehres (1815), Meyerhoff (Berl. 1830), and Geiger (Leipz. 1871).

RÉUNION, Ile de la, the name officially used after the French Revolution of 1789 and since that of 1848 for the island described at Bourbon, Ile de. The latter name was used before 1789 and from 1814 to 1848; while *Ile de Bonaparte* was the name from 1809 to 1814.

REUS, a manufacturing town of Spain in the province of Tarragona. It is only about 5 miles from the seaport of Salou. The modern portion of R. consists of wide plazas and streets. The prosperity of R. dates from about the year 1750, when a number of English merchants settled there. R. contains 80 establishments for cotton-spinning alone, 5000 looms, and many silk-ribbon factories, and manufactures soap, brandy, casks, and machinery. Pop. 28,000.

REUSS, the name of two sovereign principalities of Germany, between the kingdom of Saxony and the Prussian duchy of that name, and separated from each other by the circle of Neustadt, an outlying portion of the grand-duchy of Saxe-Weimar. Since the year 1616, the possessions of the House of R. have been divided between the elder and the younger lines. The principality of R.-Greiz (the elder line) is 123 sq. m. in extent, and had, in 1880, 50,782 inhabitants. The chief town and seat of the government is Greiz (q. v.). The principality of the younger line is R.-Schleiz, area 320 sq. m.; pop. (1880) 101,330. Capital, Schleiz (q. v.). Of both principalities the surface is hilly, being transversed by the Frankenwald, whose chief summits are upwards of 2000 feet in height. The chief rivers are the Saale and the Elster, the valleys of which are extensive and well cultivated. Large tracts are covered with forests and in pasture, and cattle and timber are exported. By the constitution of 1867, R.-Greiz obtained some much-needed reforms. Patrimonial jurisdiction was abolished, the administration of justice put under the management of regular courts, and a form of representative government granted to the people (7 of the 12 members of the single chamber being elected by town and country). The existing constitutional form of government in R.-Schleiz dates from 1852; 12 of the 16 representatives are elected by the people. The population in both states is almost wholly Protestant, and is industrially prosperous.

REUTER, Fritz, a novelist and poet who wrote in the Platt-Deutsch or Low-German dialect, was born 7th Nov. 1810 at Stavenhagen in Mecklenburgh. While studying law at Jena, he became involved in the revolutionary aims of the students' association, the *Burschenschaft*, was in 1833 sentenced to death, but got off with seven years' imprisonment in Prussian fortresses. He subsequently lived by his numerous writings, which gave a vivid picture of the distinctive manners and customs of the Low-German country. His best known works are *Olle Kamellen* and *Ut Mine Stromtid*. He died 12th July 1874.

REUTER, Baron Paul Julius, well known from the familiar newspaper heading 'Reuter's Telegrams,' was born at Cassel in 1818, and early became a telegraphist. In Aix-la-Chapelle he gradually formed an organization for collecting and transmitting telegraphic news; and in 1851, R. now a naturalized British subject, transferred his headquarters to London. As telegraphs extended throughout the world, his system multiplied its ramifications, and newspapers gained in copiousness and freshness of news. In 1865, R. made over his business to a limited liability company; in 1871, he was made a German baron; and in 1872, obtained from the Shah of Persia the—as yet inoperative—privilege of making all the railways of Persia.

REU'TLINGEN, a town of Würtemberg, situated in a beautiful district, fertile in fruit and wine, on the Echatz, a feeder of the Neckar, 20 miles south of Stuttgart. Its houses are old and picturesque; and it was formerly surmounted by walls and moats, the site of which, however, is now occupied by streets. The church of St. Mary, completed in 1345, and surmounted by a pierced tower 325 feet high, which is considered the most beautiful in the kingdom, is a noble Gothic edifice. Woollen and cotton yarns are spun, and cloth, leather, cutlery, hosiery, &c., are manufactured. Pop. (1880) 16,515.

REVALE'NTA ARA'BICA, a name given to a preparation which has long been sold as an empirical diet for invalids, extraordinary restorative virtues being attributed to it. It is only a preparation of the common lentil, its first name being formed for disguise from its botanical name, *Ervum Lens*. Its real value is about equal to good pea-meal.

REVEA'L, REVEL, the square ingoing of the sides and lintel, or arch, of doors and windows between the face of the wall and the framing.

REVEILLÉ, in an army, is the beat of drums at break of day, to warn the troops that the night is past, and the sentries to forbear from challenging.

RE'VEL, or REVAL, a Russian seaport, capital of Esthonia, stands on a small bay of the same name, 238 miles S.W. of St. Petersburg. It is divided into the upper and lower towns, which till 1878 had separate administrations. The former, occupying the top of a rocky ridge, contains the cathedral, the castle, gymnasium, governor's residence, and the houses of the nobility. The lower town extends to the sandy shore of the harbor. Till lately R. was a fortress of the first rank. The population is mostly of German extraction. It was long held by the Lithuanian Order of Knights; was made over to Sweden in 1562; bombarded by the Danish and Lübeck fleets in 1569; and besieged by Peter the Great, and annexed to the Russian empire in 1710. In 1713, a naval harbor was founded. The chief articles of export are flax, linseed, rye, skins, corn, and potato-brandy, supplied by land from the governments of Esthonia, Pskov, and Livonia. The chief imports are salt, fruits, wine, and manufactured and colonial goods. Pop. (1880) 50,860.

REVELA'TION is a familiar theological expression, commonly applied to the knowledge of Himself which God has given us in Holy Scripture. In itself, however, the word is properly, and of late years has been frequently used, not merely of the divine knowledge communicated to us in Scripture, but of all divine knowledge communicated through whatever source. Conscience and reason are in themselves modes of revelation, in so far as they witness to us of the divine laws which bind our moral life, and in harmony with which the health and happiness of that life can alone be found. History is also a species of revelation, unfolding, as it does, the same divine laws collectively in the race. Then nature reveals the divine power, wisdom, and goodness; and science, the interpreter of nature, in so far as it makes known the great laws governing the material universe, truly makes known the divine will to us. But it is with the Scriptures of the Old and New Testament that the idea of revelation has come to be especially associated. The Holy Scriptures are undoubtedly in a special sense the medium of divine revelation to the human race. God has made known to us therein more fully

and clearly than elsewhere His will and character. But at the same time we must not confound revelation, in its fact and essence, with the books of Scripture. These books are only the highest or most distinguished form or *medium* of revelation, which, in itself, and essentially, must always imply communication from one mind to another; and, in a religious sense, from the divine to the human mind. Scripture is, in its several books, the pre-eminent medium of this contact or interchange of the divine and human. It is the record of special communications which God made in time past to holy men, 'who spake as they were moved by the Holy Spirit.' It *contains*, in short, a revelation for us; but the revelation is not the record, but the knowledge which the record conveys to our minds.

REVELATION OF ST. JOHN (*Apokálypsis Ioannou*) the last book of the New Testament Scriptures. It professes to be the production of St. John, traditionally known as 'The Divine' (*hotheológos*). It has been a subject of dispute, however, whether St. John, the author of this book, is the beloved disciple, the author of the fourth gospel and of the three Epistles, or not. Upon the whole, the balance of evidence and of authority seem to be in favor of the supposition that he is the same, although some distinguished names—Luther in the past, and Lücke among modern critics—have adopted the negative view of the question. The author's simple mention of himself by his name John; his description of himself as one 'who bare record of the word of God, and of the testimony of Jesus Christ, and of all things that he saw,' is held to indicate strongly an identity with the author of the gospel, who speaks of himself in similar language (John xix. 35). He writes from Patmos, and the apostle is the only John distinctly named in the early Christian history as an exile in Patmos. The authority, moreover, with which the writer addresses the seven churches in Asia is such as may be supposed only to suit an apostle. So far as historical testimony is concerned, the authority of the early Christian Fathers—e. g., Justin Martyr, Theophilus of Antioch, and Irenæus, and Clement of Alexandria—all point to the Apostle John as the author of the Book of Revelation. The date of the book is supposed to be the very close of the 1st c. 95—97 A.D., or the end of the reign of Domitian. We cannot hear particularize the contents of the book, nor can we enter into any detailed statement of the different interpretations which have been given of it. It has been the subject of very varied and conflicting commentary.

It has been stated that 'not less than 80 systematic commentaries are worthy of note, and that the less valuable writings on the subject are unnumbered, if not innumerable.' All that we can do here is to characterize the different schools, so to speak, into which the interpreters of this wonderful book may be arranged: 1. The Præterist School of interpreters, who look upon the Revelation as fulfilled in the past, and especially in the great conflicts of Christianity with Judaism and Paganism, and its triumph over them in the ages following the time in which it was written. To this class of interpreters belong, among others, Grotius, Hammond, Bossuet, Calmet, Eichhorn, Ewald, Lücke, De Wette, Stuart, Lee, Maurice. 2. The *Futurist* School regard the book, with the exception of the first three chapters, as referring to events yet to come to pass; and this view has been advocated, in modern times, by such writers as Dr. J. H. Todd, Dr. S. R. Maitland, Newton, and others. 3. What has been called the Historical and Continuous School of expositors, who regard the Revelation as a progressive symbolic history of the fortunes of the church from the 1st c. to the end of time. To this school of interpreters belong a host of eminent names, such as Mede, Sir I. Newton, Vitringa, Bengel, Faber, Elliot, Wordsworth, Alfred, Hengstenberg, Ebrard, and others.

There are others, again, who are not disposed to allow any exact prophetical character to the book, but simply to regard it as a species of symbolical poem, setting forth the eternally-recurring principles of the divine government. The real fulfilment of the Revelation, therefore, is not to be sought in any definite historical events, but in the vindication of these principles shadowed forth more or less in great historical crises, yet transcending all partial historical results. The grand symbolic imagery of the book has never found and never will find its exact counterpart in any earthly facts, but it finds its spiritual counterpart constantly in the career of the church—the unceasing conflict of truth with error, of righteousness with sin, of life with death, of the kingdom of God with the kingdom of evil, and will attain to its true realization only on the destined triumph of the former over the latter.

REVELS, MASTER OF THE, or LORD OF MISRULE, the name of an officer, who, in England, was attached to royal and other distinguished houses, whose function it was to preside over the amusements of the court, or of the nobleman to whose house he was attached, during the 12 Christmas holidays. This officer, sometimes called *Master of the Tents and Revels*, became a permanent appendage to the English court in the reign of Henry VIII., and his duties included the keeping the tents and pavilions which accompanied the sovereign on a royal progress, as also the keeping the dresses and masks used in entertainments given at court, and the providing of new ones when required. In Queen Elizabeth's time, we find the Mastership of the Revels divided into several distinct offices. The office continued to exist till the reign of George III., when it was altogether discontinued.

RE'VENUE, PUBLIC. A state has a right to reserve part of the property of the citizens, or of the produce of the country, or to exact contributions from the citizens, to supply the expense of carrying on the government. It is also entitled to augment the riches of the state by taxing merchandise imported into or exported from the country, and by taking a small part of the things consumed. In the United Kingdom, this branch of the sovereign power is vested in parliament.

The revenue of the crown, in England, has been divided by Blackstone into two branches, designated ordinary and extraordinary; the former attached to the crown by hereditary right, the latter specially granted by parliament as a supply for national purposes. The so-called ordinary revenue was the more important of the two, in the early history of the country, consisting in a great measure of the rents of the crown-lands; but these came, in the course of time, to be delapidated by alienation and improvident management; and what remains of the hereditary land and forestal revenue of the crown, is now intrusted to certain officers, called Commissioners of Woods, Forests, and Land Revenues (see WOODS AND FORESTS), who act under the control of the Treasury. From the diminution of the hereditary revenues of the crown, subsidies have become the chief source of supply, a circumstance constitutionally of great importance, as it has rendered the crown dependent on parliament for its ordinary support and existence.

The popular voice, in the matter of taxation, was admitted as early as the reign of Edward I., an act of that monarch declaring 'that no tallage or aid shall be taken or levied without the goodwill and assent of the archbishops, bishops, earls, barons, knights, burgesses, and other freemen of the land.' The laity were thenceforth taxed by the votes of their representatives. The lords spiritual and temporal voted separate supplies for themselves; and from the reign of Edward I., the clergy, as a body, granted subsidies, either as a national council of the clergy, in connection with parliament, or, at a later period, in convocation, till the disuse of this right in the reign of Charles I.

As the Commons increased in political importance, the subsidies voted by them became the principal sources of revenue, and they gradually assumed their present position in regard to taxation and supply, including the lords as well as themselves in their grants. Concurrently with parliamentary taxation, imposts were formerly levied by royal prerogative alone; but none of these survived the Revolution of 1688. A grant by the Commons is not effectual without the ultimate assent of the Queen and House of Lords; the Lords, however, cannot alter a bill of supply, though they may refuse their assent to it.

The royal speech at the opening of parliament requires the Commons to make provision for the public service, and states that estimates will be laid before them. The Commons, referring to the royal speech, resolve that a supply be granted. Sitting as a Committee of supply, they consider what specific grants shall be voted; and sitting as a Committee of Ways and Means, they deliberate on the manner in which the necessary funds shall be raised. When some progress has been made in voting the estimates, the Chancellor of the Exchequer brings forward, in the Committee of Ways and Means, his annual statement, popularly known as the Budget, embodying his views on the probable revenue and expenditure of the year. Apart from the services voted in detail by the Committee of Supply, there are some few permanent charges which the Treasury is bound to defray from the Consolidated fund, such as the interest of the national debt, the civil list, the annuities of the royal family, and the salaries and pensions of judges and some other public officers.

When taxes are imposed or altered, the government begins to levy the new duties as soon as the resolutions for that purpose are agreed to by the House. A control is established over the expenditure of the supplies by the long-established practice of separating the custody of the public revenue from the function of payment, the former being vested in the Exchequer, and the latter in the Treasury, and the officers of the Exchequer being empowered to refuse their sanction to any demand not in accordance with the determination of the legislature. By an arrangement effected by 4 and 5 Will. IV. c. 15, the public revenue is now paid into the Bank of England, to the credit of the Comptroller-general of the Exchequer, an officer independent of the ministry, who can only be removed on a joint-address to the crown from both Houses of Parliament.

The principal sources of revenue are now the customs, the excise, the stamp-duties, the land-tax and house-duty, the property

and income tax, the post-office and telegraph service, and the crown lands. The excise, stamps, and taxes have been placed, by 12 Vict. c. 1, under the control of a board called the 'Commissioners of Inland Revenue.' The aggregate of the different sources of revenue is paid into a fund called the 'Consolidated Fund,' founded by 27 Geo. III. c. 47, which is chargeable with the interest of the national debt, and is mortgaged to raise an annual sum for the maintenance of the royal household and Civil List (q. v.).

The following table exhibits the gross revenue and expenditure of the United Kingdom, in the year ending March 31, 1880:

REVENUE.

Customs	£19,326,000
Excise	25,300,000
Stamps	11,300,000
Land-Tax and House-Duty	2,670,000
Property and Income Tax	9,230,000
Post-office	6,350,000
Telegraph Service	1,420,000
Crown Lands (net)	390,000
Interest on advances	1,254,596
Miscellaneous	4,024,459
Total Revenue	£81,265,055

EXPENDITURE.

Public Debt	£28,762,874
Civil List and Consolidated Fund	1,598,544
Civil Services	15,324,596
Army	15,645,867
Indian Home Charges	1,115,050
Abyssinian War	634
War in South Africa	3,244,920
Navy	10,416,131
Expense for collecting Customs	973,841
Inland Revenue	1,810,475
Post-office	3,333,000
Telegraphs	1,107,000
Packet Service	772,820
Localization of the Forces	250,000
Total Expenditure	£84,355,752
Excess of Expenditure over Income	£3,090,697

In the year 1879–80 the revenue was at the rate of £2, 7*s*. 7*d*. per head of the population; and the expenditure, £2, 9*s*. 3*d*. per head. In 1878–79, the revenue was £83,115,972; and the expenditure, £85,407,789. In 1880–81 the income was £84,041,000; while the expenditure was £83,108,000.

The revenue of British India for 1879–80 was £68,485,000, and the expenditure £69,668,000. The revenue of France is about £110,000,000; of Russia, £80,000,000; of Austro-Hungary, £64,000,000; of Italy, £56,000,000; of Germany (the empire), £28,000,000; and of Spain, £32,000,000.

In 1801 the gross revenue of Great Britain was £35,218,525, and of Ireland £2,919,217; in 1861–62 Great Britain raised £61,360,749, and Ireland £6,792,606. So that in 1801 the revenue was £3, 7*s*. per head of population, and in Ireland 11*s*. 2*d*; while in 1861–1862, the amount per head was £2, 13*s*. in Great Britain, and £1, 3s, 5*d*. in Ireland. At the conquest, the public revenue of England is estimated to have been about £400,000; and in the reign of Henry VI., it had fallen to £65,000. Under Henry VIII., it rose to £800,000; and under Anne, at the union with Scotland, it was £5,700,000.

REVE'RBERATORY FURNACE, a furnace so constructed that matter may be heated in it without coming in direct contact with the fuel. It consists essentially of three parts—viz., a fireplace at one end; in the middle, a flat bed or sole, on which the material to be heated is placed; and at the other end, a chimney to carry off the smoke or fume. Between the fireplace and the bed, a low partition-wall, called a fire-bridge, is placed, and the whole built over with a flat arch, dipping towards the chimney. The flame plays over the fire-bridge, and is reflected or *reverberated*, on the material beneath, hence the name. See LEAD (figs).

RE'VEREND (Lat. *reverendus*, to be respected), a title of respect given to the clergy. In Roman Catholic countries, it is applied to the members of the different religious orders. In France, before the Revolution, archbishops, bishops, and abbots were alike 'Most Reverend.' In England, deans are 'Very Reverend; bishops, 'Right Reverend;' and archbishops, 'Most Reverend.' In Scotland, the clergy in general are 'Reverend,' while it is the practice to apply 'Very Reverend' to the moderator of the General Assembly for the time being, to a synod, and to the principal of a university, being a clergyman. The General Assembly itself is usually styled 'Venerable,' but the address of the Lord High Commissioner begins with the words: 'Right Reverend and Right Honorable.'

The style Reverend is generally adopted by, and given to, the clergy of the different dissenting bodies; but there have been instances in which some of them have repudiated it.

RE'VERIE has been defined the dream of a waking man; it differs, however, in many respects; from dreaming. In an exaggerated form, it is of rare occurrence; but when exceeding absence of mind, or abstraction from what is passing around, it is abnormal and unhealthy; and may, under all circumstances, be regarded as a phenomenon of an imperfectly constituted, if not of a diseased nervous temperament. It is, moreover, generally, and always at its commencement, under the control of the will. Reverie is apparently, in all cases, an exaltation of the faculty of attention: the mind may be occupied according to the age, character, pursuits of the individual, by calculations, profound metaphysical inquiries, by fanciful visions, or by such trivial and transitory objects as to make no impression upon consciousness, so that the period of reverie is left an entire blank in memory. The most obvious external feature marking this condition is the apparent unconsciousness, or partial perception, of external objects. In what may be designated the first stage, castle-building, this inattention is only apparent, as the surrounding scenery may enter into the illusion, and constitute a part of the romance. In the celebrated case of Hartley Coleridge, whose double life, indulged in for years, affords illustrations of voluntary creations ultimately extorting a degree of belief and expectation—from a field near his home burst forth a cataract, from which flowed a river; on the banks of this arranged themselves fertile fields, a populous region, divided into realms and kingdoms, governed by laws, having traditions, histories. 'Ejuxria' was in fact, an analagon to the world of fact, embellished by imagination. This cherished unreality was parted with reluctantly.

A more advanced stage of the affection is where, independently of the will, and in opposition to the ordinary habits of the individual, and under peculiar circumstances, there occur a loss of cognizance of surrounding objects and relations, and a state of abstraction or brown-study, in which many absurd and incongruous things are said and done. Ludicrous examples of this state are witnessed where a man loses his way in his native town, forgets his own name, or retires to bed in the middle of the day. It is related that Sir Robert Peel, utterly unobservant of the adjournment of the House of Commons, and the departure of the members, remained on one occasion unmoved in his seat, plunged in a profound reverie, until the lights were about to be extinguished, and he was roused by the clerk of the House. In a third stage or form, the reverist cannot be recalled to active perception, loses individuality, and is absorbed in the contemplation of unreal, though self-suggested impressions. This is seen in such cases as St. Teresa, and in the trances of Mysticism, Quietism, Second Sight.—*Memoir of Hartley Coleridge*, Disraeli's *Life of Lord G. Bentinck*, Maury's *Le Sommeil et les Rêves*.

REVE'RSE, in Numismatics, the side of a coin or medal which does not bear the principal device or inscription. There is, however, generally an inscription or device on the reverse; and when the lower part of it is markedly separated from the rest, it is called the EXERGUE (Gr. *ex ergou*, without the work), and bears a secondary inscription.

REVERSED, in Heraldry. A term applied to a charge turned upside down.

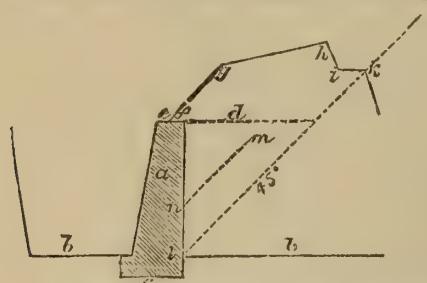
REVE'RSION. When the enjoyment of money, or of any kind of property, is postponed until, or contingent on, the happening of a given event or given events, the present right to the deferred benefit is called a reversion. When the emergence of the right is certain, and the date fixed, to ascertain the immediate or marketable value of a reversion, is a very simple calculation; for example, let it be required to know for what sum a man should sell the right to receive £100 payable ten years hence. Suppose that he expects to be able to improve the money for which he sells his right at five per cent. per annum, compound interest, then one obvious way to get an answer to the question is simply to calculate what sum annually accumulated at the assumed rate will in ten years amount to £100. The answer (see art. INTEREST) will be found to be £61, 7*s*. 10*d*. When the date of the emergence of the reversionary right is uncertain, the purchase, in an individual case, must always be a speculation; but if there are a sufficient number of such rights, postponed to events of which there are sufficient observations from which to deduce laws of average, then the marketable value is easily calculated: for example, it is required to know what is the immediate value of £100 payable certainly on the death of a man aged 60. Here the perpetuity divides itself into the present value of an annuity of the annual interest of the £100 on the life of a male aged 60, and the reversionary right which is to emerge when the life fails. Having then ascertained the former value, and deducted it from £100, the remainder will be the present value of the reversion.

When an assurance company buys a reversion, it is simply buying that which it sells when it grants a policy of life assurance. In the former case, however, an office, to secure its expenses and profits, will assume a high rate of interest and a long life; in the latter case, for the same reason, it will assume a low rate and a short life.

Where the reversion is contingent, problems arise whose solution requires the utmost skill on the part of the actuary; for instance, B, aged 30, wishes to borrow £100 on the security of a sum payable to him *in the event* of his surviving A, aged 58. Here the security being doubtful, it could only be rendered marketable by assuring a sum to be paid in the event of B dying before A; and there would remain the important question of what this sum should be, so as to cover the loan and the premiums of assurance with yearly accumulations on both. This question will be found ably discussed in a paper by Mr. Lang in the *Assurance Magazine* for 1850, p. 18.—On the general subject, see the works that deal with questions of insurance and interest, and repeated articles in the *Assurance Magazine* and like periodicals.

REVERSION is that right to property which remains after some particular estate has ceased which had been granted by the owner. Thus, if A has a life estate in B's property, and after he dies, the property returns to B, B is said to have the reversion, or to be the reversioner. The landlord of property let to a tenant is called the reversioner, because, the moment the lease determines, the whole of the property and possessions vest in him. In the sale of reversionary estates, owing to the want of a system of registration of deeds, great risk is incurred by the purchaser lest the property should be burdened by some rent-charge.

REVE'TMENT, in permanent Fortification, is a retaining-wall of masonry built for the purpose of holding back the earth of which works are composed. The most ordinary position of revêtments is for the escarp and counterscarp of the ditch (see FORTIFICATION). The most important of these two is the escarp, which has to hold back the great mass of earth represented by



ac, revetment; *b*, bottom of ditch, level of ground within the work; *de*, top of rampart; *fgh*, parapet; *ik*, banquette; *kle*, mass of earth supported by revetment; *m*, center of gravity of mass; *n*, point of greatest pressure on revetment.

the rampart, parapet, banquette, &c. It is usually of solid brick work or stone, 5 feet thick at the top, and sloping outwards as it descends (on the ditch-side only) to the extent of 1 in 6. Prior to Vauban's time, the escarp revêtment was commonly raised to the top of the parapet; but as in this case the artillery of a besieger played on the top of the wall, and ruined it soon after the siege commenced, that engineer adopted the principle—thenceforth followed—of raising it no higher than the crest of the glacis, or about 7 feet above the natural ground, leaving the parapet above of sloped earth only. When the main ditch is 24 feet deep, the scarp revêtment will be about 30 feet high. Additional strength is imparted to the revêtment wall by massive buttresses at every 15 feet, called *counterforts*, and these, again, are sometimes connected and strengthened by masonry arches outside the revêtment. The revêtment forms a terrible barrier to an assaulting party. In field-works, temporary revêtments may be made of timber, turf, hurdles, or other materials at hand.

REVIEW', in Military parlance, is the inspection by the sovereign or some staff-officer of any body of troops in parade order. Reviews always comprise a march past the inspecting-officer in column, and a general salute in line; to these is frequently added a mock-battle, for the amusement of spectators, and the practising of the troops themselves in warlike manœuvres.

REVIEW. The name applied by common literary usage to such periodical publications as are made up of essays, criticism, and the like. See PERIODICAL.

REVI'SING BARRISTER is a barrister appointed annually by the English judges to revise the lists and settle who are the persons entitled to vote for members of parliament. For this purpose, all England is subdivided into districts, and a barrister is appointed for each district by the judges of assize. Though the appointment is only for one year, yet practically the same person is reappointed for life. The barrister must be of three years standing at least. The revision of the lists takes place generally between August and October of each year. There is an appeal from the decision of the revising barrister to the Court of Common Pleas at Westminster.—Similar duties are performed in Scotland by the sheriff-substitute.

REVI'VALS OF RELIGION. The term *Revival of Religion*, or, more briefly, *Revival*, is employed to denote an increase of faith and piety in individual Christians, particularly after a period of religious declension, and also an increase of religion in a community or neigborhood, both through the *revival* of those who are already religious, and through the *conversion* of the previously irreligious. In these applications, its use is countenanced by several passages of Scripture; the idea which it is intended to convey is, however, far more frequently suggested by passages in which the term does not occur. The idea of revival is more particularly connected with the system of 'evangelical' doctrine, and particularly with that part of it which relates to the work of the Holy Spirit in the conversion of sinners.

What are commonly called revivals of religion may be described as religious movements or excitements extending, more or less generally, over a neighborhood, or sometimes over a country. By those who regard them as genuine, it is urged in their favor, that they are in accordance with what the Scriptures teach us to expect, and that we have instances of a similar kind recorded in the Scriptures themselves—both in the history of the Jews, and in the early history of the Christian Church, particularly in the effusion of the Holy Spirit on the day of Pentecost, and afterwards in connection with the ministry of the apostles, when many were converted through a single discourse, or, in other cases, evidently within a short time. It is further urged that the promise of the effusion of the Spirit in 'the latter days' was not completly fulfilled on the day of Pentecost, but relates to the whole period of the Christian dispensation, and that, according to many prophecies, we have reason to expect even more of it in future times than there has hitherto been, so that 'a nation shall be born in a day, and the kingdoms shall be the Lord's.'

The Reformation of the 16th c., and the more partial movements of the same kind which preceded it, are also regarded as essentially revivals of religion—the Reformation itself the greatest which has taken place since the apostolic age. The great development of religious fervor in England in the 17th c., is, according to this view, to be considered as a revival, and the extravagances which attended it as mere excrescences, like those of the Anabaptists in the time of the Reformation. The next great movement of the same kind was that in the first half of the 18th c., from which the Methodist churches originated (see METHODISTS). It was accompanied with many circumstances similar to those which have attended later revivals of religion. The term revival did not begin to be commonly employed till after this period; and the revival which took place in New England and other parts of North America about the same time, was then and still is generally designated the *Great Awakening*. The beginning of this revival seems to have had no connection with the Methodist movement in England, although subsequently they became connected through Mr. Whitefield's visits to North America. The revival in New England, which began about 1734, under the ministry of the celebrated Jonathan Edwards at Northampton, and rapidly extended over great part of New England and New York, was speedily followed by similar religious movements in Scotland, not altogether independent of it. Such religious movements had not, however, been unknown in Scotland before, although very much confined to particular times and localities.

In 1625 and some following years, there was a revival at Irvine, under the ministry of Mr. David Dickson—a minister of more than ordinary abilities and attainments, some of whose works have recently been republished—so considerable as to be noticed in many histories of the church of Scotland, and which, because it extended very much to the neighboring parish of Stewarton, and along the banks of the Stewarton Water—the people of that district frequenting Irvine on market-days, and hearing Mr. Dickson's lectures—was contemptuously styled by its adversaries the *Stewarton sickness*. In 1630, several hundreds are said to have been converted at once, through a sermon preached at Kirk-of-Shotts by Mr. John Livingstone, then a young preacher, but afterwards an eminent minister of the church of Scotland, and a sufferer for the cause of Presbyterianism. About the same time (1623—1641), similar movements took place in Ireland under the ministry of Scottish Presbyterian ministers settled in Ulster, and to which the origin of the Irish Presbyterian Church must in great part be ascribed. The Presbyterians of Scotland were thus in some measure prepared to acknowledge the revivals of the earlier part of the 18th c. as genuine, which began at Cambuslang—Mr. M'Culloch being minister of that parish—in 1742, and speedily extended to Kilsyth and other parishes in the neighborhood, as well as to Dundee and other places more remote. No similar movement, however, took place over the country generally; nor was there

anything of the same kind again till the very end of the century, when a revival took place (1798—1800) at Moulin in Perthshire, of which Mr. Alexander Stewart was then minister. This was followed in a few years by a revival in Arran (1804—1813), under the ministry of Mr. M'Bride. Other similar local revivals followed, not unfrequently, and in parts of Scotland widely remote from each other, both in the Highlands and Lowlands; and also in other parts of Britain, particularly a very extensive one in Wales, resulting in the formation of the Welsh Calvinistic Methodist Church, but not confined in its effects to those who became connected with that church. Local revivals also in some instances attended the ministry of evangelical ministers of the Church of England.

In 1839, the attention of all Scotland was drawn to a religious movement at Kilsyth, which was followed by similar occurrences in a number of other places, more or less evidently connected with it. The first appearance of an unusual degree of religious feeling at Kilsyth was in the parish church, during a sermon by Mr. William C. Burns, a son of the minister of the parish, and afterwards a missionary in China. The emotion of many of the congregation broke out in sobs and cries, so that for a time the preacher's voice could scarcely be heard. For months, religion was the almost exclusive subject of interest to a great part of the inhabitants of the parish, and many meetings for public worship were held besides the ordinary Sabbath services, at which great emotion was often displayed. Among the other places to which this movement notably extended was Dundee, where Mr. W. C. Burns was then statedly employed in the ministry of the gospel. After 1839, there were revivals from time to time in various places in Scotland; but none of great extent or interest there or elsewhere in the British Islands for nearly twenty years. There had, meanwhile, been many revivals in America, generally, indeed, confined to particular congregations, seminaries, or localities, but sometimes extending over considerable districts; and throughout at least the northern and middle parts of the United States, the idea had become familiar to the popular mind, that revivals of religion ought to be expected from time to time; from which naturally followed the belief that means ought to be employed to produce them. From this resulted, in some cases, increased earnestness in preaching and prayer, with greater assiduity in the use of all the ordinary means for the promotion of religion; in other cases, direct endeavors to produce excitement, as by *camp-meetings*—assemblies of great numbers of people held in the open air, at which exciting addresses were delivered by preacher after preacher, to work upon the nervous sensibilities of the audience.

Nothing of this kind, however, attended the commencement of the great religious movement which took place in 1857 and in the two following years. Its origin is ascribed in part to the thoughts and feelings awakened during a period of great commercial distress. It began in New England, particularly in Connecticut and Massachusetts, and rapidly extended to New York and over the middle and western states. It was not generally attended with scenes of great excitement. Strong, but calm religious feeling was its general characteristic. In the city of New York, almost every congregation received a great accession of members, and prayer-meetings were held for about an hour in the middle of the day, which were attended by great numbers of persons actively engaged in business. More than 2000 places in the state of New York were reported as partaking of this revival. Not long after it began in America, a similar movement took place in the north of Ireland, not apparently connected in its origin with that in America, although certainly connected with it soon afterwards, and promoted by the news brought across the Atlantic. It rapidly extended over the whole north of Ireland, and subsequently to many parts of Scotland, Wales, and some parts of England. As a rule, it was free from excitement, and characterized by little else than the intensity of religious feeling displayed. Another remarkable revival, which extended over the greater part of Great Britain in 1874—1875, originated in the efforts of two American evangelists, Messrs. Moody and Sankey, and was characterized by the almost entire absence of sensationalism.

Revivals of religion have occurred also in other parts of the world. About fifty years ago, a widespread movement of this kind took place in Switzerland, although not affecting more than a small part of the population anywhere. Under the ministry of Felix Neff, it subsequently extended to the Protestant districts of Dauphiné, and to the neighboring Vaudois or Waldenses, on the Italian side of the Alps. Similar religious movements have occurred in many parts of Sweden.

Revivals have been accounted for in very different ways; but in general, too evidently in mere accordance with the different religious views of those by whom the theories have been proposed. Some have attempted to explain the phenomena of religious excitement extending over wide districts, and rapidly spreading from one place to another, by the supposition of a kind of epidemic disease affecting the mind. Another opinion was very prevalently entertained by those who do not see in revivals anything really good, is, that they are the result of endeavors to work upon the feelings. It is replied, that although this theory might be plausibly enough advanced, if only such things were considered as the camp-meetings of the American Methodists, it is far from being in accordance with the best ascertained facts as to many of the revivals which have taken place both in America and in other countries. It is certain that many of these have taken place without any apparent attempt to work upon the feelings, more than is ordinary and proper in the preaching of the gospel, and that the greatest display of emotion has often been connected with preaching of the most simple and sober kind.—By those who believe in the reality of revivals, as productive of a true increase of religion, they are generally ascribed to the operation of the Holy Spirit, to which, according to the 'evangelical' scheme, the 'conversion' of every individual soul is ascribed, and also all increase of faith and piety in the converted.

Revivals have, however, often been regarded with doubt by many who believe in the whole doctrine of the work of the Spirit as generally held in the Protestant churches, but who look upon the excitement frequently attending them as inconsistent with the proper sobriety and solemnity of religion, and think the progress of religion ought rather to be expected to be gradual, and without very much to call particular attention to it at one time more than another. It is replied, that while a blessing on the regular use of ordinances may confidently be expected, if duly sought by prayer, there is yet much in Scripture to favor the notion that particular seasons may be unusually marked by the evidence of it; and further, that revivals, when they take place, generally show the usefulness of the ordinary means employed for the promotion of religion, as they seldom occur among persons very ignorant of religion, but rather among those who have peviously enjoyed the benefit of the most faithful ministrations. With regard to the excitement attending many revivals, it is argued that this excitement is not wonderful, if persons are suddenly impressed with a deep sense of their sins, of the danger of divine wrath, and of the importance of religion; and that it is in some measure also to be expected in those who are brought by a quick transition from deep distress to a full sense of forgiveness and the favor of God. Are we to be surprised, it is asked, if persons in such circumstances, after much effort of self-restraint, cry aloud in the congregation, or fall down, overpowered by their emotions?

It is sometimes alleged by the opponents of revivals, as an objection to them, that much of the excitement manifested in them is merely hysterical; and some of their advocates have rashly denied that this is the case; others, admitting it, deny that it affords any just cause of objection, and maintain that hysterical excitement is natural and unavoidable in such circumstances, and however undesirable in itself, is a manifestation of the reality and strength of the feelings awakened. They acknowledge, however, also, that like similar excitement produced by causes which have nothing to do with religion, it may extend from one to another, even where the cause in which it originated does not operate; and they therefore refuse to see in it, considered by itself, any evidence of the religious or spiritual condition of the persons affected by it.

That much folly and extravagance have often been exhibited in connection with revivals of religion, is freely admitted by many who are fully convinced of their reality; but this, they say, is also only what might be expected, as the occasion always seems a favorable and inviting one to persons whose zeal exceeds their discretion, and too often affords opportunity for ignorant and self-conceited persons to thrust themselves forward as teachers and conductors of religious exercises.

It may be proper to advert to some of the practices which sometimes take place on occasions of revival, but which are disapproved by all except those who are filled with the desire of seeing excitement produced and increased. Among these is the bringing forward of persons in the character of new converts, to conduct prayer in public, and to address meetings, which they are often among the least capable of doing well. Another practice liable to much objection is the permitting of mere youths, under profession of Christian zeal, to converse in private with persons in distress of mind, especially when these are young persons of the other sex. A third objectionable practice is the calling upon those who are anxious about their salvation to come forward and occupy a place by themselves—or what are called in America *anxious seats*—that they may be individually conversed with, and that special prayer may be made for them, they being thus brought into a publicity which is undesirable. It is hardly necessary to refer to the absurdity of demanding—as has sometimes been done—a show of hands from those who are now resolved to give themselves to the Lord! With such uncommendable practices may be classed that of encouraging persons who have been of very profligate life to recount their own history, which has sometimes been carried so far, that they have seemed even to glory in the enormity of their past wickedness.

Certain peculiar modes of expression, which might not unaptly be designated a kind of slang, have often come into use in connection with revivals of religion, with the unhappy effect of exciting disgust in many minds, and particularly among the most educated classes of society. Thus, in the revival of last century in New England, the subjects of the revival—in a certain state of their experience—were spoken of as being *filled*. In the recent revival in Ireland, it was common to speak of those who fell down suddenly in congregations or in their own houses as *stricken*, and as the *stricken ones*. It was very common during the same revival to speak of individuals as having *found peace;* and this finding of peace was by some regarded as proof of conversion, or even as indicating the moment of conversion—all which was considered by many who fully believed in the reality of the revival, as unscriptural and delusive.

Among the evils acknowledged to attend revivals by those who believe them to be real, but who also believe that there is often much connected with them which is not the work of God, is the disposition to judge of the spiritual state of individuals, as converted or unconverted. *New converts*, especially when brought into undue prominence, are apt to become elated and self-satisfied, and even to regard themselves as the only true Christians, or as superior to those whose piety is of much longer standing than their own. This, however, is not always the case, and much depends on the judicious or injudicious conduct of the ministers chiefly concerned when a revival takes place.

We have endeavored to present this subject fairly to our readers; but it is evident that as to the opinion to be formed by any one, which must depend upon the general religious views which he entertains. As to mere religious excitement, however, and bodily affections resulting from it, many facts may be adduced to show, what might be supposed beforehand, that these may be connected with religious views extremely at variance. Excitement may be produced by religious views that are utterly false, as well as by those which are true. Heathenism has always abounded in it; Mohammedanism has much of it; and it has appeared in the church of Rome as well as in the Protestant churches. It is not necessary to do more than allude to the extravagances of the Flagellants, and to the strange scenes of the Dancing Mania. Some of the small sects, also, which evangelical Protestants regard as most heterodox, seem to maintain their existence by a systematic working up of excitement.

The subject of this article has been treated in a multitude of publications, almost every revival which takes place calling forth new pamphlets, narrative and controversial. The works of Jonathan Edwards deserve the first attention of those who wish to study the subject; and much information as to the history of revivals will be found in Gillies's *Historical Collections Relating to the Remarkable Periods of the Success of the Gospel.* Reference may also be made to Mrs. Lundie's work on *Revivals in the British Isles;* and for the revivals in Scotland in the middle of the 18th c. to Robe's *Narrative of the Revival of Religion at Kilsyth, Cambuslang, and other Places* in 1742 (new ed., Glasgow, 1840). Edwards maintains the genuineness of revivals with perhaps more force of argument than any writer has since done; and most of those extravagances which have sometimes attended revivals down to the present time, might have been avoided if those whose religious views accord with his had more carefully studied his discriminating remarks and sober counsels. No work has yet been produced such as Edwards in one of his letters expresses a strong desire to see—'a history of true, vital, and experimental religion and enthusiasm, bringing down the history from age to age, judiciously and clearly making the distinction between the one and the other.'

REVI'VOR is a bill or writ by which a suit or action is kept alive in the English courts of equity or law, where one of the parties dies during its dependence.

REVOCA'TION, when used as a legal term, is the withdrawing or annulling of a deed or will which otherwise would be valid. A will is said to be always subject to revocation, even though the testator say in the most express language that it is not to be revocable, because a will is supposed to be subject to the ever-varying occasions of life. On the other hand, a deed is not capable of revocation, and is in its nature final and irrevocable; but if an express proviso is inserted which reserves a power of revocation, then this is a valid power, and may be exercised, provided the directions of the deed are strictly followed.

REVOLU'TION, in Politics, any extensive change in the constitution of a country suddenly brought about. The two most important events in modern history known under this name are the English Revolution of the 17th c., and the French Revolution of the 18th. The former began in the early part of the reign of Charles I., with the struggle between that king and his parliament. In 1642, the struggle became a civil war, in which the parliament obtained the ascendency, and brought Charles to the block in 1649. A republic followed, under the Protectorate of Oliver Cromwell, which was succeeded in 1660 by the Restoration of monarchy in the person of Charles II.; but the arbitrary rule of James II. brought the king and people again into antagonism; and James having fled the country, William III. was called to the throne under such conditions and safeguards as secured the balance of the constitution.—The French Revolution was a violent reaction against that absolutism which had come in the course of time to supplant the old feudal institutions of the country. It began with an outbreak of insurrectionary movements at Paris in July 1789, including the destruction of the Bastille. On the 21st January 1793, King Louis XVI. was beheaded. The Christian religion was deposed, the sacredness of the Republic and worship of Reason solemnized, and a disastrous reign of blood and terror followed, which was brought to an end in 1794, when Robespierre himself suffered on the guillotine the fate to which he had condemned countless multitudes of his countrymen.

Among other important revolutions in the modern world are the American Revolution of 1775, by which the United States threw off their dependence on Great Britain; the French Revolution of 1830, which drove Charles X. into exile, and raised Louis Philippe, Duke of Orleans, to the throne by the will of the people; as also the Revolution of 1848, when France rose against Louis Philippe, and adopted for a time a republican form of government, the revolutionary contagion spreading temporarily over most of continental Europe. By the Italian Revolution of 1859—1860, the various minor sovereigns of Italy were driven into exile, and the whole of the peninsula, became, with the incorporation of the Roman territories in 1870, subject to Victor Emmanuel. The third French republic was also established in 1870–71 by a revolution.

REVOLU'TIONARY TRIBUNAL, the name specially given to the infamous court of judgment—the most extreme republican will scarcely affirm that it was a court of justice—instituted by the French Convention in March 1793, on a motion made by Danton (q. v.), who considered that such a court had become necessary, inasmuch as the recent disasters that had befallen the national armies on the frontiers had led to dangerous conspiracies against the revolutionary government. Its members were chosen from the various departments, and their appointment was ratified by the Convention. Their function was to sit in judgment on all persons accused of crimes against the state, and from their sentence, delivered with appalling promptitude, there was no appeal. During the 'Reign of Terror,' when Fouquier-Tinville (q. v.) was 'public accuser,' it acquired a horrible notoriety, abolishing soon almost all forms of justice, neither hearing witnesses on behalf of the accused, nor allowing him an opportunity of defence, but blindly executing the orders of the 'Committee of Public Safety,' which was merely a tool in the hands of Robespierre (q. v.).—In the provinces, similar tribunals, under the name of 'Revolutionary Committees,' were established, the commissaries-general of which, as, for instance, Carrier (q. v.), shot or drowned *suspects* in crowds.

REVO'LVER, in Firearms, is a weapon which, by means of a revolving breech, or revolving barrels, can be made to fire more than once without reloading. The invention is very far from new, specimens, with even the present system of rotation, being still in existence, which were manufactured at the beginning of the 17th century. Probably the first revolver to suggest itself was one in which several barrels were mounted on an axis, and made to revolve by the action of the trigger, so that their powder-pans came successively under the action of the lock. This principle was never entirely abandoned, and in the reign of George IV. was produced a pistol called the 'Mariette,' which had from four to twenty-four small barrels bored in a solid mass of metal, made to revolve as the trigger was drawn back. At close quarters, such a pistol would doubtless have been useful; but its great weight and cumbrous mechanism rendered aim extremely unsteady.

Contemporaneously from the first with the revolving barrels, went the formation of a revolving chamber or breech, pierced with several cylindrical apertures to receive the charges. Being made to revolve, each motion brought a chamber into line with the one barrel, common to all, whereupon the weapon was ready for use. Numerous patents for this principle have been taken out, including one by the celebrated Marquis of Worcester in 1661. Various improvements were made, especially in the mode of causing revolution, an American, of the name of Elisha H. Collier, patenting such a weapon in the United States and England about 1818.

In 1835, Colonel Samuel Colt brought to a conclusion experiments of some years' standing, and patented his world-renowned Colt's Revolver, which was a great advance on all previous attempts, and is substantially still in use. Colt's revolver consists of one rifled barrel of considerable strength and

a massive chamber perforated with six or seven barrels, which are brought into line with the barrel by action of the trigger.

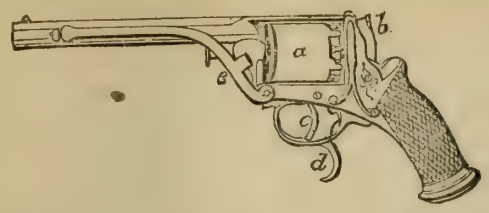


Fig. 1.
a, the chamber ; *b*, hammer ; *c*, trigger ; *d*, spur for raising the hammer ; *e*, lever-ramrod.

Each chamber has its nipple for a cap, which is brought under the hammer by the motion which brings the chamber or breech pieces around. In the most recent form of this revolver, the capped nipple disappears, the cap being contained with the cartridge. The hammer is discharged by the trigger, and acts nearly horizontally in a forward direction. Under the pistol is a fixed lever-ramrod, which is used in loading the chambers. Besides all this, by withdrawing a bolt, which can be done in a moment, the entire breech-piece can be taken out, and replaced by another ready charged, so that, by carrying a spare breech-piece, a person may fire twelve shots in less time than another could fire three if he had to load between the shots. Colt's revolvers are now extensively used in the naval and military services of America and Europe.

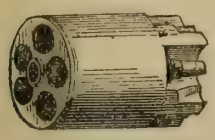


Fig. 2.—Chamber with five barrels.

The principal rival of Colt's Revolver has been the Deane and Adams' Revolver, although many more of various sorts have been patented in the interval. The 'Deane' differed in that it could be fired by merely pulling the trigger without also raising the hammer with the finger, as in Colt's; but this was found to be so dangerous in practice, that the inventors soon substituted an arrangement under which it could be fired either by the trigger or by raising the hammer; and lastly, they introduced the great improvement of a spur behind the trigger, which must be pressed by the middle finger, while the forefinger discharges the piece through the trigger. The revolver principle has also been successfully applied to the manufacture of a kind of revolving guns for small projectiles, which are really aggregates of small arms. The Gatling gun, a revolver of this class, in which the several barrels turned round a common axis, was used during the American civil war. But the best known gun of this description is the French *mitrailleuse* or *mitrailleur*, of which so much was heard during the Franco-German War. That most commonly used had a group of 25 barrels, surrounded by a bronze sheathing, and movable breech-piece; it was fired by means of a crooked handle or winch at the right-hand side. The range of such guns in a level plain is not great; but amongst fortifications, or in a narrow valley, they may be used with very deadly effect.

REVU'LSION, in Medicine, a term synonymous with DERIVATION (q. v.). See also COUNTER-IRRITANTS.

RE'WAH, a state of India, called also BAGHELCUND, lying between the North-western and the Central Provinces, subsidiary to the government of the latter, and having for its capital a town of the same name, which is 70 miles south-west from Allahabad, and stands on the right bank of the Tons. The town has a pop. of about 7000. It exhibits remains of former magnificence, but even the walls and the rajah's palace are much decayed. The state has an area of about 13,000 sq. m., and great part of it is well cultivated. The pop. is about 2,035,000.

REWARD, when used in a legal sense, means a sum of money awarded by a court or judge to a witness who has been instrumental in detecting crime. By an English act of parliament of 1827, whenever it appears to a court of assize that a person has been active in apprehending offenders charged with murder, or with feloniously shooting, stabbing, cutting, wounding, or poisoning, or with rape, burglary, housebreaking, robbery, arson, or cattle-stealing, or with receiving stolen goods, the court may order the sheriff of the county to pay to such person a sum of money, to compensate his expenses, exertions, and loss of time. So courts of quarter sessions may order a reward not exceeding £5. If any man happen to be killed while endeavoring to apprehend a criminal charged with any of these offences, the court may also order a sum to be paid to the widow or child. The going to foreign countries to apprehend criminals, is not considered to be a proper ground for giving these rewards. Nor is ordinary stealing from the person a crime which is within the act. Sometimes persons whose property has been stolen inconsiderately offer a reward for its restoration, and persons offer to recover it for a sum of money. The following enactments of the statute 24 and 25 Vict. c. 96, are directed against this practice.

Whoever corruptly takes any money or reward, directly or indirectly, under pretence of helping any person to any chattel, money, valuable security, or other property which shall have been stolen, embezzled, or illegally disposed of, shall be guilty of felony, and be liable to penal servitude for seven years, or imprisonment for two years. A person may commit this offence though he has no knowledge of or connection with the thieves. Moreover, whoever shall publicly advertise a reward for the return of any property stolen or lost, and shall in such advertisement use any words purporting that no questions will be asked, or that a reward will be given, without seizing or making any inquiry after the person producing such property, or shall offer or promise to return to pawnbrokers or others any money advanced on such stolen or lost property, shall forfeit £50; and whoever shall print or publish such advertisement, shall forfeit the same sum.

REWARDS FOR DISTINGUISHED MILITARY SERVICE are annuities—most commonly of £100 each—granted to meritorious officers in consideration of distinguished service. The officers to whom they are awarded are usually major-generals or colonels, though a few paymasters, quartermasters, and medical officers receive these annuities, which, however, in their case do not always amount to £100. The officer holds the annuity until, being a general officer, he is appointed colonel of a regiment. The amount given to officers in 1882–83 was £15,000; to sergeants, £4920; besides £810 for Victoria Cross pensions, and £8000 for gratuities for long service, &c.

REY'KIAVIK. See ICELAND.

REYNARD THE FOX, the title of a celebrated epic fable of the middle ages, belonging to, and terminating the series of poems in which 'beasts' are the speakers and actors. It is written in Low-German, professedly by a Hinreck van Alckmer, 'schoolmaster and tutor of that noble virtuous Prince and Lord the Duke of Lorraine,' and was printed at Lübeck in 1498, under the title of *Reineke Vos;* but German critics in general are disposed to believe that no such person as Hinreck van Alckmer ever existed—he is nowhere else mentioned in history, literary or otherwise—and that the real author is a Hermann Barkhausen, town-clerk and book-printer in Rostock, who, according to a common enough practice, sent his book into the world under a pseudonym. A Rostock edition appeared in 1517, which was long believed to be the earliest, until the discovery of a copy—the only one known to exist—of the older Lübeck edition in the Wolfenbüttel Library by Professor Hakemann, who published it in 1711. Since then, the work has been repeatedly republished in Germany—the best edition being that of Hoffmann von Fallersleben (Bresl, 1834; 2d edit. 1852), which is enriched with an 'Introduction,' 'Notes,' and 'Glossary.'—At a comparatively early period, translations were made from the Rostock edition into High-German, that of Mich. Beuther (Frankf. 1544), though badly executed, passing through more than 20 editions. The High-German translation was retranslated into Latin verse by Hartmann Schopper (Frankf. 1567), and thus gradually found its way into other countries. Goethe translated the work anew into modern German hexameters with admirable spirit and freshness (Berl. 1794), and his translation has been charmingly illustrated by Kaulbach (Mun. 1847): later translations are those by Soltau (Berl. 1803) and Simrock (Frankf. 1845—1852), both of which are executed in the measure of the original—i. e., rhymed iambic couplets. A Danish translation in verse by Herm. Weiger was published at Lübeck in 1555; a Swedish, at Stockholm in 1621—prose version, 1775.

This brief outline of the literary history of *Reineke Vos*, leads us to the second and even more important part of the subject. Was that work strictly an original product of the author's fancy, or was it merely the final form assumed by a widespread fable? Till Jakob Grimm published the results of his laborious researches, everybody supposed that the poem printed at Lübeck in 1498, by whomsoever composed, was the earliest literary embodiment, if not the direct source, of the fable; but that opinion is no longer tenable. Grimm has shown that, in one form or another, the 'beast-fable' (Ger. *Thier-sage*) goes back to the remotest antiquity, and is a common inheritance of the Aryan or Indo-Germanic races—Hindus, Celts, Greeks, Romans, Slaves, Esthonians, Germans—and even the Finns; and he explains with great clearness the conditions of thought, intellectual and religious, under which such a literary form is developed. But all nations do not attain equal success in its cultivation, and it was among the Germans, particularly the Franks, that it attained its most complete poetical elaboration. Grimm is, however, inclined to think that the particular fable of *Reineke Vos* is of German rather than Oriental origin (although the Persian version of Pilpay's fables, entitled *Anvár-i Suhaili*, or the Lights of Canopus, translated by Mr. Eastwick, Hertford, 1854, contains a story strikingly simi-

lar), and that the Franks brought it with them to the Netherlands and to France, where (and not in Low-Germany) it first appeared.

Grimm published, in the *Lateinische Gedichte des* 10 *und* 11 *Jahrh* (Gött. 1838), some small pieces, containing the nucleus or germ of the fable, and showing how soon, in the hands of the verse-loving monks, it had been turned to didactic and satiric purposes. Somewhat later, other stories make their appearance, bearing more or less on the history of Reynard, but none of them setting forth the fable in the same manner as we now have it—the two principal being *Isengrimus* (apparently the composition of an ecclesiastic in Southern Flanders about the beginning of the 12th c., and containing two stories of the wolf) and *Reinardus* (also originating from a Flemish ecclesiastic named Nivardus, which besides an expansion of the *Isengrimus*, contains ten new stories; its date is about half a century later). But while, in these clerical compositions, side-allusions to the papacy, to the discipline of the church, and to the then powerful and flourishing order of the Cistercians, are very noticeable, in the mouth of the Franco-Flemish people, on the other hand, the story kept itself free of such temporary phenomena, and gradually shaped itself into a style of pure epic satire, reflecting general human characteristics. Before the close of the 12th c., this purer and more epic form of the satire found its way into both German and Flemish literature. In the former, this happened about 1170, when Heinrich der Glichezare (i. e., Henry 'the Feigner' = Inventor or Troubadour), a native of Alsace, wrote in High-German his *Isengrines nôt;* and again in Flemish, a little later, when a poet, whose name is scarcely known, wrote *Der Reinaert*, a work of the purest epic character, and far surpassing all its predecessors both in conception and execution.

Both works were afterwards redacted by unknown hands—the German, about the beginning of the 13th c., when its redactor gave it the title of *Reinhart* (published by Mailáth und Köffinger, in the 'Koloczaer Codex,' Pesth, 1818; and again in a purer state, with all his valuable historical investigations, by Jakob Grimm, *Reinhart Fuchs*, Berl. 1834); the Flemish, about the close of the 13th c., when it received the name of *Reinaert de Vos*, part of which appeared in Grimm's *Reinhart Fuchs*, but the whole of which was published by J. F. Willems (Ghent, 1836—1850), at the expense of the Belgian government.—Meanwhile, in France, the number of poems in which fables about Reynard are set forth had mightily increased, but only the oldest among those which have survived (which only reach back to about the beginning of the 13th c.) display a pure epic character. In 1826, M. Méon published a collection, in 4 vols., of the stories extant in Norman-French, under the title of *Le Roman du Renart*, to which M. Chabaille, in 1835, added *Suppléments*, with various readings and corrections. The *Renart li Contrefet*, of an unknown poet of Champagne, has only been partially printed. From such sources sprung the French chap-books (*Volksbücher*), which came into vogue after the 15th century. How popular the fable became in France may be estimated from the fact, that the German word Reinhart (old form, *Raginohart*—i. e., 'bold' or 'cunning in counsel'), which merely designates the character of the Fox, has entirely superseded the old Franco-Latin word *goupil* (from the Latin *vulpes*). The Swabian court-poetry of Germany had little in harmony with the 'beast-fable,' which was little cultivated while the former continued to flourish.

In the Netherlands, on the other hand, it continued to keep its ground, but as the medieval spirit of poetry declined, it passed into prose—e. g., *De Hystorie van Reinaert de Vos*, published in Dutch at Gouda, in Holland, in 1479; which, in its turn, was translated into English in 1481 by William Caxton—*Hyer begynneth thystorye of Reynard the Foxe;* republished, with a few changes, by W. J. Thoms (Lond. 1844).—Thus have we sketched in meagre outline the history of the fable of Reynard the Fox in different countries, and from internal evidence it is clear, that the substance of the Low-German *Reineke Vos* of Hinreck van Alckmer or Hermann Barkhusen was derived from the Flemish sources already referred to. Its peculiarity consists in this, that it is the latest, best, and most complete of the whole series of poems about the Fox, gathered up into itself, as it were, whatever scattered merits its predecessors possess, and presenting the whole in epic unity for the pleasure and profit for all future ages. The work now consulted by general readers is Goethe's version, of which an excellent translation into English heroic verse was made by T. J. Arnold, with illustrations by J. Wolf (Lond. 1855). For a critical appreciation of the fable, see Carlyle's 'Essay on German Literature of the Fourteenth and Fifteenth Centuries' (*Miscellaneous Essays*).

REYNOLDS, Sir Joshua, P.R.A., is generally anknowledged to be at the head of the English school of painting; he was born on 16th July 1723. His father was the Rev. Samuel Reynolds, rector of Plympton, St. Mary, and master of the grammar-school of Plympton, Devonshire. He intended his son for the medical profession, but Joshua having manifested from an early age an ardent desire to be a painter, was, in 1741, placed under Hudson, the principal portrait-painter of the day. After being in the studio of this artist two years, he commenced on his own account as a portrait-painter at Plymouth Dock, now Devonport, and met with great encouragement. In 1746, he went to London, and established himself in St. Martin's Lane; but on the appointment of Commodore Keppel to the Mediterranean station, he accepted an invitation to accompany him, sailed from Plymouth in 1749, and on his arrival in Leghorn proceeded to Rome. He remained about three years in Italy, most diligently employing his time in visiting the various cities where the chief art collections are to be found. On his returning to London in October 1752, his works attracted great attention, eclipsing everything that had been done there since Van Dyck's time. When the Royal Academy was instituted in 1769, he was elected President; was knighted by George III., and on Ramsay's death, in 1784, succeeded him as painter to the king. He died in his house in Leicester Square on 23d February 1792, and after lying in state at the Royal Academy, was interred in the crypt of St. Paul's.

Sir Joshua lived in friendly intercourse with Johnson, Burke, and the leading men of his period. His literary works consist of fifteen Discourses delivered in the Royal Academy; three essays contributed to the *Idler*, at Dr. Johnson's request; notes to Mason's translation of Du Fresnoy's *Art of Painting;* a few notes for Dr. Johnson's edition of Shakspeare; and notes of his tour through Flanders in 1781. In his writings, there is much valuable information on art, imparted in an admirable manner; but he has been charged with laying down in them various rules, and holding up the works of certain schools as models for the student, while he himself did not carry out these precepts in his practice as an artist; and from this an unfair inference has been drawn, that from love of gain he cultivated portrait-painting, the most lucrative branch of the profession, and recommended others to follow what is generally believed to be a more arduous but less remunerative path of art. But this accusation is most unjustly made—perhaps no other artist has handed down in writing so many practically useful maxims and observations on art. His works of this kind fortunately are numerous, and bear a very high value. There are nearly 700 engravings from R.'s pictures; most of them admirably rendered in mezzotint.—Northcote's *Life of Sir Joshua Reynolds* (2 vols. 8vo., Lond. 1819); Cunningham's *Lives of British Painters, Sculptors, and Architects* (Lond. 1854, vol. 1).

RHA'BDOMANCY. See Divining-rod.

RHADAMA'NTHUS, a mythical personage, son of Zeus and Europa, and brother of Minos (q. v.). He settled in Bœotia, where he married Alcmene. So great was his reputation during life for the exercise of justice, that after his death he was appointed a judge in the under-world, along with Minos and Æacus, His special function was to sit in judgment on the actions of all those who came to Hades from Asia.

RHÆ'TIC BEDS, a series of strata forming the uppermost portion of the Trias (q. v.), which are extensively developed in the Rhætian Alps. The British beds referred to this group are more highly fossiliferous than any of the other members of the Triassic period.

RHAMNA'CEÆ, a natural order of exogenous plants, consisting of trees or shrubs; often spiny; with simple, generally alternate leaves, and stipules minute or wanting. The flowers are small, generally green. The calyx is 4—5 cleft; the petals distinct, hood-shaped, or convolute, inserted into the throat of the calyx, occasionally wanting. The stamens are equal in number to the petals, and opposite to them; the disc is fleshy; the ovary is superior, or half-superior, with two, three, or four cells; the ovules solitary. The fruit is fleshy, and does not open when ripe, or dry and separating into three parts. This order contains about 250 known species, natives of temperate and tropical countries, and very generally distributed over the globe. Some of them are used in dyeing (see Buckthorn and French Berries), some in medicine (see Red Root), and the fruit of some is pleasant (see Jujube); whilst *Hovenia dulcis*, a native of China and Japan, is remarkable for the thickening of its flower-stalks after flowering, so as to form a succulent sweet red pulp, with a flavor resembling that of a pear.

RHAMPSINITUS, the Greek name of the Egyptian monarch Rameses III., first king of the 20th dynasty, and builder of the great palace at Medinat Habu. According to Herodotus, he placed two colossal statues of 25 cubits high in front of the west vestibule of the Hephæsteum at Memphis. He was the richest of Egyptian kings, having amassed 400,000 talents, or £77,500,000—an incredible sum for that period. This wealth was, however, probably in jewels as well as the precious metals, for both are recorded on the walls of the treasury of Medinat Habu. To secure this enormous treasure, he built a treasury of stone, one side of which adjoined the wall of his palace. In connection with this, is narrated a story which rather resembles the tale of Ali Baba in the *Arabian*

Nights than the sober narrative of history. The story was told by the Egyptian dragomen of the days of the Persians to the Father of History, who naively doubts its veracity; but notwithstanding some of the German researches, which attempt to connect it with Hellenic myths of the brothers Agamedes and Trophonios, it is believed to be essentially Egyptian. R. is said to have descended to Hades, and to have played at draughts with Isis, or Ceres, and he is so represented on the walls of his palace at Medinat Habu. His return was celebrated as a festival. Herodotus, who has inverted and confused the whole history of Egypt, calls R. the son of Proteus, and predecessor of Cheops, placing him 16 dynasties earlier than he should be. According to Lepsius, he reigned about 1275 B.C. According to Diodorus, R. was called Remphis, or rather Rempsis (Ramses), and by Pliny Ramses, in whose reign Troy was taken.

Pliny, *Hist. Nat.*, xxxvi. 8, 14, 2; Herodotus ii. 121—124; Diodorus, i. 62; Champollion, *Not. Descr.*; Burton, *Exa. Hier.*; Sir G. Wilkinson, *Manners and Customs*, i. p. 121, and foll.; Lepsius *Einleit.* p. 299, and foll.

RHA'PSODISTS (from Gr. *rhapto*, to string together, and *ode*, a song), in ancient Greece, were a class of persons who earned their bread by going about from place to place, reciting, in a sort of musical chant, the epic ballads of Homer and other ancient poets. They may be compared with the wandering minstrels of the middle ages; but there is this important difference, that the latter were generally the authors of the compositions which they sung. The R. were long a respected and venerated body, but lost their importance, and consequently their character, when the Homeric songs, after being written down, and perhaps woven together into their present form by the scholars at the court of Peisistratos, became generally known to the Greek world through the medium of manuscript copies. Each ballad, or at least as much as could conveniently be remembered and recited at one time, was termed a 'rhapsody,' whence the application of the term to the separate books of the *Iliad* and *Odyssey*, in which usage it is equivalent to the *Fytte* or *Canto* of Scott and Byron.

RHATANY ROOT. See RATTANY ROOT.

RHE'A. See NANDU.

RHEEA FIBRE, an exceedingly valuable East Indian fibrous material, produced by one of the nettle tribe, *Urtica tenacissima*, found indigenous in Assam. It is very nearly like the fibre of which the Chinese make their celebrated *grass cloth*, or linen, and excepting that there are at present some difficulties in preparing it, it would at once become one of the most useful and most abundant of textile fibres; large quantities have already been imported into Britain, and it is gradually getting into use.

RHEIMS, or REIMS, a city and archiepiscopal see in the department of Marne, France, situated on the Vesle (a tributary of the Aisne), 107 miles east-north-east of Paris, by the Paris and Strasbourg Railway. R., a very ancient city is built on the site of *Durocotorum*, which is mentioned by Julius Cæsar (*De Bello Gallico*, vi. 44) as the capital of the Remi, from which people it subsequently took its present name. Christianity may have found an entrance into R. at an earlier period, but it was not till the middle of the 4th c., that it became a bishop's see. Under the Frank rule it was a place of much importance, and it acquired a deeply religious interest from its having been the scene of the baptism of Clovis and his chief officers by the bishop, St. Remy in 496. In the 8th c., it became an archbishopric, and from the 12th c., (in 1179, in which year Philip Augustus was there solemnly crowned), it became the place for the coronation of the kings of France down to the time of Charles X., a vessel of sacred oil, called *la Sainte Ampoule*, to which a miraculous origin was ascribed, being preserved for the purpose. The only sovereigns in the long series, down to the Revolution of 1830, not crowned at R. were Henry IV., Napoleon I., and Louis XVIII. During the frenzy of the Revolution, the cathedral was attacked by the populace, and the sainte ampoule destroyed, in detestation of royalty; and in 1830, the ceremony of coronation at R. was abolished. R. is one of the principal entrepôts for the wines of Champagne, and the hills which surround the town are planted with vineyards. It is one of the great centers of the woollen manufacture in France, and its manufactures, embracing woollen goods, mixed fabrics in silk and wool, merinoes, &c., are known in commerce as *Articles de Reime*.

The town is well built, and from the material employed in building, which is the chalk-stone of the district, and from the prevalence of the older style of domestic architecture, has a picturesque appearance. Its most striking public building is the cathedral, which, although it still wants the towers of the original design, is one of the finest extant specimens of Gothic architecture. It was built in the first half of the 13th century. Its nave is 466 feet long by 99 in breadth, with a transept of 160 feet, and the height is 144 feet. Its grandest features are the western front, which is almost unrivalled, and the so-called Angel Tower, which rises 59 feet above the lofty roof. The stained glass is remarkable for its beauty; the baptismal fonts also are of exquisite workmanship, and the organ is reputed one of the finest in France. The church of St. Remy is of greater age, and nearly of equal size, but it is of less architectural pretension. The archiepiscopal province of R. comprises the sees of Soissons, Chalons, Beauvais, and Amiens. Pop. (1881) 93,344.

RHEI'NGAU, a district stretching along the right bank of the Rhine, formerly belonging to the archbishopric of Mainz, now forms the administrative district of Wiesbaden, in the Prussian province of Hessen-Nassau. R. is about 12 miles long, and 6 broad. This district, one of the richest in Germany, protected by mountains from the north and east winds, and exposed to the mid-day sun, produces wines of the best quality.

RHEIN-HESSE. See HESSE-DARMSTADT.

RHE'NISH ARCHITECTURE, the style of the countries bordering on the Rhine when the arts first revived after the fall of the Roman empire. Being, at the time of Charlemagne, part of the same empire with Lombardy, the arts of that country (see LOMBARD ARCHITECTURE) soon spread northwards, and similar buildings sprung up north of the Alps. There are almost no traces of architecture in Germany before the time of Charlemagne. It received great encouragement from him and his successors, and the Rhenish style made great progress up to the beginning of the 13th c., when the fashion of copying the Gothic architecture of France superseded it. It is, however, a well-marked style, and is complete and perfect in itself. Like the Lombard style, it is round-arched, and has some remarkable peculiarities. The earliest

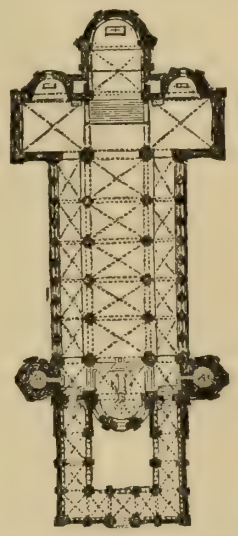


Fig. 1.—Plan of Church at Laach.

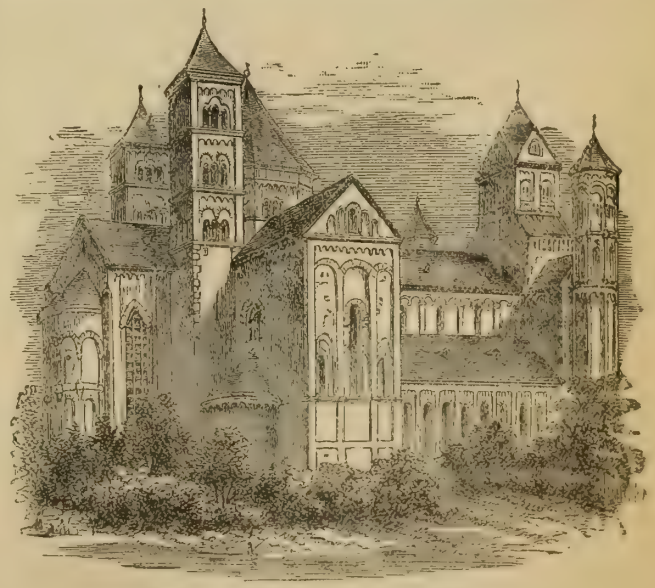


Fig. 2.—Elevation of Church at Laach.

churches seem to have been all circular (like the Dom at Aix-la-Chapelle, built by Charlemagne), and when this was abandoned, the circular church was absorbed into the Basilica, or rectangular church (see ROMANESQUE ARCHITECTURE), in the form of a *western* apse. Most German churches thus have *two apses*—an eastern and a western. They also have a number of small circular or octagonal towers, which seem to be similar in origin to the Round Towers of Ireland. They exemplify in a remarkable manner the arrangements of an ancient plan of the 9th c., found in the monastery of St. Gall, and supposed to have been sent to the abbot, as a design for a perfect monastery, to aid him in carrying out his new buildings.

The arcaded galleries at the eaves, and the richly carved capitals, are among the most beautiful features of the style. Examples are very numerous from about 1000 to 1200 A. D. The three great types of the style are the cathedrals of Mainz, Worms, and Speyer. The last is a magnificent building, 435 feet long by 125 feet wide, with a nave 45 feet wide, and 105 feet high. It is grand and simple, and one of the most impressive buildings in existence. There are also numerous fine examples of the style at Cologne—the Apostles' Church, Sta. Marie in Capitulo, and St. Martin's being amongst the most finished examples of Rhenish architecture. The illustrations of the church at Laach explain the peculiarities of plan and elevation above referred to. It will also be observed that there is a paradise or pavis in front of the entrances. The vaults in this case being small, the different spans were managed (although with round arches) by stilting the springing; but in great buildings like Speyer and Worms, the vaults are necessarily square in plan, in this round-arched style, and the nave embraces in each of its bays two arches of the side aisles—a method also followed by the early Gothic architects. From the use of the round arch and solid walls, the exteriors are free from the great mass of buttresses used in Gothic buildings, and the real forms are distinctly seen.

RHENISH PRUSSIA (Ger. *Rheinprovinz*, or *Rheinpreussen*), the most western and most thickly peopled of the provinces of Prussia lies along the banks of the Rhine, and is bounded on the W. by Belgium and the Netherlands. Area, 10,400 sq. m.; pop. (1880) 4,074,000, of whom about 2,950,000 are Catholics, half-a-million are of Flemish blood, and 11,000 are Walloons. In the south, the surface is mountainous, the principal ranges being the Hundsrück, the Eifelgebirge, and branches of the Westerwald. The largest river is the Rhine, which flows through the province in a north-north-west direction for 200 miles, and receives many affluents from left and right. The surface is everywhere more or less mountainous, except in the extreme north, and the soil of the higher mountain-tracts barely supports the inhabitants; while that of the valleys of the Rhine, Moselle, and Nahe are very fruitful, and the flat districts in the north are most productive in grain. Timber and minerals, including lead, copper, zinc, coal, &c., abound; and the warm and hot sulphur springs of Aix (q. v.) and Burtscheid (q. v.) have a European reputation. Industries and manufactures are here prosecuted with the utmost energy, and with great success. The cotton manufactures of the Wupperthal, the silk manufactures of Krefeld and vicinity, and the woollen cloth and Cashmere manufactures of the district of Aix, are famous. R. P. came into the possession of Prussia by the treaty of Vienna in 1815. It consists of the former duchies of Cleves, Gelders, and Berg, of the principalities of Mörs and Lichtenberg, the northern and middle parts of the former archbishopric of Cologne, numerous lordships, portions from the four French departments of Rhein-Mosel, Mosel, des Forêts, and Saar, &c.

RHE'SUS MONKEY (*Macacus Rhesus*), an Indian monkey, ex-



Rhesus Monkey (*Macacus Rhesus*).

tending further north than any other species except the Entellus (q. v.), or Honuman, and, like it, partially migratory, visiting regions of the Himalaya in summer, which are far too cold for it in winter. It is held in almost as great veneration by the natives of India as the Honuman itself; and the killing of one of these animals is apt to arouse the greatest popular indignation. The monkeys live in troops in the forests, chiefly in hilly districts, and visit the cultivated grounds to carry away grain and other produce, which they store up for themselves among rocks. The native farmers leave a share for the monkeys, believing this to be necessary for the averting of their anger, as otherwise, next year, they would destroy the whole crop whilst green. The R. M. has a stout form, stout limbs, short ears, a short tail, large callosities, the skin hanging loose about the throat and belly, the hair rather long, the back brownish, the lower part of the back and the haunches bright chestnut, or almost orange, the shoulders and arms lighter. It is one of the most intelligent and mischievous of monkeys.

RHE'TORIC (Gr. *rhetorike*, from *rhetor*, an orator) in its broadest sense may be regarded as the theory of eloquence, whether spoken or written. It aims at expounding the rules which should govern all prose composition or speech designed to influence the judgments or the feelings of men, and therefore treats of everything that relates to beauty or force of style—e. g., accuracy of expression, the structure of periods, and figures of speech. But in a narrower sense rhetoric concerns itself with a consideration of the fundamental principles according to which particular discourses of an oratorical kind are composed. The three chief elements of an oration are usually held to be—*inventio*, or the discovery of proper ideas; *dispositio*, or their arrangement; and *elocutio*, or the style in which they are expressed. The ancients, however, who cultivated oral eloquence more than the moderns do, reckoned other two—viz., *memoria*, or memory, and *actio*, or gesticulation. The most distinguished writers on rhetoric in ancient times were Aristotle, Cicero, and Quinctilian; in modern times, Blair, Campbell, Whately, and Spalding among the English; Erneste Maass, Schott, Richter, and Felkmann among the Germans; and among the French, Rollin, Gilbert, Le Batteux, La Harpe, Marmontel, and Andrieux.

RHEU'MATISM (from the Gr. *rheuma*, a flux) is a blood-disease in which inflammation of the fibrous tissues is the most marked characteristic. It occurs either as an acute or as a chronic affection; there is, however, no distinct line of demarcation between the two, and the latter is often a consequence of the former.

Acute rheumatism is indicated by general febrile symptoms, redness, heat, swelling, and usually very intense pain, in and around one or more (generally several, either simultaneously or in succession) of the larger joints, and the disease shows a tendency to shift from joint to joint or to certain internal fibrous membranes, and especially the pericardium; rheumatism being the most common origin of pericarditis, as has been already shown in the article on that disease. The pulse is strong and full, there is headache, but seldom delirium, unless the heart is affected; the tongue is covered with a creamy thick fur, the tip and edges being red; the urine is turbid, and abnormally acid; and the skin is bathed in a copious perspiration, with so characteristic a smell (resembling that of sour-milk), that the physician can often recognize the disease almost before he sees the patient. The joints are extremely painful, and the pain is much increased by pressure, and consequently by movement which gives rise to internal pressure. Hence the patient lies fixed in one position, from which he dares not stir. There are two varieties of acute rheumatism. In one, the inflammation commences not *in* the joint, but *near* it, and attacks the tendons, fasciæ, ligaments, and possibly the muscles themselves. This form is termed *fibrous* or *diffused* rheumatism. In the other variety, the synovial membrane in the joint becomes affected, and an excess of fluid is poured into the joint, distending the membrane, and making it bulge out between the spaces intervening between the various tendons, ligaments, &c., round the joint. It is the knee-joint which is most commonly affected in this way, and fluctuation may readily be perceived on applying the hands to the two sides of the knee. In this form, which is called *synovial* rheumatism, the swelling and redness come on sooner, and are more marked than in the former variety. The fibrous is by far the most severe form, and it is to it that the previous sketch of the most marked symptoms chiefly applies. In the synovial form, the fever is less intense, the tongue less foul, the perspiration far less profuse, and the membranes of the heart are much less liable to be attacked. It is to this form that the term *rheumatic gout* is often applied, and it is by no means inappropriate, because synovial rheumatism forms (as Dr. Watson has observed) a connecting link between gout and rheumatism, and partakes of the characters of both.

The only known exciting cause of acute rheumatism is exposure to cold, and especially to cold combined with moisture, and hence the greater prevalence of this disease amongst the poor and ill-clad. Sleeping in damp sheets or upon the damp ground, the wearing of wet clothes, and sitting in a cold damp room, especially if the sitter was previously warm from exercise, are examples of the kind of exposure which is apt to be followed by this disease. The excreting power of the skin being checked by the action of cold, certain effete matters which should be eliminated in the form of perspiration, are retained, and accumulate in the

blood, which thus becomes poisoned. This blood-poisoning is not, however, a universal sequence to exposure to the cold. It only occurs when there is a special predisposition to this disease, or, as it is termed, a rheumatic diathesis or constitution, and the diathesis may be so strongly developed as to occasion an attack of acute rheumatism, independently of exposure to any apparent exciting cause. Men are more subject to the disease than women, but this probably arises from their greater exposure to atmospheric changes from the nature of their occupations. The predisposition is certainly affected by age; children under ten years, and adults over sixty, being seldom attacked, while the disease is most prevalent between the age of fifteen and forty. Persons once affected become more liable to the complaint than they previously were. Dr. Fuller believes, from his observations made in St. George's Hospital, that the disease is sometimes hereditary; whether this be the case or not, there can be no possible doubt that the predisposition is very apt to exist in members of the same family. The exact nature of the poison is unknown. The late Dr. Prout regarded lactic acid as the actual *materies morbi*, and certain experiments recently made by Dr. Richardson tend to confirm this view.

The danger in cases of acute rheumatism arises almost entirely from the disease going from the joints to the heart, and setting up Pericarditis (q. v.). Hence that mode of treatment will be best which tends most surely to prevent, or, at all events, to lessen the risk of this complication. If the patient is a young person of robust constitution, and there are well-marked inflammatory symptoms (such as a flushed face and a bounding pulse), he should be at once bled from the arm. A large quantity of blood can usually be taken before any signs of faintness occur, and the bleeding is serviceable in at least three points of view. In the first place, it almost always mitigates the pain, and diminishes the febrile symptoms; secondly, it enables other remedies, as calomel, opium, colchicum, &c., to act more efficiently; and thirdly, it may occasionally cut short the attack of the disease, which, if not arrested by treatment, may run on for six weeks, two months, or even longer. Unfortunately, however, the cases of rheumatism which are fit to bear free venesection are comparatively few, especially in large towns; and further, it often happens that the physician is not called in till the proper time for free depletion is past. Purging is probably almost as efficacious as blood-letting, at the beginning of the disease. From five grains to a scruple of calomel given every night, and followed in the morning, for three or four days in succession, by an ordinary black draught, will sometimes dislodge an enormous amount of dark and foul secretions from the liver and bowels, and give marked relief. The main drawback to this mode of treatment is the pain occasioned by changing the position when the bowels act; but this may be to a great extent obviated by the use of the bed-pan. Opium (or morphia) is one of the most valuable remedies in this disease, from its power of allaying pain and procuring sleep.

Dr. Corrigan of Dublin trusts to opium alone for the cure. He begins with one grain, and repeats that quantity (or a larger dose if necessary) at intervals of two hours, until the pain disappears. He found twelve grains in the twenty-four hours to be the average amount required; but half that quantity (or even less) will generally suffice, if the opium be combined with other remedies, as, for example, if it be given with ipecacuanha (as in Dover's Powder), or with small doses of calomel. Colchicum sometimes has a marvelous effect in subduing the disease, but it must be given with extreme care, in consequenee of the prostration to which an over-dose gives rise. See Poisons. Dr. Watson believes that this remedy is of most value when synovial symptoms are present, or when, in other words, the rheumatism approaches in its characters to gout. 'Large doses,' he observes, 'are not requisite. Twenty minims of the wine or of the tincture may be given every six hours until some result is obtained.' The abnormal acidity of the various fluids (the sweat, urine, and even the saliva) in acute rheumatism has led to the belief, that alkaline remedies would both neutralize the poison, and, from their diuretic properties, tend to eliminate it. The bicarbonate of potash in solution has been largely tried by Dr. Garrod, who administered it in average doses of two scruples every two hours, by night and day, for several days together. Of 51 cases so treated, the average period of treatment was between six and seven days, and the average duration of the disease was slightly under a fortnight. The medicine soon rendered the urine alkaline, but did not irritate either the bladder or the intestines. It seemed rapidly to calm the pulse and to allay the febrile heat; and in no case did any heart-complication arise after the patient had been forty-eight hours under its influence. Other physicians, including the late Dr. Golding Bird, prefer the acetate of potash.

The mode of treatment by lemon-juice in doses of one or two ounces five or six times a day, originally advocated by Dr. G. O. Rees, at first sight seems in direct antagonism to the alkaline mode of treatment. As, however, the most active principle in the lemon-juice is citrate of potash, which, before it reaches the kidneys, becomes converted into carbonate of potash, there is less essential difference between the acid and the alkaline mode of treatment than at first sight seems to be the case. Some years ago, a new and wholly different mode of treating acute rheumatism was warmly advocated by Dr. Davies of the London Hospital. It mainly consists in the application of a series of blisters to the parts surrounding and adjacent to the affected joints. One of our highest authorities on this disease, Dr. Fuller of St. George's Hospital, after trying various hot external applications, finds that a mixed alkaline and opiate solution is far more powerful than any other in allaying acute rheumatic pain. The solution which he now usually employs is made by dissolving half an ounce (or rather more) of carbonate of potash or soda in nine ounces of hot water, and adding six fluid drachms of Battley's *Liquor opii sedativus*. Thin flannel, soaked in this hot lotion, is applied to the affected joints, and the whole is wrapped in a covering of thin gutta-percha.

Cases which are intermediate between acute and chronic rheumatism are of very common occurrence. In those cases of what may be termed *subacute* rheumatism, there is slight fever, and several joints are usually affected, without intense inflammation in any one joint. These cases soon show signs of amendment under mild alkaline treatment, as, for example, a drachm of liquor potassæ daily, well diluted and divided into three or four doses, and the moderate use of purgatives.

In all cases of acute and subacute rheumatism, the heart-sounds should be examined daily, or even oftener, with the view of detecting the earliest trace of cardiac affection, and, if possible, of checking its further development. For the treatment to be adopted when there is evidence that the membranes of the heart are affected, the reader is referred to Pericarditis (q. v.)

There are two kinds of *chronic rheumatism*, which are sufficiently distinct to require notice. In one there is considerable local heat and swelling, although unaccompanied with any corresponding constitutional disturbance; while in the other the patient complains of coldness (rather than heat) and stiffness of the affected joints. The former approximates most closely to the previously described forms of rheumatism, of which it is frequently the sequel, and must be treated in a similar manner; while the latter, which is termed by some the *passive* form, usually occurs as an independent affection. In passive rheumatism, the pain is relieved by friction, and the patients are most comfortable when warm in bed—conditions which increase the pain in the former variety. Patients of this kind derive benefit from living in a warm climate, from warm clothing, warm bathing, especially in salt water at a temperature of not less than 100°, the hot-air bath, &c. Friction with some stimulating liniment, and the peculiar manipulation known as shampooing, are here of service; and amongst the internal remedies, turpentine, cod-liver oil, sulphur, guaiacum, sarsaparilla, and Dover's Powder possess a high reputation. Dr. Fuller recommends the muriate of ammonia as a remedy of 'singular efficacy;' but of all remedies for this affection there can be little doubt that the most efficacious is the iodide of potassium, given in five-grain doses, combined with a few grains of carbonate of ammonia three times daily. A patient who is liable to attacks of chronic rheumatism should always wear flannel next the skin during the day, and at night he should sleep between the blankets, abjuring altogether the use of sheets.

Rheumatic Diseases are less common in the lower animals than in men. Horses are not very liable to acute rheumatism, but suffer from a chronic variety, which occurs especially in conjunction with influenza. When affecting the limbs, it often exhibits its characteristic tendency to shift from one part to another. In cattle and sheep, rheumatic disorders are more common and acute than in horses. The specific inflammation sometimes involves most of the fibrous and fibro-serous textures throughout the body, inducing general stiffness, constipated bowels, and high fever. This is rheumatic fever—the chine-felon or body-garget of the old farriers. Sometimes the disease mainly affects the larger joints, causing intense pain, lameness, and hard swellings; occasionally it is confined to the feet and fetlocks, when it is recognized as bustian-foul. Cattle and sheep on bleak exposed pastures, and cows turned out of the dairy to feed on strong alluvial grazings, are especially subject to rheumatism in its several forms. Amongst dogs, rheumatism is known under the name of kennel lameness, and is very troublesome and intractable in low, damp, cold situations. Blood-letting is rarely admissible except in the most acute cases amongst cattle. In all animals, a laxative should at once be given, with some saline matters and colchicum, and when the pain and fever are great, a little tincture of aconite may be added. For cattle, a good combination consists of one ounce of nitre, two drachms of powdered colchicum, and two fluid drachms of the Pharmacopœia tincture of aconite, repeated in water or gruel every three hours: half this dose will suffice for horses. With a simple laxative diet, dogs should have a pill night and morning containing five grains of nitre and two of col-

chicum. Comfortable lodgings, a warm bed, horse-rugs on the body, and bandages on the legs, will greatly expedite a cure. In chronic cases, or after the more acute symptoms are subdued, an ounce of oil of turpentine, and two drachms each of nitre and powdered colchicum, should be given for a cow, half that quantity for a horse, and one-fourth for a sheep. Hartshorn and oil, or other stimulating embrocations, diligently and frequently rubbed in, will often abate the pain and swelling of the affected joints.

RHEYDT, a town of Rhenish Prussia, on the left bank of the Niers, and on the railway between Düsseldorf and Aix-la-Chapelle, 14 miles west-by-south from Düsseldorf. It has manufactures of silks and velvets, soap, glue, vinegar, and leather; it has also dyeworks, and some trade in linen. Pop. (1880) 15,087.

RHIME, or RHYME, is more properly, perhaps, written *rime*, as it does not seem to be derived from the Greek *rythm*, but to be a native Teutonic word, from the same root, probably, as Ger. *reihe*, a row, verb *reihen*, to array; also *reihen*, a song or a chaindance, of which *reim* may be only a variety. In Ang.-Sax., *rimcraeft*, meant the art of numbering; *riman*, to number; and thus *rime*, although a native Teutonic word, may ultimately be from the same Aryan root as the Greek *Rythm* (q. v.), which etymologists derive from *rheo*, to flow. In early English, rhime (and the same is true of Ger. *reim* and the other forms of the word in other northern tongues as well as in the Romanic) meant simply a poem, a numbered or versified piece (compare Lat. *numeri*, numbers = verses, versification); but it has now come to signify what is the most prominent mark of versification in all these tongues, namely, the recurrence of similar sounds at certain intervals. As there may be various degrees and kinds of resemblance between two syllables, there are different kinds of rhime. When words begin with the same consonant, we have *Alliteration* (q. v.), which was the prevalent form of rhime in the earlier Teutonic poetry (e. g., Anglo-Saxon). In Spanish and Portuguese, there is a peculiar kind of rhime called *Assonanc*, consisting in the coincidence of the vowels of the corresponding syllables, without regard to the consonants; this accords well with the character of these languages, which abound in full-toned vowels, but is ineffective in English and other languages in which consonants predominate.

In its more usual sense, however, rhime denotes correspondence in the final syllables of words, and is chiefly used to mark the ends of the lines or verses in poetry. Complete identity in all the parts of the syllables constitutes what the French call *rich* rhime, as in mo*dèle*, fi*dèle;* beau*té*, san*té*. But although such rhimes are not only allowed but sought after in French, they are considered faulty in English, or rather as not true rhimes at all. No one thinks of making *deplore* rhime with *explore*. Rhyming syllables in English must agree in so far, and differ in so far; *the vowel and what follows it—if anything follow it—must be the same in both; the articulation before the vowel must be different.* Thus, m*ark* rhimes with l*ark*, b*ark*, *ark*, but not with r*emark*. In the case of *mark* and *ark*, the absence of any initial articulation in the last of the two makes the necessary difference. As an example of rhime where nothing follows the vowel, we may take be-*low*, which rhimes with fore-*go*, or with *O!* but not with *lo*. To make a perfect rhime, it is necessary, besides, that the syllables be both accented; f*ree* and merri*ly* can hardly be said to rhime. It is almost needless to remark, that rhime depends on the sound, and not on the spelling. *Plough* and *enough* do not make a rhime, nor *ease* and *decease*.

Such words as *roaring*, de-*ploring*, form *double* rhimes; and an-*nuity*, gra-*tuity*, *triple* rhimes. In double or triple rhimes, the first syllable must be accented, and the others ought to be unaccented, and to be completely identical. In the sacred Latin hymns of the middle ages, the rhymes are all double or triple. This was a necessity of the Latin language, in which the inflectional terminations are without accent, which throws the accent in most cases on the syllable next the last—do-*lorum*, vi-*rorum;* sup-*plicia*, con-*vicia*.

Although rhimes occur chiefly between the end-syllables of different lines, they are not unfrequently used within the same line, especially in popular poetry:

> And then to see how ye're negleckit.
> How *huff'd*, and *cuff'd*, and disrespeckit.
> *Burns.*

> And ice mast-*high* came floating *by*.
> *Coleridge.*

(See LEONINE VERSES.)

When two successive lines rhime, they form a *couplet;* three form a *triplet*. Often the lines rhime alternately or at greater intervals, forming groups of four (*quatrains*) or more. A group of lines embracing all the varieties of metre and combinations of rhime that occur in the piece, forms a section called a *stave*, sometimes a *stanza*, often, but improperly, a *verse*. In the days of Acrostics (q. v.) and other conceits, it was the fashion to interlace rhimes in highly artificial systems; the most complex arrangements still current in English are the Sonnet (q. v.) and the Spenserian (q. v.) stanza. Tennyson has accustomed the English ear to a quatrain, in which, instead of alternate rhimes, the first line rhimes with the fourth, and the second with the third.

It is a mistake to suppose that rhime is a mere ornament to versification. Besides being in itself a pleasing musical accord, it serves to mark the endings of the lines, and other sections of the metre, and thus renders the Rhythm (q. v.) more distinct and appreciable than the accents alone can do. So much is this the case, that in French, in which the accents are but feeble, metre without rhime is so undistinguishable from prose, that blank verse has never obtained a footing, notwithstanding the war once waged by French scholars against rhimed versification. 'The advantages of rhime,' says Guest (*English Rhythms*), 'have been felt so strongly that no people have ever adopted an accentual rhythm without also adopting rhime.' The Greek and Latin metres of the classic period, depending upon time or quantity, and not upon accent, were able to dispense with the accessory of rhime; but as has been well observed by Trench (*Sacred Latin Poetry, Introduction*, 1864), even 'the prosodic poetry of Greece and Rome was equally obliged to mark this (the division into sections or verses), though it did it in another way. Thus, had dactyls and spondees been allowed to be promiscuously used throughout the Hexameter (q. v.) line, no satisfying token would have reached the ear to indicate the close of the verse; and if the hearer had once missed the termination of the line, it would have been almost impossible for him to recover it. But the fixed dactyl and spondee at the end of the line answer the same purpose of strongly marking the close, as does the rhime in the accentuated verse; and in other metres, in like manner, licenses permitted in the beginning of the line are excluded at its close, the motives for this greater strictness being the same.' It is chiefly, perhaps, from failing to satisfy this necessary condition, that modern unrhimed verse is found unsatisfactory, at least for popular poetry; and it may be doubted whether it is not owing to the classical prejudices of scholars that our common English blank verse got or maintained the hold it has.

The objection that rhime was 'the invention of a barbarous age, to set off wretched matter and lame metre,' rests on ignorance of its real history. It cannot be considered as the exclusive invention of any particular people or age. It is something human, and universal as poetry or music—the result of the instinctive craving for well-marked recurrence and accord. The oldest poems of the Chinese, Indians, Arabians, &c., are rhimed; so are those of the Irish and Welsh. In the few fragments of the earliest Latin poetry that are extant, in which the metre was of an accentual, not quantitative kind, there is a manifest tendency to terminations of similar sound. This native tendency was overlaid for a time by the importation from Greece of the quantitative metres; yet even under the dominance of this exotic system, rhiming verses were not altogether unknown; Ovid especially shows a liking for them:

> Quot cœlum stellas, tot habet tua Roma puellas;

and in the decline of classicality they become more common. At last, when learning began to decay under the irruptions of the northern nations, and a knowledge of the quantity of words—a thing in a great measure arbitrary, and requiring to be learned—to be lost, the native and more natural property of accent gradually reappeared as the ruling principle of Latin rhythm, and along with it the tendency to rhime. It was in this new vehicle that the early Christian poets sought to convey their new ideas and aspirations. The rhimes were at first often rude, and not sustained throughout, as if lighted upon by chance. Distinct traces of the adoption of rhime are to be seen as early as the hymns of Hilary (died 368), and the system attained its greatest perfection in the 12th and 13th centuries. In refutation of the common opinion, that the Latin hymnologists of the middle ages borrowed the art of rhime from the Teutonic nations, Dr. Guest brings the conclusive fact, that no poem exists written in a Teutonic dialect with final rhime before Otfried's *Evangely*, which was written in Frankish about 870.

Alliteration had previously been the guiding principle of Teutonic rhythms; but after a struggle which was longer protracted in England than on the continent, it was superseded by end-rhimes.—See Guest's *History of English Rhythms* (2 vols., Lond. 1838); where the whole subject is learnedly and elaborately treated; Trench's *Sacred Latin Poetry, Introduction* (Lond. 1864); F. Wolf, *Ueber die Lais Sequenzen, und Leiche* (Heid. 1841).

RHIN, BAS (LOWER RHINE), formerly a frontier department of France, and corresponding pretty nearly to the present German administrative district of Lower Alsace (*Nieder-Elsass*) in the imperial territory of Alsace-Lorraine. To the east lies Baden, and to the west are the French departments of Moselle, Meurthe, and Vosges. The area of Bas-Rhin, as a department of France, was 1759 sq. miles, and its pop. in 1866 was 609,987; the area of Lower Alsace is 1841 sq. m., and its pop. in 1880, 612,015. This district lies almost wholly within the basin of the Rhine, which

flows north along its eastern border. The eastern portion of the district lying along the left bank of the Rhine, consists wholly of plains; while in the west are the rugged and wooded heights which form the eastern slopes of the Vosges Mountains. In the hilly regions are many beautiful valleys. The winters are long and cold; the summer variable; the autumns always fine. Cretinism and goître prevail in some parts, though to a less extent now than formerly. The country is unusually rich in agricultural and manufacturing resources and capabilities. A great variety of grains, fruits, and vegetables, including fine crops of hemp and tobacco, are grown extensively; and wines, red, and white, the latter held in the highest estimation, are produced abundantly. Manufactures, textile and other, are carried on on a grand scale.

Spinning-mills, weaving factories for cotton, calico, woollen, and other fabrics, are exceedingly numerous, and foundries, arms and machine factories also abound. Some timber, floated down the Rhine in rafts, is exported. The region recently occupied by the French departments of Haut-Rhin and Bas-Rhin constituted, prior to the treaty of Ryswick in 1697, one of the most densely peopled and industrious portions of Germany, called in German, Elsass (Latin *Alsatia*). Ceded then to France, it became the French province of Alsace, which was at the Revolution subdivided into the two departments. So it remained till, in 1870, during the war between France and Germany, Bas-Rhin and Haut-Rhin were, with portions of the departments of Moselle, Meurthe, and Vosges, erected by the king of Prussia into the German general government of Alsace. When peace was concluded at Frankfurt, the repossessed German territory was not incorporated with any of the German states; but, certain portions having been restored to France, formed a member of the new German Empire, with the title of the imperial territory (Reichsland) of Alsace-Lorraine (Elsass-Lothringen).

RHIN, Haut (Upper Rhine), formerly a frontier department in the east of France, now for the most part comprehended within the German district of Upper Alsace. The area of Haut-Rhin was 1586 sq. miles, and its population in 1866 was 530,285; the area of Upper Alsace being 1354 sq. miles, and its pop. (1880) 461,942. The eastern frontier is for the most part formed by the Rhine, and the western frontier by the Vosges Mountains. After the Rhine, the principal river is the Ill, into which the streams from the Vosges Mountains flow. In the middle of the district the soil is fertile, and of the valleys of the west some are exceedingly rich and productive. The vineyards are extensive, and much wine is produced. In agriculture, and in trade and manufactures, great activity and enterprise are manifested. At the treaty of Frankfurt, the cantons of Belfort, Delle, Giromagny, with 28 other communes, all formerly included in Haut-Rhin, were restored by Germany. The French remnant was then called 'Territory of Belfort,' but since 1878 is again H.-R.

RHINA'NTHUS, a genus of plants of the natural order *Scrophulariaceæ*, having an inflated 4-toothed calyx; the upper lip of the corolla compressed laterally, furnished on both sides below the tip with a straight tooth or lobe, the lower one plane and 3-lobed. The capsule is compressed and 2-celled. *R. crista-galli* is a very common British plant, an annual, 1—2 feet high, to be seen in almost every meadow and in many pastures, with yellow flowers, and rather large capsules, in which the seeds rattle when ripe, whence its common name, *Yellow Rattle*. It is also called Cock's-comb, from its fringed bracts.

RHINE (*Rhenus*), the most important river in Germany, and one of the most noted in Europe, takes its rise in the Swiss canton of the Grisons, and after a north-north-west course of about 850 miles falls into the German Ocean. The area of the R. basin, including its various feeders, which have been counted to the number of 12,000, is estimated at about 86,000 sq. miles. The R. divided into the Upper, Middle, and Lower R., the first of these terms being applied to the river from its source to Basel; the second applies to its course from Basel to Cologne; and the last to its course from Cologne through the Netherlands to the sea, into which it empties itself by several mouths, forming an extensive delta. The head-waters of the Upper R. consist of three main streams called respectively the Vorder R., the Mittler R., and the Hinter Rhine. The first and most easterly rises on Mount Crispalt, north-east of Mount St. Gothard, 7500 feet above the level of the sea, and flowing east, bursts like a torrent through a deep ravine.

At Dissentis, 12 miles from its source, it is joined by the Mittler R., or central branch, at the comparative low level of 3500 feet. At Reichenau, 50 miles from the source of the Vorder R., the stream is swelled by the third branch, known as the Hinter R., which, taking its rise among the glaciers of the Vogelberg, flows over a distance of 80 miles before it blends its waters with the main branches. The Hinter R., considerably the longest of the upper waters, claims to be esteemed the chief source, and at its confluence with the other branch at Reichenau, the river first assumes the general name of Rhine. At Coire, where the river takes a sudden turn northward, it is nearly 150 feet wide, and navigable for rafts and flat boats. A little above the small town of Sargans, in St. Gall, it leaves the Grisons, and forming the boundary between the small principality of Lichtenstein and the Voralberg, on the right, and St. Gall on the left, flows in a northerly direction to Rheineck, where it enters the Boden See, or Lake of Constance, which may indeed be regarded as the river itself, augmented in its course between Rheineck and Constance by the confluence of numerous streams. Emerging from the Upper Lake at Constance, the R. enters the Unter See, or Lower Lake, a few miles below, and following a westerly course, forms the boundary-line between Switzerland and the grand duchy of Baden; and after receiving the Thur, Töss, and Aar on the left, and the mountain torrents of the Wutach and Alb on the right, pursues its course to Basel. At Schaffhausen, about 13 miles from the western extremity of the Unter See, the waters of the river, rushing over a rock 70 feet high, form the cataract known as the Falls of Schaffhausen; while lower down the narrowing of the channel through the projection of rocks on either side gives rise to rapids both at Laufenburg, and at a point ten miles below it, known as Höllenhacken, where the navigation is impeded for a considerable distance by the force of the cataracts.

Below Basel, the R., turning again due north, separates Alsace-Lorraine from Baden, forms the eastern boundary of Rhenish Bavaria, cuts the province of Rhine-Hesse in two, and flows between Hessen-Nassau and Rhenish Prussia, through which it afterwards pursues a north-west course. Before it reaches Cologne, it takes up numerous tributaries and affluents—viz., the Ill, Wiese, Elz, Kinzig, Murg, Neckar, Main, Lahn, Moselle, &c.; and passes the cities of Breisach, Strasburg, Germersheim, Spiers, Mannheim, Worms, Oppenheim, Mainz, Bingen, Coblenz, and Bonn. In the middle part of its course, the river makes great bends, the current is rapid, and navigation is rendered difficult by numerous small islands and sandbanks, which are subject to changes of form and position. Much has been done to improve the R. above Bingen. By an agreement made, in 1840, between France and Baden, it has been brought into its proper channel and considerably shortened. The valley through which the R. runs between steep banks from Mainz to Bonn, contains the picturesque scenery which has made this river so celebrated, and the vineyards from which the famous Rhenish wines are obtained. From Cologne to its mouths, the R. flows through a low level country, and soon after entering the Netherlands, divides it into two arms, the left, called the Waal, uniting with the Maas near Fort Loevestein, and forming the Merwede or Merwe, which below Dordrecht takes the name of the Old Maas; the right arm, called the R., a little above Arnheim, throws off the New Yssel, originally a canal, cut by Drusus to connect the R. with the Old Yssel.

Flowing on to Wijk bij Duurstede, the R. divides again into the Lek, which unites with the New Maas near Ysselmonde, and the Kromme Rhine, which at Utrecht parts into the Vecht and the Old R., the latter as a small stream entering the North Sea by the Katwijk Canal to the north-west of Leyden. The delta of the R., which extends from about 51° 35′ to 52° 20′ N. lat., and occupies nearly 50,000 sq. m. of territory, belonging to the Dutch provinces of North and South Holland, Utrecht, and Guelderland, requires to be protected by strong embankments. The principal of these, which begin at Wesel, are about 25 or 30 feet above the lowest level of the river. Several canals connect the R. with the Rhone and Saone, the Scheldt, Meuse, and Danube, and thus open a line of communication with France and Belgium on the one side, and with the Netherlands and every part of Germany on the other. The commerce and navigation of the R., which are of vast extent and great importance, used to be regulated by treaties between the different states through which it passes, all of which levied tolls on vessels and goods entering their respective territories, and thus produced an accumulation of duties which pressed heavily on the transit trade. Steam-navigation is, however, conducted with greater regularity and energy on the R. than on any other river of Germany; and of late years, since the main lines of railway, running on either side of the river, have been connected by railway bridges across the river, additional importance and extension have been given to the commercial relations of all the countries connected with the Rhine. Pontoon or boat bridges cross the river at Cologne, Mainz, Mannheim, and a few other places.

RHINE, Confederation of the. See Confederation of the Rhine.

RHINE-WINE is a term of very general signification, applied, however, most frequently to those wines produced in the Rheingau (q. v.). The most valued and costly of these are the Schloss-Johannisberger, Hochheimer, Kloster-Erbacher, Rudesheimer, Steinberger, Gräfenberger, Rauenthaler, Rothenberger, Scharlachberger, and Markobrunner. The red Rhine-wines, of which the Asmannshäuser is the most celebrated, are not nearly so much

prized as the white; neither have they the strength or bouquet of the latter. The wines of the Lower Rhine, from Düsseldorf downwards, are generally of inferior quality.

The term Rhine-wine, in its general signification, includes the Pfalz and Moselle wines. It is now generally held in Germany that Rhine-wines that have been properly kept for three or four years are in the most wholesome condition for use; the very old stocks no longer find a ready market except in Russia and England.

RHINO'CEROS (Gr. nose-horned), a genus of Perissodactyle Ungulates, containing the largest and most powerful of terrestrial mammalia, except the elephants. There are at least seven or eight existing species, all natives of the warm parts of Asia, the Indian Archipelago, and Africa; and numerous fossil species



Rhinoceros (*R. Indicus*).

have been discovered in the newest geological deposits. The form of the R. is clumsy and uncouth; its aspect dull and heavy. The limbs are thick and strong; each foot is terminated by three toes, which are covered with broad hoof-like nails. The tail is small, and terminated by a small tuft. The ears are moderately large; the eyes very small. The head is large, the muzzle prolonged, and the nasal bones combined into an arch for the support of a horn, which, however, does not spring from them, but merely from the skin; a second horn, in some of the species, growing above it, in like manner springing from the skin, and resting for support on the bone of the forehead. The upper lip is more or less prolonged and prehensile, in some of the species so much so that it is capable of being used to pick up very small objects.

The whole body, head, and limbs are covered with an extremely thick and hard skin, which in none of the existing species exhibits more than mere traces of hair, although there is evidence that some of the extinct ones were covered with fur; and the hardness of the skin being such that in some of the species it has not pliancy enough to permit the movements of the animal, it is in a manner jointed by means of folds on the neck, behind the shoulders, in front of the thighs, and on the limbs.

The horn of the R. is a very remarkable organ, and a powerful weapon of offence and defence. With it also the animal can root up bushes or small trees, the foliage or fruit of which it desires to eat. It is of a perfectly homogeneous structure (see HORNS), and solid.

The different species of R. display some differences of dentition. None of the species of R. displays a high degree of intelligence. Although usually harmless, they are easily provoked, and show much capriciousness of temper. When irritated, they become very dangerous; and although usually slow in their movements, they can, upon occasion, run rapidly. Their great weight and strength enable them to force their way through jungles, breaking down the smaller trees before them. The hide is proof against the claws of a lion or tiger, and is not to be penetrated by a leaden bullet, except at a very short distance, or in some of the thinner parts about the neck or chest. Bullets of iron or tin are used for shooting them.

The species of R. agree in being found sometimes solitary or in pairs, sometimes in little companies, never in large herds.

The INDIAN R. (*R. Indicus*) is a native of the continental parts of the East Indies, and lives chiefly in marshy jungles on the banks of lakes and rivers, often wallowing in the mud, with which it encases itself, apparently as a protection against insects, which annoy it notwithstanding the thickness of its hide. It is the largest known species of R., a large specimen being rather more than five feet in height. The horn is sometimes 3 feet in length, and 18 inches in circumference at the base. The Indian R. was known by very imperfect description to the ancient Greeks, receiving the very inappropriate name of *Indian Ass;* and from accounts of it the fable of the unicorn probably originated. Individuals have from time to time been brought alive to Europe, and have proved tolerably quiet and tractable, feeding with apparent satisfaction on moistened hay, vegetables, pulse, grain, &c. —The JAVANESE R. (*R. Javanicus*, or *R. Sondaicus*) is a somewhat smaller species, also one-horned. Sumatra has a two-horned species (*R. Sumatrensis*).—Different species of R., all two-horned, are found in almost all parts of Africa, and one or more of them were known to the ancient Romans.—The BOVELE or BLACK R. (*R. bicornis*, or *R. Africanus*), of South Africa, is the smallest of all the known species. It is of a black color, and its first horn is rather thick than long, its second short and conical. It is a fierce and dangerous animal, capable of great activity, and more dreaded by the South African hunter than the lion itself.—The KEITLOA (*R. Keitloa*) is larger, and has the two horns nearly equal in length, the foremost horn curved backwards, the other curved forwards. It is also a native of South Africa, and much dreaded both on account of its strength and its ferocity.—The WHITE R. (*R. Simus*), or MUCHUCO, or MONOOHO, is the largest of the well-ascertained African species.

No species of R. is prolific. One young one only is produced at a birth, and the intervals are long. The flesh of the R. is used for food. That of the different species is somewhat variously esteemed. The skin is used in the East Indies for shields; in South Africa, it is sliced up into thongs.

The earliest remains of the R. are found in Miocene strata, and in the subsequent Tertiary deposits they frequently occur. Ten species have been described. A two-horned species was found by Pallas in the frozen gravel of Siberia, along with the mammoth, still covered with a shaggy coat of long wool, and having its flesh preserved.

RHINOPLA'STIC OPERATION. When a portion or the whole of the nose has been destroyed by accident or disease, the deficiency may be restored by a transplantation of skin from an adjoining healthy part. When the whole nose has to be replaced, the following course is usually adopted. A triangular piece of leather is cut into the shape of the nose, and is extended on the forehead with its base uppermost; its boundaries when thus flattened, are marked out on the skin with ink. Any remains of the old nose are then pared away, and a deep groove is cut round the margins of the nasal apertures. When the bleeding from these incisions has stopped, the marked portion of the skin of the forehead must be carefully dissected away, till it hangs by a narrow strip between the eyebrows. When the bleeding from the forehead ceases, the flap must be twisted on itself, so that the surface which was originally external may remain external in the new position, and its edges must be fastened with stitches into the grooves prepared for their reception. The nose thus made, is to be supported with oiled lint, and well wrapped in flannel, to keep up the temperature. When complete adhesion has taken place, the twisted strip of skin may be cut through, or a little slip may be cut out of it, so that the surface may be uniformly smooth. When only a part of the nose, as one side only, or the septum, requires to be restored, modifications of the above operation required, and the skin, instead of being taken from the forehead, is taken from the cheek or the upper lip. For further details regarding this important operation, the reader is referred to Fergusson's *Practical Surgery*.

This operation is popularly known as the *Taliacotian Operation*, from its having been first performed by Taliacotius, who was professor of anatomy and surgery at Bologna, where he died in 1553. The work in which the operation is described was not published for more than forty years after his death. It appeared in 1597, under the title *De Curtorum Chirurgia per Insitionem libri duo*. Instead of taking the skin for the new nose from the forehead, he took it from the arm of his patient, and there is no reason why the operation which he describes, although inferior in many respects to that at present adopted, should not be successful. The difficulty of keeping the arm sufficiently long in apposition with the face (a period of about twenty days), was doubtless one of the reasons for selecting the forehead in preference as the part from which to take the skin. The name of Taliacotius has been mainly popularized in this country by a well-known coarse joke in Butler's *Hudibras*. There is, however, little foundation for the view which Butler takes of the operation. Taliacotius discussed the advantages and disadvantages of taking the skin from the *arm* (he does not suggest any other part of the body) of another person, but he comes to the conclusion, that it would be impossible to keep two persons so fastened together for the necessary time, that no motion of the parts in apposition should occur, and he adds, that he never heard of the plan being attempted. It is almost unnecessary to add, that even if a nose were manufactured from the skin of a second person, there is not the slighest reason for apprehending that it would suddenly die and drop off on the death of the original proprietor of the skin, notwithstanding the cases to the contrary recorded, as illustrative of the power of sympathy, by Van Helmont, Campanella, Sir Kenelm Digby, and others. This astounding notion was resuscitated not many years ago by M. Edmund About in a popular novel, entitled *Le nez d'un Notaire*.

RHIPI'PTERA. see STREPSIPTERA.

RHIZA'NTHEÆ (RHIZOGENS of Lindley) are a very remarkable natural order of plants. They are parasitical plants, brown, yellow, or purple, never of a green color, destitute of true leaves, and having cellular scales instead. The stem is amorphous and fungus-like; sometimes, as in Rafflesia (q. v.), there is no stem; but the flowers arise immediately from the surface of the branch or stem to which the plant is parasitically attached. Spiral vessels are either few or wanting, and the substance is chiefly cellular tissue. Whilst their general structure thus associates them with fungi, which they resemble also in their mode of decay, they have the flowers and sexual organs of phanerogamous plants. The flowers are monœcious, diœcious, or hermaphrodite. Lindley regards these plants as forming a class distinct from the other Phanerogamous plants (*Exogens* and *Endogens*), and as one of the connecting links between them and the Cryptogamous plants (*Thallogens* and *Acrogens*). There are not many more than 50 known species in all, of which one or two are found in the south of Europe, the others in Africa and the warmer parts of Asia and America. *Cynomorium coccineum* (*Balanophoraceæ*) is found in Malta, and is the *Fungus Melitensis* of apothecaries, long celebrated for arresting hæmorrhages. Others are likewise used as styptics. *Cytinus hypocistis* (*Cytinaceæ*) grows on the roots of species of Cistus in the south of Europe. Its extract (*Succus hypocistidis*) is used as an astringent in hæmorrhages and dysentery. A species of *Ombrophytum* (*Balanophoraceæ*) springs up suddenly after rain in Peru, like a fungus, is insipid, and is cooked and eaten under the name of *Mays del Monte*. Different species of *Balanophora* are very abundant in Northern India. They are found in the Himalaya at an elevation of 10,000 feet, producing great knots on the roots of maple trees, oaks, &c., which are sought after by the Tibetans, and carried into Tibet, where they are made into very beautiful cups.

RHIZO'PODA (Gr. *rhizon*, a root, and *poda*, feet), an important class of the lowest of the animal subkingdoms, the Protozoa. In all the organisms of this class, the body is composed of a simple gelatinous substance, to which the term 'sarcode' is applied; and in all, locomotion is performed by the protrusion of processes which, from their function, are termed pseudopodia,' or false feet. As in the case of all the Protozoa, except the Infusoria, there is no mouth or intestinal tube.

As a typical form of rhizopod, the *Amœba* (fig. 1), a minute animal readily obtained in this country, may be taken. On placing one of these organisms (obtained from a pond, or from a bottle containing some vegetable infusion) under the microscope, it is seen to resemble a roundish mass of semi-transparent jelly, altogether devoid of life. Soon, however, the animal begins to push out in various directions portions of the gelatinous mass of which it consists, and by the alternate expansion and retraction of these prolongations, it effects a slow and somewhat irregular locomotion. Should these processes come in contact with anything fit for food, they grasp it and coalesce around it, and the morsel soon becomes enclosed in the interior of the body, much as (to use an illustration employed by Professor Greene in his *Manual of the Protozoa*) a stone may be forced into the interior of a lump of clay, or similar plastic material. When all that is nourishing is absorbed, the indigestible remains are ejected through some part of the body. A nucleus may generally be observed, and at times (but not permanently) one or more clear vesicles may be noticed, containing a fluid which is apparently furnished during the process of digestion. The members of the genus *Amœba* (containing at least three species) may be regarded as representing the simplest forms of animal life. Closely allied to the *Amœba* is the *Actinophrys*, or Sun-animalcule (fig. 2), and both these genera are completely naked. In *Difflugia* (fig. 3), the 'sarcode' is invested with a membranous oval coat with an aperture at one end, from which the pseudopodia project. In *Arcella* (fig. 4) the soft parts are protected by a discoid, or hemispherical shield, open below; while in the *Foraminifera* (q. v.), the soft part is invested with a calcareous shell, which is sometimes simple, but more commonly consists of an agglomeration of minute chambers (fig. 5).



Fig. 1.—Amœba radiosa.
a, young *Amœba*, with five pseudopodia protraded; *b*, another specimen.



Fig. 2.—Sun-animalcule in the act of feeding:



Fig. 3.—Difflugia proteiformis.



Fig. 4. Arcella acuminata.

At *a* is seen a captured Infusorian entering the substance of the body.

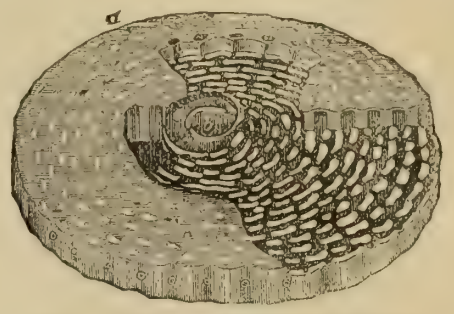


Fig. 5.—Structure of Orbitolites complanatus:

a, simple dise of *Orbitolites* laid open to show its interior; *b*, central cell; *c*, circumambient shell, surrounded by concentric zones of shells connected with each other by annular and radiating passages.

Various classifications of the Rhizopods have been proposed by different zoologists. That of Greene, in which they are simply divided into *Amœbea* and *Foraminifera*, is sufficient for all practical purposes. All the *Amœbea* are microscopic, and seldom exceed $\frac{1}{50}$th of an inch in diameter. The *Foraminifera* (q. v.) are somewhat larger.

Amongst the most important contributions to our knowledge of this department of the animal kingdom must be mentioned: Schultze, *Ueber den Organismus der Polythalamien*, 1854; Williamson, *On the Recent Foraminifera of Great Britain*, 1858; Claparède et Lachmann, *Etudes sur les Infusoires et les Rhizopodes*, 1858—1860; Carpenter, *Introduction to the Study of the Foraminifera* 1861; and Häckel *Die Radiolarien*, 1862.

RHODE ISLAND, one of the thirteen original United States of America, and the smallest in the Union, on the southern coast of New England, is 47½ miles from north to south, and 37 miles from east to west; and has an area of 1306 sq. miles. It is bounded N. and E. by Massachusetts, S. by the Atlantic, and W. by Connecticut. It is divided into five counties, and its principal towns are Providence and Newport, the twin capitals; Bristol, Warren, Pawtucket, Woonsocket, &c. Narraganset Bay, which occupies the south-eastern quarter of the state, is from 3 to 12 miles wide, and filled with beautiful islands, the largest of which, Rhode Island, is 15 miles long, by 3 to 3½ wide, and contains the town of Newport, a fashionable summer resort, with a large and spacious harbor, and formidable fortifications. Several small rivers, as the Pawtucket, Pawtuxet, Parocatuck, &c., rising in the hills of Massachusetts, flow into Narraganset Bay, and their frequent falls afford water-power to numerous manufacturing villages. The country is hilly and the soil rough and stony, and chiefly devoted to pasturage and orchards. The formation is chiefly of primary stratified and unstratified rocks, with some coal of a poor quality, iron, limestone, and marble. The climate is mild, and on the islands delightful. The population is chiefly engaged in trade and manufactures. There are in the state 142 cotton, 65 woollen, 26 iron factories; and a large coasting-trade and considerable fisheries are carried on. There are several railways. The state debt in 1878 was 2,434,500 dollars; the receipts for the year 1877–8 were 832,980 dollars. There are 62 national banks and 37 savings-banks. 6 daily and 19 weekly newspapers, about 300 churches, over 700 schools with 40,000 pupils, Brown University, and state penitentiary and asylums (see PROVIDENCE).

The government, which existed until 1842 under the charter given to Roger Williams in 1642, is similar to that of the other states. The governor has a salary of 1000 dollars, or about £200, and the lieutenant-governor 500 dollars, or £100 per annum. R. I. is believed to have been the Vinland of the Norsemen, who explored this coast in the 10th century. It was settled in 1636 by Roger Williams and his companions, Baptists, who were expelled for their religious opinions from the Puritan colony of Plymouth. The colony suffered from the Indian wars, until the defeat and death of Philip, king of the Wampanoags. Pop. in 1820, 83.069; 1840. 108.830; 1860, 174,621; 1870, 217,353, of whom 4980 were colored; 1880, 276,530.

RHODES, an island now belonging to Asiatic Turkey, and long an important, wealthy, and independent state of ancient Greece, in the Mediterranean, lies off the south-west coast of Anatolia, from the nearest point of which it is distant about 12 miles. It is 45 miles long, and 20 miles in greatest breadth, and is traversed in the direction of its length—from north-east to south-west—by a chain of mountains, which reach in Mount Artemira (the former *Atabyros*) a height of 4070 feet, and in Mount Artamiti of near 6000 feet. Pop. about 30,000, of whom 6000 are Turks, 1000 are Jews, and the remainder Greeks. The mountains are covered with forests, the valleys are fertile, and the well-watered plains form rich and beautiful pasture-lands. Of all the islands in the Levant, R. possesses the most beautiful and the most temperate climate. It produces oil, oranges, citrons, &c., and might raise in profusion most necessaries and luxuries. But owing to the insecurity and extortion from which the Rhodians have long suffered, agriculture is in a very depressed state; much fertile lands lies waste, and the island does not even raise corn enough for its scanty population. A little marble is quarried. The harbors are neglected, and the trade is now inconsiderable.

R., the ancient *Rhodos*, was inhabited at a very early period. The Telchines, who are asserted by tradition to have been its most ancient inhabitants, are said to have migrated hither from Crete. It was not, however, until the immigration of a branch of the Doric race that the distinctive national character of the Rhodians became fixed. The first immigration of Dorians seems to have taken place before the Trojan war, for R. is said to have sent nine ships to Troy under the leadership of the Heracleid Tlepolemus. Situated between the three ancient continents, a position highly favorable to the development of commercial enterprise, the Rhodians at an early period rose to great prosperity and affluence. Their three most ancient towns were Lindus, Ialysus, and Camirus, and they planted numerous colonies not only on the shores in their vicinity, but also on the coasts of Lycia, Italy, Sicily, and Spain. At the end of the 5th c. B.C., they founded the city of Rhodes (q. v.); and after this event, the history of the island is comprised in that of the city.

RHODES, an ancient and famous maritime city, capital of the island of the same name, and situated on the north-east extremity of that island. Lat. of harbor 36° 26′ N., long. 28° 16′ E. The modern city, though scarcely one-fourth the size of the former one, has an imposing appearance. Its site is admirable, and it rises in the form of an amphitheater behind the fortified harbors, of which there are two, separated from each other by a narrow quay. At the entrance to the harbors stand the two large quadrangular towers of St. John and St. Michael. The harbors, however, are now neglected, and this once flourishing mart of the East is now comparatively desolate, and is no longer the seat of industry or active commerce. The town, overlooked by mosques and minarets, consists of ill-built houses and gloomy streets. The earthquakes of 1851, of 1856, and of 1863, as well as the frightful powder-explosion in 1856, caused by a flash of lightning, did much to devastate the town. By the powder-explosion, the church of St. John, built in 1500, and the great tower of the Knights of St. John, were shattered, together with 300 houses, under the ruins of which 1000 townspeople lost their lives; and by the earthquake of 1863, 2000 houses were destroyed, and many lives lost. The palace of the Grand Master is now in ruins, and the hospital of the knights now serves as a granary. Pop. about 20,000

The city of R. was founded in 408 B.C., and was built on a regular plan, the unity and harmony of its architecture being secured by the circumstance, that the design of the whole was the work of one man. It was girt about by strong walls, surmounted by towers, and was provided with two excellent harbors. But it was remarkable for the number and excellence of its paintings, sculptures, and statues, as well as for the beauty and strength of its architecture. At the entrance of one of its ports stood a gigantic brazen statue of Helios, 70 cubits in height, and called the Colossus of Rhodes. Besides this statue, which is described as one of the seven wonders of the ancient world, 3000 others, of which 100 were colossal, adorned the city. The capital of a fertile and flourishing island, and the great center of the commerce of the Mediterranean, R. long enjoyed great prosperity. The arts were also prosecuted with assiduity, and intellectual activity manifested itself here long after it had declined in most parts of Greece. From the outbreak of the Peloponnesian War to the middle of the 4th c. B.C., R. was alternately in league with Athens and in arms against that city. Like the rest of Greece, it submitted to the victorious Alexander, and received a Macedonian garrison; but on the death of Alexander, 323 B.C. the Rhodians rose upon and expelled the intruders. From this time to the overthrow of the Macedonian monarchy, R. largely extended its territories, and rose to great commercial and naval importance. After the death of Cæsar, whose side the Rhodians had taken against Pompey in the civil war, they were defeated in a naval engagement by Cassius, who in 42B.C. entered the city by force, massacred the hostile leaders, seized the public property, and rifled the temples. This visitation broke the power of R., but it long continued to maintain its *prestige* as a seat of learning. During several centuries, R. remained in the power of the Greek emperors. In 1310, the Grand Master of the Knights of St. John of Jerusalem settled here, and here the brethren remained till the 16th century. (See JOHN, ST., KNIGHTS OF.) Since this period, R. has remained a possession of Turkey.

RHO'DIAN LAW is the earliest system of marine law known to history, said to be compiled by the Rhodians after they had by their commerce and naval victories obtained the sovereignty of the sea, about 900 years before the Christian era. Cicero refers to the Rhodians as illustrious for their naval discipline. The collection of Marine institutions termed Rhodian Laws is to be found in Vinnius, but their authenticity is doubted. Some say that the Romans adopted these laws during the first Punic war; others say that Justinian incorporated them with the Roman law. The leading points supposed to be borrowed from the Rhodian law relate to the shares of the officers and crew of a ship, the punishment of barratry and of plundering wrecks, and compensation payable to the heirs of mariners who lost their lives in the service of the vessel.

RHO'DIUM (symb. R., Rh, and Ro, according to different chemists; eq. 52—new system, 104—sp. gr. 12·1) is one of the metals of the platinum group. It is a white, very hard metal, resembling aluminium rather than silver. It fuses less easily than platinum. It is ductile and malleable when pure and after fusion, and insoluble in all acids; but when alloyed in small quantity with platinum, copper, bismuth, or lead, it dissolves with them in *aqua regia*. It usually forms about one-half per cent. of the ore of platinum, from which it is extracted by a complicated process, for details of which we must refer to Deville and Debray's 'Memoir on Platinum and its Ores,' in the *Annales de Chimie et de Physique* for 1859. Two oxides, two sulphides, and three chlorides of rhodium have been obtained and examined by chemists. The sesquichloride unites with several soluble chlorides to form crystallizable double salts, which are of a rose color (whence the name rhodium, from the Gr. *rhodon*, a rose). An alloy of steel, with a small quantity of rhodium, is said to possess extremely valuable properties; and according to Deville, an alloy of 30 or more parts of rhodium with 70 of platinum, is easily worked, and is not attacked by aqua regia, and hence it forms an excellent material for crucibles. This metal was discovered in 1803 by Wollaston.

RHODODE'NDRON (Gr. rose-tree), a genus of trees and shurbs of the natural order *Ericeæ*, having ten stamens, a very small calyx, a bell-shaped or somewhat funnel-shaped corolla, and a capsule splitting up through the dissepiments. The buds in this and nearly allied genera, as *Azalea* (q. v.), are scaly and conical. The species are numerous; they have evergreen leaves, and many of them are of great beauty both in foliage and in flowers. A few small species are natives of Continental Europe and of Siberia; but the greater number belong to the temperate parts of North America, and to the mountains of India. *R. maximum*, so designated when the far larger India species were unknown, is common in Britain as an ornamental shurb. It is a large shrub or small tree, which forms impenetrable thickets on many parts of the Alleghany Mountains, and has a magnificent appearance when in flower. The leaves are large, oblong, acute, stalked, leathery, dark green, and shining above, rusty brown beneath. The flowers are large, in umbellate corymbs, varying in color from pale carmine to lilac. This species is quite hardy in Britain; as is also *R. ponticum*, a very similar species, with narrower and more pointed leaves, which are of the same color on both sides, a native of Western Asia, and apparently also of the south of Spain. *R. Catawbiense*, a native of the southern parts of the Alleghanies, with large purple flowers; *R. Caucasicum*, the name of which indicates its origin; and *R. arboreum*, a native of Nepaul, with very dense heads of large scarlet flowers, and leaves 4—6 inches long, attaining in its native country a height of 30 or 40 feet, are also fine species, and well known. Most of the extremely numerous varieties now common in our gardens and shrubberies have been produced from them by hybridizing or otherwise.—Many splendid species of R. have recently been discovered in the Himalaya, the Khasia Hills, and other mountainous parts of India, by Dr. Hooker and others; and some of them have begun to be introduced into cultivation in Europe. It is impossible for us to notice more than a few.

R. Falconeri is described as in foliage the most superb of all, the leaves being 18 or 19 inches long. It is a tree 30—50 feet high, with leaves only at the extremities of the branches. It grows in Eastern Nepaul at an altitude of 10,000 feet. *R. argenteum* has flowers 4½ inches long, and equally broad, clustered, and very beautiful. *R. Maddeni*, *R. Aucklandii*, *R. Edgeworthii*,

and others, have white flowers. *R. Dalhousiæ* is remarkable as an epiphyte, growing on magnolias, laurels, and oaks. It is a slender shrub, bearing from three to six white lemon-scented bells, 4½ inches long, at the end of each branch. *R. Nuttalii* has fragrant white flowers, said to be larger than those of any other rhododendron. All these belong to the Himalaya. In more southern latitudes, as on the Neilgherry Hills and on the mountains of Ceylon, *R. nobile* prevails, a timber tree 50—70 feet high, every branch covered with a blaze of crimson flowers.—*R. Keysii*, and *R. Thibandiense*, also natives of the north of India, have flowers with nearly tubular corolla.—*R. ferrugineum*, and *R. hirsutum* are small species, shrubs from one to three feet in height, natives of the Alps, and among the finest ornaments of alpine scenery. They are called *Alpenrose* (Alpine Rose) by the Germans. They are not easily cultivated in gardens. They have small carmine-colored flowers in umbellate clusters. The mountain slopes glow with their blossoms in July and August. The flora of the Himalaya contains a number of similar small species. *R. anthopogon* and *R. setosum*, dwarf shrubs with strongly-scented leaves, clothe the mountains in Eastern Nepaul at an elevation of 12,000 feet and upwards, with a green mantle, brilliant with flowers in summer. *R. nivale* is the most alpine of woody plants, spreading its small woody branches close to the ground, at an elevation of 17,000 feet in Sikkim. *R. Lapponicum*, a procumbent shrub, with small flowers, grows as far north as human settlements have reached in Europe, Asia, and America.—Some of the species of this genus possess narcotic properties. An oil obtained from the buds of *R. ferrugineum* and *R. hirsutum* is used by the inhabitants of the Alps, under the name *Olio di Marmotta*, as a remedy for pains in the joints, gout, and stone. *R. chrysanthum*, a low shrub, with golden yellow flowers, native of Siberia, is also used in gout and rheumatism. *R. cinnabarinum*, a Himalayan species, poisons goats which feed upon it, and when used for fuel, causes inflammation of the face and eyes. But the flowers of *R. arboreum* are eaten in India, and Europeans make a pleasant jelly of them.

RHO'MBUS. See PARALLELOGRAM.

RHONE (*Rhodanus* of the Romans), which takes its rise in the Swiss Alps (on the western side of Mount St. Gothard, not far from the sources of the Rhine, is the only important French river which falls into the Mediterranean. Its entire length, from its origin to the Gulf of Lyon at its embouchures, is 644 miles, and the area of its river-basin 28,000 sq. miles. The R. is, for its length, probably the most rapid river in the world. On issuing from its source, it runs in a south-westerly direction through the canton of Valais, and after being swelled in its rapid course by the afflux of several tributaries, it takes a sudden turn to the north near Martigny, and throws its waters into the Lake of Geneva (q. v.). After issuing from the lake, it takes up the turbid stream of the Arve, and forcing its passage through a rocky gorge of the Jura chain, disappears below the rocks near Fort l'Ecluse for a length of 300 feet, forming the subterranean channel known as *La Perte du Rhone*. At St. Génis, the R. enters a less mountainous district, and passing beyond the Jura district, flows through a low valley to Lyon, where it receives the Saône. From Lyon it follows a southern direction past Vienne, Valence, Montélimart, Avignon, and Arles, bifurcating near Beaucaire and Tariscon into two main streams, the Greater and the Lesser Rhone, which enclose the delta known as the Ile de la Camargue, and finally merge their waters with those of the Mediterranean. The most important affluents of the R. are, on the right, the Ain, Saône, Doubs, Ardèche, and Gard; on the left, the Arve, Isère, Drôme, and Durance. From Lyon southward, the R. is easily navigable for good-sized vessels; but the up-navigation, owing to the rapid fall of the stream, and the sudden shifting of sandbanks, is attended with considerable difficulty, and is at times almost impracticable. On account of these and other obstructions, which are greatest near the mouths of the river, the communication with the Mediterranean is chiefly effected by means of canals, which, communicating with several shore-lakes, as l'Etang de Berre and others, open a passage between the sea at Port du Bouc and the river at Arles, and thus obviate the necessity of navigating round the delta.

In its upper and middle course, the R. presents beautiful and varied scenery, enriched with a luxuriant southern vegetation, including grapes of superior quality, from which some of the finest wines of France are obtained; but below Avignon, it passes through a broad, arid tract of country, and is bounded by swampy banks. The great national commercial advantages of the R. have been considerably extended by means of numerous canals, which, by joining it to the Seine, the Loire, and the Rhine, have connected it with the Atlantic and the German Ocean.

RHONE, a small but important inland department of France, bounded on the N., W., and S. by the departments of Saône-et-Loire and Loire; area, 1077 sq. m.; pop. (1881) 733,562. It lies almost wholly in the basin of the Rhone, and its great affluent the Saône; its eastern boundary is formed by these rivers. The surface is almost entirely mountainous or hilly. Of the 689,536 acres, more than one-half is under tillage. The principal productions are vines and mulberry-trees. The wines are famous for their excellent quality. Of the Mâcon wines, grown in the north, in the former district of Beaujolais, the best are the fine red wines of Chenas; of those grown in the south of the department, called the *vins du Rhone*, the finest are the red wines of Côte Rôtie and the white wines of Condrieu. About 75,000 acres are in vineyards, and the amount of wine made annually is about 17,000,000 gallons. Silks (see LYON) are manufactured extensively, and numerous other branches of manufacture are actively carried on. The industries of the department are mentioned under the names of the towns. The department is divided into the two arrondissements of Lyon and Villefranche. Capital, Lyon (q. v.).

RHONE, BOUCHES DU. See BOUCHES-DU-RHONE.

RHU'BARB (*Rheum*), a genus of plants of the natural order *Polygoneæ*, closely allied to *Rumex* (dock and sorrel), from which it differs in having nine stamens, three shield-like stigmas, and a three-winged achenium. The species, which are numerous, are large herbaceous plants, natives of the central regions of Asia, with strong, branching, almost fleshy roots; erect, thick, branching stems, sometimes 6 or 8 feet high; the stems and branches whilst in the bud covered with large membranous sheaths. The leaves are large, stalked, entire or lobed; the flowers are small, whitish or red, generally very numerous, in large loose panicles of many-flowered clusters. The roots are medicinal; but those of different species seem to possess the medicinal properties in very different degrees, or these properties are developed very variously in different soils and climates, or according to other circumstances not at all understood. It is not known what species of R. yields the valued R. of commerce, which comes from inland parts of China or Chinese Tartary. Some of it reaches Europe by way of Canton, but the best is brought through Russia. It is commonly known, however, in Britain as *Turkey R.*, because it was formerly brought by way of Natolia. It is carefully examined at Kiachta by persons appointed by the Russian government, so that the superior quality of all that is permitted to enter the European market is secured. R. is sometimes cultivated for its root in Europe, but the produce, *French R.* and *English R.*, is very inferior to the R. of the East, which it is often employed to adulterate. About 12 acres are devoted to the cultivation of R. for its root near Banbury, in England, the species cultivated being *Rheum rhaponticum;* but in France, besides this species, *R. undulatum* and *R. compactum* are employed. At Banbury, the roots are taken up when three or four years old, and dried in drying-houses by a carefully regulated heat.

The leaf-stalks of R. contain an agreeable mixture of citric and malic acids, and when young and tender, are much used, like apples, for tarts or pies, and also for making a kind of preserve. For these purposes, different kinds of R. are now very extensively cultivated in Britain, and in other temperate and cold countries, although it is only since the beginning of the present century that this valuable addition has been made to the plants of our kitchen-gardens; the species previously introduced having been cultivated merely as objects of curiosity, or for the sake of their roots. A number of species have been introduced into cultivation for their leaf-stalks. *R. palmatum*, the first species known, and which was once believed to yield the Turkey R., has roundish green leaf-stalks and half-palmate leaves, with pinnatifid pointed lobes. Its stalks are very inferior to every other kind in our gardens both in size and quality, and the appearance of the leaf is very different. The other cultivated kinds, *R. undulatum*, *R. rhaponticum*, and *R. hybridum*, with endless varieties produced by the art of the gardener, all have broad, heart-shaped, undivided leaves, and the leaf-stalks flattened and grooved on the upper side. The leaf-stalks are often also of a reddish color, which in some of the finest varieties pervades their whole flesh. R. is propagated by seed, and the plants yield a crop in the second or third year, or by dividing the roots. It prefers a light rich soil; and the ground ought to be heavily manured every year. The plants are placed 3 or 4 feet apart, according to the size of the variety. The varieties which, by excessive manuring, are made to produce the most gigantic stalks, are not nearly so good in quality as the smaller kinds. R. is cultivated on a most extensive scale by market-gardeners. It is forced in winter and early spring by being placed in pots within houses, or by having pots inverted over it, and dung and straw heaped around; and forced R. is more tender and delicate than that which grows in open air.

There are few subjects in the materia medica which are so enveloped in obscurity as rhubarb. Even the period of its introduction into medicine is uncertain, for the description given by Dioscorides of the drug which he designates *Rheon* does not correspond with our rhubarb. It was probably introduced into Europe by the Arabian physicians, somewhat previous to the time of Avicenna, in whose writings the term *Rewund* occurs—a name

still used, with a slight alteration, for R. by the Persians and Hindus. In the British Pharmacopœia, no attempt is made to determine the species of *Rheum* used in medicine, and there can be no doubt that the roots of several species are usually to be found in the drug-market. According to the Pharmacopœia, the root, deprived of its bark, is imported from 'Chinese, Tibet and Tartary.' Little is known of the chemical composition of R. root, further than that it yields a yellow coloring matter termed *Rhein* ($C_{20}H_8O_6$?), which is sparingly soluble in water, but dissolves freely in the alkalies, producing a reddish-brown liquid, from which the rhein may be precipitated in flakes on the addition of acetic acid. R. is very liable to adulteration; and if the adulterated R. be in a state of powder, the detection of the fraud is very difficult.

R. may be briefly described as a cathartic, an astringent, and a tonic. As a cathartic, it chiefly operates by increasing the muscular action of the intestines; and when the cathartic action is over, there is generally more or less constipation, arising, as is usually supposed, from the astringent action then coming into play. The appetite is also improved, and the digestive process rendered more active, by the action of this drug. It must not be forgotten that the coloring matter of R. passes into the serum of the blood and the secretions; and urine rendered red by its absorption has not unfrequently been confounded with bloody urine by practitioners ignorant of the very different chemical reactions of rhein and the coloring matter of blood.

R. is one of the best aperients for general use in infancy, in consequence of the certainty of its action, and of its tonic and astringent properties, which are of much importance in the treatment of many infantile diseases, attended with imperfect digestion and irritation of the intestinal canal. In adults, it is serviceable in chronic diarrhœa and dysentery, when it is expedient to clean out the bowels. It is also a useful aperient in convalescence from exhausting disease, as being free from the risk of overacting; and for the same reason, it is a useful medicine for persons who are constitutionally liable to over-purgation from trivial causes.

The officinal preparations are the *Pulvis Rhei Compositus* (composed of powdered R., magnesia, and ginger, and popularly known as Gregory's Powder or Mixture—the average dose being a teaspoonful), the *Pilula Rhei Composita* (a compound R. pill, composed of R., aloes, myrrh, hard soap, oil of peppermint, and treacle—the dose, as an aperient, being ten or fifteen grains), the *Extractum Rhei* (dose from five to ten grains), the *Infusum Rhei* (dose from two to four fluid ounces), and the *Tinctura Rhei*, which is usually given in doses of about a drachm, in association with other aperients.

RHUMB, or RHOMB (Lat. *rhombus*), a term introduced, according to Vitalis, into navigation by the Portuguese, and signifying at first a meridian, or especially the principal meridian of a map. It then came to signify any vertical circle, whether a meridian or not, and hence any point of the compass. A ship is therefore said to sail on a rhumb when its head is kept constantly directed to the same point of the compass. The rhumb-line thus crosses all meridians at the same angle, and corresponds exactly to what is know as the *Loxodromic Lines* (q. v.). In Mercator's chart the rhumb-line is a straight line (though not so in nature); but it must be carefully noticed that equal portions of it on the chart do not indicate equal distances on the surface of the globe, the divisions which are lowest in latitude always representing the greatest distance, and *vice versâ*.

RHYME. See RHIME.

RHYMER, THOMAS THE. a name given to the earliest poet of Scotland. The history of his life and writings is involved in much obscurity; but it is generally believed that Thomas Rymour of Ercildoune was the person whose poems and prophecies were extensively known among the people of Scotland at an early period. The R. derived his territorial appellation from the village of Ercildoune (now Earlstoun), in the county of Berwick. The time of his birth is unknown; but he appears to have reached the height of his reputation in 1286, when he is said to have predicted the death of Alexander III., king of Scotland. This singular prophecy is recorded in the *Scotichronicon* of Fordun in 1430; also by the historian Boece in 1527. It is to the effect that the Earl of Dunbar, having on one occasion questioned the R. as to what kind of weather was to be on the morrow, was answered that on that day before noon should be the greatest storm of wind that ever was heard in Scotland. Next day, towards noon, the weather being calm, Dunbar expressed a doubt as to the truth of the prediction, when the R, said: 'It is not noon yet;' and immediately thereafter a messenger arriving with the tidings of the king's accidental death at Kinghorn on the previous evening, the prophet stated that that was the storm he had predicted.

From this and other prophecies, the R. became popularly known as 'True Thomas,' and was believed to have derived his skill from his intercourse with the Queen of Fairyland. The legend bears that he was carried off at an early age to Fairyland, and after seven years' residence there, was permitted to revisit the earth, but still remaining bound to return to his royal mistress when she should intimate her pleasure. Accordingly, one day, when a hart and hind were seen composedly and slowly parading the street of the village, the R. instantly rose and followed the animals to the forest, whence he was never seen to return. (Compare the myth of TANNHAUSER.)

The earliest historical document referring to Thomas Rymour of Ercildoune, is a charter of Petrus de Haga of Bemersyde, to which the R.'s name is appended as a witness; its date is about 1260–70. Again, in a charter of 1294, Thomas of Ercildoune, describing himself as 'son and heir of Thomas Rymour of Ercildoune,' conveys his lands in the village of Ercildoune to the Trinity House of Soltra. From this it has been inferred that the R. was now dead; although Blind Harry, in his *Wallace*, speaks of him as still alive in 1296. The R. is also alluded to by Wynton in his *Chronicle*. Boece calls him Thomas Learmont, and in this has been followed by others; but there is no contemporary authority for this surname. Whether Rymour was a family surname, or a personal appellation derived from his poetical reputation, has also been discussed. The fact that his son, in the charter above referred to, applies the name to his father, but does not take it himself, seems to favor the latter view.

The R. is chiefly famous for the prophecies which have been attributed to him, and which were first collected and published in Edinburgh by Waldegrave, in 1603. Sir Walter Scott believed him to be the author of the famous romance of *Sir Tristrem*, because his name occurs along with that of the romance in an ambiguous passage in the poems of Robert of Brunne (1303). But the romance is now believed to have had a French origin, and to be of earlier date than the time of the R. The other poems attributed to him are chiefly descriptive of his interviews with the Fairy Queen, and his adventures in Fairyland. They display poetical power of a very high order. These have been edited by Dr. J. A. H. Murray for the Early English Text Society (1876).

RHYNCHONE'LLA, a genus of brachiopodous mollusca, characterized by its trigonal acutely-beaked shell, the dorsal valve of which is elevated in front, and depressed at the sides, and the ventral valve is flattened or hollowed along the center. The genus is represented by two living species, the one from the icy seas of the north, and the other from New Zealand. The shells of both are black. No less than 250 species of fossil shells have been referred to the genus. They occur in all formations from the Lower Silurian upwards.

RHYNCHO'PHORA. See WEEVIL.

RHYNCHOPS, commonly called SKIMMER, is a genus of web-footed birds of the *Laridæ* (q. v.) family, to which the gulls, &c. belong. The bill is broad at the base, but thence to the tip is laterally compressed. The upper mandible is the shorter. There are three or four species; the best known being the black Skimmer, found on the east coasts of North and South America. In all, the flight is swift and graceful; they rarely swim; and they feed, chiefly by night, on fish and crustaceans.

RHYTHM (Gr. *rhythmos*, any motion, especially a regulated, recurring motion; hence, measured motion, time, number), in its widest sense, may be defined as measured or timed movement, regulated succession. It seems to be a necessity for man, if movements of any kind are to be sustained for a length of time, that some more or less strict law of interchange should regulate the succession of the parts. It is even believed that the ground of this necessity may be discovered in the structure and functions of the human body. See Bain, *The Senses and the Intellect*. More particularly, in order that a number of parts may constitute a whole, or, at all events, a pleasing whole, a certain relation or proportion must be felt to pervade them. When exemplified in the arrangement of matter into visible objects, as in sculpture, architecture, and other plastic arts, rhythm is usually called *symmetry*. Rhythm applied to the movements of the body produces the *dance*. 'The rhythmical arrangement of sounds not articulated produces *music*, while from the like arrangement of articulate sounds, we get the cadences of *prose*, and the measures of *verse*. Verse may be defined as a succession of articulate sounds, regulated by a rhythm so definite that we can readily foresee the results which follow from its application. Rhythm is also met with in prose; but in the latter its range is so wide that we never can anticipate its flow, while the pleasure we derive from verse is founded on this very anticipation.'

The rhythm of verse is marked in various ways. In Sanscrit, Greek, and Latin, during their classic periods, *quantity*, or the regulated succession of long and short syllables, was the distinguishing mark of verse. In the languages descended from these three ancient tongues, as well as in all the other Aryan languages, the rhythm depends upon *accent*. See METRE. The recurrence of similar sounds, or *rhime*, is also used, along with accent, to render certain points of the rhythm more distinct, as well as to embellish it. See RHIME.

RHYTHM, in Music, the disposition of the notes of a musical composition in respect of time and measure. To rhythm, music is chiefly indebted for its order, perspicuity, intelligibility, and consequently its power and effect. The rhythmical value of a musical sound is the ratio which its duration bears to that of other sounds. See NOTE. A musical composition is made up of portions of equal rhythmic value, called *measures*, separated by vertical lines called bars, the length of the measure being indicated by a sign at the beginning of the movement. For the varieties of time and their signatures, see MUSIC. The first note in each measure is distinguished by a greater force or stress than the rest: that stress is called *accent*, and of the four measure-notes in common time the third has also a subordinate accent, as has the third measure-note in triple-time. There is also an irregular or rhetorical accent in music called *emphasis*, which may be laid on any part of the measure, and whose use is regulated by taste and feeling.

RHY'THYMICAL MENTAL DISEASES. Certain affections become aggravated or mitigated at particular hours; certain others appear in paroxysms, to a certain extent of regular duration and recurrence; and a third class is named quotidian, quartan, &c., from the precise and unvarying periods at which their access returns. The element of time, and of regular intervals of time, is chiefly characteristic of morbid conditions of the nervous system. In chorea and involuntary shrieking, singing, &c., a rhythm may often be detected, of which the patient is altogether unconscious. Not merely have movements of the eyelids and of the limbs presented a perfectly timed succession, but cases are recorded where the wild gesticulations and jactations of St. Vitus's Dance have been regulated so as to correspond to popular airs. A person has been known to strike his breast with the hand for hours with the same exactitude as if measured by a time-piece. Those affected with Tarantism are prompted to dance by the sound of music; and their movements are determined, it is affirmed, not by volition, but by the cadences of the tunes played in their hearing. The victims of the dancing mania in the 15th c. were similarly affected. In many forms of insanity, there is seen a tendency to rhiming in words, as well as to rhythmical movements A patient for three consecutive days vociferated incessantly words terminating in *-ation.*—Laycock, *Nervous Diseases of Women*, pp. 185, 314; Sauvage, *Nosologia Methodica*, tomus ii., p. 231; *Medical Critic*, *passim.*

RIAZA'N, a central government of Great Russia, extends S.-E. from the government of Moscow. Area, 16,221 sq. m.; pop. (1879) 1,653,263. The principal river is the Oka, which, after forming the boundary between the governments of Moscow and Tula, and part of the boundary between Moscow and R., flows south-east to the middle of the latter, then turning north, disappears across the border on the north-east. The Oka divides the government into two unequal parts, of which the northern is low in surface and sandy in soil, while the southern presents an elevated surface and a most fertile soil. The Don crosses the south-west part of R., but is not here navigable. The chief products are iron ores, limestone, wheat, oats, rye, millet, buckwheat, and vegetables. There are many remarkably good studs. Though the chief occupations are agriculture and horticulture, there are a number of important industrial establishments, as needle, cloth, and glass factories; cotton-mills, iron-works, tanneries, and soap and tallow works. Manufactured goods and corn are exported.

RIAZAN, a town of Great Russia, capital of the government of the same name, stands on a branch of the Oka, near its junction with that river, 130 miles south-east of Moscow. It was founded in 1208, became in 1487 the residence of the princes of Riazan, and was made chief town of the government of R. in 1778. The chief fragment of antiquity is the interesting old fort called the Kreml. There is a ferry here across the Oka, at which the products of the vicinity are shipped: 5,770,000 bushels of corn are exported annually. Pop. (1880) 19,990.

RIB, in Architecture, a projecting band or moulding on an arched or flat ceiling. It is of universal use in all styles of Gothic architecture; the early Norman examples are simple square bands crossing the vault at right angles, the groins being plain angles. In early English, the groins and ridge are also ribbed, and all the ribs are moulded. The ribs and their mouldings are multiplied as the style advances, till the whole surface becomes covered with them in the Fan-tracery Vaults (q. v.). Plaster ceilings are sometimes elaborately ornamented with patterns formed by ribs, especially in the styles of the times of Elizabeth and James I.

RIBBON, in Heraldry, a diminutive of the ordinary called the Bend, of which it is one-eighth in width.

RIBBON. See SILK and SILKWORM.

RIBBON-FISH, the popular name of a family of acanthopterous fishes, called *Tæniidæ*, or, more properly, *Tænioidæ*, by naturalists (from *tænia*, a tape-worm), on account of their compressed and elongated form. Notwithstanding their peculiarity of form, they are nearly allied to the *Scomberidæ*, or Mackarel family. They are of very delicate structure, with naked and silvery skin, a long dorsal fin often uniting with the tail-fin, a small mouth, and a protractile snout. They are widely distributed from polar to tropical seas, but are nowhere found in abundance, being deep-sea fishes, and mere occasional visitants of the coasts. Owing to the delicacy of their frame, perfect specimens are seldom obtained. Species exist which are nine or ten feet long, not six inches deep, and scarcely an inch thick. See BAND-FISH, DEAL-FISH, and GYMNETRUS.

RI'BBONISM, the name of a system of secret associations among the lower classes in Ireland, the objects of which have long been a subject of much suspicion and of considerable controversy. The first origin of the associations known under this name is involved in much obscurity. From the middle of the last century secret organizations, variously designated, but for the most part connected with agrarian discontent, have from time to time arisen in Ireland. The earliest of these appears to have been that of the Whiteboys, who appeared about the year 1759. Later in the century, the fierce and sanguinary strife to which the relaxation of some of the penal laws under which the Catholics had long suffered gave occasion in the north, and which resulted in the Protestant organization already described under the head ORANGEMAN (q. v.), led to the Catholic counter-organization known by the name of Defenders; but this association seems to have been for the time purely local, being confined to Armagh and the neighboring counties, in which the violences of the Protestant party had originated. The severely repressive measures adopted by the government on the outbreak of the rebellion of 1698, and continued for several years, prevented any notable progress of the Catholic organization; and when at length, about 1806, such an organization was initiated, it was of necessity conducted with the utmost secrecy. The name by which the members of these associations were now known was 'Threshers.' They appeared chiefly in Sligo, Mayo, Leitrim, Longford, and Cavan; and it is worthy of note that one of their professed objects was to resist the payment of tithes, and even of the stipend commonly, although freely, paid to the Catholic priests by members of their congregations.

The associations called (it is supposed from the badge worn by the members) by the name of Ribbon societies first appeared about 1808, and originated in Armagh, whence they spread to Down, Antrim, Tyrone, and Fermanagh. There can be no doubt that their real object was a combined action, partly for self-defence, partly also probably for directly antagonistic action against the now wide-spread and formidable Orange confederacy. Their operations from the first were for the most part limited to the counties, chiefly in the north and north-west, in which the Orange associations were sufficiently numerous to be formidable; nor do they appear at any time to have had a footing in the purely Catholic counties, where there were few or no Orangemen to be encountered. The secret associations of the other districts—the midland, southern, and south-eastern counties—as the 'Carders' in East and West Meath, in Roscommon, and part of Mayo; and the 'Shanavests' and 'Caravats' in Tipperary, Kilkenny, Cork, and Limerick, had little of the religious element in their organization, being mainly due to discontents arising from alleged agrarian and social grievances.

The Ribbon association also, no doubt, addressed itself to the same agrarian and social grievances; but it is plain that its direct and immediate object was antagonism to the Orange confederation, to which, in some respects, it bore considerable resemblance, although it was deficient in that complete and wide-spread organization which so remarkably distinguished the former body. The Ribbon association was divided, like the Orange, into lodges, and the members of each lodge were bound by a secret oath to 'be true to each other,' and 'to assist each other in all things lawful.

Stated meetings of the lodges were held, and small money contributions were exacted, both at entrance into the association, and on each occasion of meeting. The members, moreover, were known to each other by certain secret signs and pass-words, which were frequently changed, and some of the specimens of which were of a singularly absurd and ludicrous character. But there does not appear to have been anything like that complete and curious scheme of a 'Central Grand Lodge,' with its subordinate hierarchy of 'county,' 'district,' and 'private' lodges, which characterized the great rival confederation. A still more striking and important difference was in the class of men with which the Ribbon societies were recruited. They are proved to have consisted exclusively of the very lowest classes, the humbler peasantry, farm-servants, and operatives of the least intelligent class. No trace appears among them of what is so striking in the Orange Association—the co-operation, or even the countenance,

of the gentry, the clergy, the commercial class, hardly even of the farming class, except a few of the sons of farmers of the lowest grade. On the contrary, an attempt which was made, in a committee of the House of Lords in 1839, to connect the Catholic clergy and the Catholics generally with the Ribbon association, proved a signal failure, as did also the attempt to show that the objects of the association were the overthrow of British rule in Ireland; and it was proved that the Catholic clergy, from the first origin of these associations, have persistently opposed them, and employed all their influence, and even their spiritual authority, to deter their flocks from taking any part in them.

From the absence of all statistical information, and from the rude and illiterate material out of which alone these societies are formed, it is impossible to offer any estimate of their number or extent. That they still exist, becomes abundantly clear on every occasion of party-strife which arises in Ireland; but they appear to have been replaced in several parts of the country by newer associations, such as the 'Phenicians,' the 'Brotherhood of St. Patrick,' and the 'Fenians,' an association which is said to possess large affiliations in America, and among the Irish in the manufacturing towns of England and Scotland. See FENIANS.

RIBEAUVILLE (Ger. *Rapportsweiler*), a small manufacturing town of Alsace, pleasantly situated amid vineyards, 34 miles south-south-west of Strasburg. Excellent wines are made, and cotton goods are manufactured. The town is overlooked by the Vosges Mountains, along the crests of which runs a wall or rampart, built of unhewn stones, without cement, and from eight to ten feet high. It is of unknown antiquity, and is called the *Heidenmauer*, or Pagan wall. Pop. (1875) 5785.

RIBERA, JOSE, called SPAGNOLETTO ('the Little Spaniard') was born at Xativa, near Valencia, in 1588, and died at Naples in 1656 or 1659. He studied a few years with Francesco Ribalta, a Spanish painter of eminence, but resolved to visit Italy; and after working hard at Rome, and studying the greatest masterpieces in some other states, he went to Naples, where, attracted by the novelty and boldness of Caravaggio's style, he adopted it, and became the ablest painter among the *naturalisti*, or artists whose treatment of subjects was based on a vigorous and powerful, but generally coarse and vulgar representation of nature, in opposition to that formed on the study of conventional or academic rules. He settled in Naples, where he became court-painter, and executed numerous important commissions in that city; and it is there that his best works are to be seen. Salvator Rosa and Guercino are numbered among his pupils. He executed about eighteen or twenty etchings, all marked by force and freedom.

RIB-GRASS. See PLANTAGINEÆ.

RIBS are elastic arches of bone, which, with the vertebral

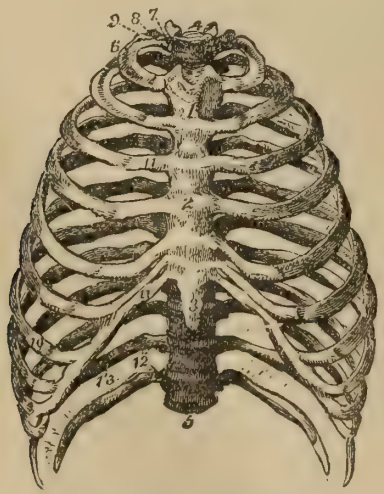


Fig. 1.—The Ribs, *in situ*:

1 and 2 are the upper and middle parts of the sternum or breast-bone; 3, its ensiform cartilage; 4, the first dorsal, and 5 the last (or twelfth) dorsal vertebra; 6, the first rib; 7, its head; 8, its neck, resting against the transverse process of the first dorsal vertebra; 9, its tubercle; 10, the seventh or last true rib; 11, the costal cartilages of the true ribs; 12, the last two false ribs or floating ribs; 13, the grooves along the lower border of the ribs (from Wilson's *Anatomist's Vade-Mecum*).

column behind, and the sternum or breast-bone in front, constitute the osseous part of the walls of the chest. In man, there are 12 ribs on each side. The first 7 are more directly connected through intervening cartilages with the sternum than the remainder, and hence they are termed *vertebro-sternal* or *true* ribs; while the other 5 are known as *false ribs*, and the last two of these, from being quite free at their anterior extremities, are termed *floating ribs*. A glance at a skeleton, or at a plate representing the articulated bones, will show that the ribs vary very

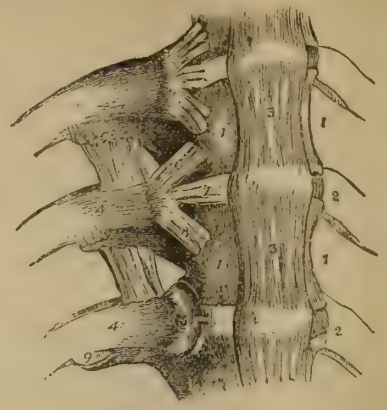


Fig. 2.—A Front View of the Articulations of the Ribs with the Spinal Column:

1, 1, Dorsal vertebræ; 2, 2, intervertebral cartilages; 3, 3, the anterior common ligament, extending like a riband along the whole of the front of the vertebral column; 4, the neck, and 5 the head of rib; 6, 7, 8, three flat bundles of ligamentous fibres, radiating from the head of the rib to the adjacent vertebræ and intervertebral substances (they are removed in the lowest rib, seen in the figure); 9, the articulation between the tubercle of the ribs and the transverse vertebral process (From Gray's *Anatomy*).

considerably both in their direction and size. The upper ribs are nearly horizontal, but the others lie with the anterior extremity lower than the posterior; this obliquity increasing to the 9th rib, and then slightly decreasing. They increase in length from the first to the eighth, and then again diminish. The spaces between the ribs are termed the *intercostal spaces*.

On examining a rib taken from about the middle of the series, we find that it presents two extremities (a posterior or vertebral, and an anterior or sternal), and an intervening portion, termed the body or shaft. The posterior extremity presents a head, a neck, and a tuberosity. The head is marked by two concave articular surfaces divided by a ridge, the lower facette being the larger. These surfaces fit into the cavity formed by the junction of two contiguous dorsal vertebræ, and the ridge serves for the attachment of a ligament. The neck is a flattened portion proceeding from the head; it is about an inch long, and terminates at an eminence termed the tuberosity or tubercule, from whence the shaft commences. On the lower surface of this tubercule is a small oval surface, which articulates (as shown in fig. 2) with a corresponding surface on the upper part of the transverse process of the lower of the two contiguous vertebræ. The shaft presents an external convex, and an internal concave surface. A little in front of the tubercle, the rib is bent inwards, and at the same time upwards, the point where this bending takes place being called the angle. The upper border of the rib is thick and rounded, while the lower border is marked by a deep groove, which lodges the intercostal vessels and nerve.

The ribs of Mammals are mostly connected, as in man, with the bodies of two vertebræ, and with the transverse processes of the posterior one. In the Monotremata, however, they articulate with the vertebral bodies only; while in the Cetacea, the posterior ribs hang down from the transverse processes alone. Their number, on each side, corresponds with that of the dorsal vertebræ. The greatest number, 23, occurs in the two-toed sloth, while in the Cheiroptera, 11 is the ordinary number. In Birds, each rib articulates by means of a small head with the body of a single verterbræ near its anterior border, and with the corresponding transverse process by means of the tubercle. Moreover, each rib possesses a 'diverging appendage,' which projects backwards over the next rib, so as to increase the consolidation of the thoraic framework, necessary for flying. The dorsal vertebræ here never exceed 11, and are commonly 7 or 8 in number, and the ribs proceeding from them are connected with the sternum, not by cartilage, as in Mammals,, but by true osseous sternal ribs, which are regularly articulated at one end with the sternum, and at the other with the termination of the spinal ribs.

In the Chelonian Reptiles, the ribs (as well as the vertebra and the sternum) deviate remarkably from the normal type, the lateral parts of the carapace consisting mainly of anchylosed ribs united by dermal plates. In the Crocodiles, there are only twelve pair of true or dorsal ribs; while in the other Saurians, and in the Ophidians, the ribs are usually very numerous. In the Frogs, there are no true ribs; the reason probably being, that any bony element in their thoracic walls would interfere with the enormous thoracico-abdominal enlargement which these animals periodically undergo at the breeding period.

In the language of the transcendental anatomists, a rib is to be regarded as a *Pleurapophysis*—one of the elements of a typical Vertebra (q. v.).

RIBS, FRACTURE OF THE, is a very common surgical accident, resulting from blows or falls upon the chest. Ribs may, moreover, be broken by mere pressure, as when persons are severely crushed in a crowd; and instances are on record in which, in the case of aged persons, the ribs have been actually fractured in violent coughing.

The treatment consists in the application of a broad flannel roller round the chest, so tightly as to prevent, as far as possible, all movement of the ribs, and to render the respiration abdominal rather than thoracic. The bandage must be prevented from falling by the addition of shoulder-straps; and in order to prevent the shoulder-blade from moving, and thus disturbing the broken ribs, some surgeons confine the arms to the side of the body. If one or both of the extremities of the fractured rib should perforate both the pleuræ, and wound the lung, air escapes in the act of inspiration from the lung into the pleural cavity, and from thence through the wound in the costal pleura into the cellular or areolar tissue of the trunk, giving rise to *emphysema*, in the form of a soft puffy tumor, that crepitates and disappears on pressure.

RICORD, PHILIP, a distinguished French physician, was the son of a wealthy ship-owner, and was born on the 10th of December 1800, at Baltimore, whither his father had gone in 1790, to repair his fortunes, which he had lost under the India Company. He came in 1820 to Paris, where he was attached in succession to the Hôtel-Dieu under Dupuytren, and to the Pité under Lisfranc. He graduated as Doctor in Medicine in 1826; but was unable, from the scantiness of his private means, to begin practice in Paris. His professional career, therefore, commenced at Olivet, near Orleans, and was thence transferred to Croüy-sur-Ourcq, where he rapidly rose to distinction as a practitioner. In 1828, he returned to Paris, where he delivered two annual courses of lectures at the Pitié on surgical operations; and was appointed surgeon-in-chief to the hospital for venereal diseases. This post he held with brilliant success till his retirement in October 1860. It was here that he won his world-wide reputation in the specialty which he had chosen—a reputation which he owed to his combination of accurate physiological and pathological knowledge, with great manual dexterity as a surgeon, and felicitous inventiveness and resource as a physician. He did much to improve the classification of enthetic diseases; and, at the Venereal Hospital delivered annually, from 1834, a course of lectures on Syphilology, for which a special amphitheater was granted to him. For his suggestions on the cure of varicocele and on the operation of urethroplasty, he received in 1842 one of the Montyon prizes.

M. R.'s practice is the most extensive and the most lucrative in Paris, inasmuch that while an inmate of the debtors' prison at Clinchy, he was literally beseiged by crowds of patients. He has been since 1850 Member of the Academy of Medicine (section of Surgical Pathology); Member of the Surgical Society; and consulting-surgeon to the Dispensary of Public Health. In 1862, he was appointed Physician in Ordinary to Prince Napoleon; and in 1869, consulting surgeon to the late emperor; having already on the 12th of August 1860 been raised to the distinction of Commander of the Legion of Honor. His works are numerous, the most important of them being these: *On the Employment of the Speculum Biviale* (1833), invented by himself; *On the Blennorrhagia of the Female* (1834); *On the Employment of Mercurial Ointment in the Treatment of Erysipelas* (1836); *The Monography of Chancre* (in which he gives a detailed exposition of his own system); *Theory of the Nature and Treatment of Epididymitis* (1838); *Treatise on Venereal Maladies* (1838); *On Blennorrhagic Ophthalmia* (1842); *Inconographical Clinic of the Venereal Hospital* (1842—1851); and *On Syphilisation and the Contagion from Secondary Accidents* (1853). He has also contributed to the medical journals a multitude of Memoirs, Observations, Researches and Communications on his specialty. His latest works are those entitled *Letters on Syphilis* (3d ed. 1863), and *Lectures on Chancre* (2d ed. 1860), both remarkable for their fluency and grace of style.

RICARDO, DAVID, a political economist and statesman, was born in London on the 19th of April 1772. He was of Jewish extraction; and his father, who was a respectable member of the Stock Exchange, brought him up to his own business. There was an alienation between them on account of the son marrying out of the Jewish persuasion, and conforming to Christianity. Young R. practised in the Exchange until the year 1818, and whether from his own skill as a broker, or the favor extended to him on account of the position in which he was placed by his conformity, he realized a large fortune, preserving throughout his career in business an honorable reputation. While thus practically occupied, he was ardently working his way back to the first principles of political economy, and especially the finance department of it. In 1810, he produced a notable sensation by his pamphlet entitled *The High Price of Bullion a Proof of the Depreciation of Bank-notes*. The title was a condensation of the principle worked out in the treatise, which gave one of the earliest distinct announcements of the principle of a metallic basis, and the propensity that a paper currency always has to redundance, if it be not in some form or other restrained by the operation of such a basis. This was followed by several pamphlets, each in its turn a success in securing fame and influence. In 1817, appeared his principal work *On the Principles of Political Economy and Taxation*. He had previously in one of his pamphlets touched on the most important feature of this work—the elucidation of the true theory of rent, as not being incidental and casual, like the profits of stock, but a fund that must, under certain conditions of population, come into existence, whoever may draw it (see RENT).

Some critics of R. found that the elements of the theory were given in *The Bee* by Dr. Anderson (see ANDERSON, JAMES). R., however, who probably had not read *The Bee*, reached his conclusions in a different and original form, and from his happy method of elucidation, at once secured a general adhesion to the soundness of the theory, which was strengthened by comparing it with Anderson's remarks. R.'s work is one of the clearest and least tedious of all books on political economy. Like almost all works, however, written before free trade actually showed its power, it narrows the influence of the elements from which the riches of the world can be increased. Like Malthus, he was unable to anticipate the effect of an industrious people having the whole world for their market, and spoke of population outrunning subsistence, and the wages of labor being measured by the price of commodities. In 1818, he entered parliament, and kept his seat till his death. As he had a very clear method of announcing a principle, and being known as a successful man of business, his speeches had perhaps more influence in all matters of trade and money than those of any other member in the present century. He was a zealous student of geology, chemistry, and other sciences. He died on the 11th of September 1823.

RICA'SOLI, BETTINO, Baron, born at Florence 9th March 1809, was descended from a very ancient Lombard family, which established itself in Tuscany in the 13th century. R. studied at Pisa and Florence, and from an early period of his life was imbued with a desire to ameliorate the civil and religious condition of his country. His friends and associates were men like Poerio, Pepe, Coletta, Giordani, Nicolini, &c. But he was averse to revolution, and finding no legitimate opening for himself in political life, quietly subsided into a country gentleman, and set about 'improving' his estates. He was one of the best agriculturists in Italy, and wrote works on the cultivation of the vine, of the olive, and of the mulberry. His wines of Chianti gained for him the cross of the Legion of Honor. In 1847, he appeared as a politician; but he hoped to obtain liberty and good laws from princes, and not from the people, and when Leopold II. fled to Gaeta, he retired from public life. Very soon, however, he joined with other Tuscan gentlemen, and after the defeat of Novara, he overthrew the government of Guerrazzi, and recalled the Grand Duke, trusting to the constitutional promises given by the latter.

Leopold returned, accompanied by the Austrians; and R., indignant at this treachery, sent back his decoration to the prince, and shut himself up in his castle of Brolio—addicting himself more than ever to agricultural pursuits. For ten years he worked successfully at the drainage of the Tuscan Maremme (q. v.). In 1859, when Tuscany wished to take part in the war of Italian independence, R. reappeared. The Grand Duke fled, and R. was made dictator of Tuscany. After Villafranca, he remained alone in the government, beset by the French emissaries, who were advising him to recall Leopold II. R. fiercely refused to do so; he wished the annexation of Piedmont; and to those who spoke of the dangers he was incurring, he answered in those words, which history will never forget: '*Dopo Villafranca ho sputato sulla mia vita*'—literally: 'After Villafranca I have spit upon my life.' His obstinacy saved Italy, and produced the unity of the Peninsula. On the death of Cavour (1861), R. was called to the ministry, and by another abrupt and decided act. he promulgated political and administrative unity. His cabinet, undermined by Rattazzi, did not stand, and he therefore resigned (March 1862). R. returned to power in June 1866, and retired in April the following year, when he was succeeded by Rattazzi. He then retired from public life, for which the state of his health now unfitted him, and died 23d October 1880.

RICCI, MATTEO, a celebrated Italian, founder of the Jesuit missions to China, was born at Macerata, in the Marches of Ancona, October 6, 1552; and after studying law at Rome, entered the Society of Jesus in 1571. Six years later, he accompanied to India Père Valignan, 'Inspector-general of the Eastern Missions.' On account of his fine combination of zeal and tact, he was chosen by his superior to introduce a knowledge of the Christian religion into China, and after preparing himself for the arduous undertaking by a study of the Chinese language at

the Portuguese settlement at Macao, he endeavored to effect an entrance into the empire. But his first efforts were vain, and it was not till 1583 that the Jesuit Fathers obtained permission to settle at Tchao-king-fu. R. quickly saw that it was hopeless to attempt the conversion of the Chinese except by accommodating himself to their intellectual tastes and beliefs, as far as the principles of his religion permitted. Aware of the value which the ruling class—the mandarins—attached to literary skill, he executed and published a Chinese *Map of the World*, and also a little *Catechism*, in which he set forth only such portions of Christianity as embody the general principles of morality. These two productions won R. a high reputation among the Chinese *literati*; the most illustrious mandarins came to visit him; and expressed their esteem for his character and talents. In 1595, he boldly resolved to go to Peking, believing that he could accomplish far more as a religious propagandist in the metropolis than elsewhere. Having obtained permission from his superiors to assume the dress of a Chinese scholar, he set out in the train of a mandarin, who did not allow him, however, to proceed further than Nanking. Expelled thence, he was obliged to return homeward; but at Nan-tchang-fu, the indomitable and adroit priest composed two treatises, entitled the *Art of Memory* and a *Dialogue on Friendship*, in imitation of Cicero, which so pleased the taste of the Chinese, that they ranked them along with their most esteemed books, and the fortunate author was allowed to proceed north. He reached Peking, and although he could not obtain an interview with the sovereign, he was permitted to fix his residence at Nanking, the second city in the empire, where his fame as a scholar increased from day to day.

In 1600, he and his companions were allowed to settle at Peking, and even to build a church. He spent the remainder of his life in teaching mathematics and other sciences, in writing works of a secular as well as a religious kind, and in using his great influence with the king, the court, and the learned classes generally to obtain a favorable attention to the claims of that religion which he represented. R. made several striking conversions, and through his zeal, missionary establishments were set up in the principal cities of China. He died May 11, 1610, and was universally mourned. In the annals of the Chinese empire, he is designated sometimes *Li-ma-teou*, and sometimes *Si-thai*. The most important (for us) of his numerous writings are his Memoirs, published by Père Trigault, under the title of *De Christiana Expeditione apud Sinas suscepta ab Societate Jesu, ex M. Riccii Commentariis Libri V.* (Augsb. 1615; Lyon, 1616), which contains a vast number of valuable observations on the geography and history of China. The family of R. possess 66 interesting letters of the great missionary.

RICCIO, or RIZZIO, DAVID, an Italian of considerable ability and accomplishments, who, in the reign of Mary Stewart, Queen of Scots, came to Edinburgh in the train of the ambassador from Savoy. His first employment at court was as a musician; but his skill and fidelity led Mary to advance him to the post of her French secretary, about the time of her marriage with Darnley; and in this situation he was believed to possess considerable influence over the queen. His advancement was distasteful to the nobles in general, but more especially to the party of the Reformers, who suspected him of intriguing with the papal court. He became obnoxious on other grounds to Darnley and his father, the Earl of Lennox. The former, who had for a time been on the most friendly footing with him, was easily led to believe not merely that he was the real obstacle to his favorite design of having the crown settled on him and his heirs, but also that he had supplanted him in the affections of the queen.

In this belief, he entered into a compact with the leaders of the Protestant party—including Murray, Ruthven, Morton—to assassinate R., and slay even in the queen's palace and presence whoever opposed them. Darnley formally bound himself to prevent the attainder of the conspirators, and procure their pardon, and to support and advance the Protestant faith, while the conspirators in return obliged themselves to procure the wished-for settlement of the crown in his favor. Accordingly, on the 9th March 1566, when Mary, then seven months with child, was sitting at supper in a small cabinet adjoining her bedroom, at Holyrood, attended by the Countess of Argyle, the Commendator of Holyrood, Beaton Master of the Household, Arthur Erskine, Captain of the Guard, and R., the king led the conspirators up a secret stair, while the Earl of Morton, with a troop of soldiers, seized the gates of the palace. Led by the king, the conspirators burst into the cabinet, overturned the table and threw themselves on R., who sprang for protection behind the queen. Ruthven drew his dagger; Ker of Fawdonside, it is said, held a pistol to the queen's breast; while George Douglas, natural son to the Earl of Angus, snatching the king's dagger, stabbed R. over the queen's shoulder, and dragging him from the cabinet, despatched him in a pool of blood, in the adjoining apartment, with fifty-six wounds. This murder was the first of a series of tragic events in which Mary Queen of Scots was involved. John Knox, in his *History of the Reformation*, characterizes it as 'a just act, and most worthy of all praise.'

RICE (*Oryza*), a genus of grasses, having panicles of one-flowered spikelets, with two very small pointed glumes; the florets compressed, the paleæ strongly nerved, awned or awnless, six stamens, one germen, and two feathery stigmas. The only important species is the COMMON R. (*O. sativa*), one of the most useful and extensively cultivated of all grains, supplying the principal food of nearly one-third of the human race. It seems to



Rice (*Oryza sativa*).

be originally a native of the East Indies, but is now cultivated in all quarters of the globe, and almost wherever the conditions of warmth and moisture are suitable. It is adapted to tropical and sub-tropical climates, rather to the latter than the former; and requires much moisture, rather, however, in the soil than in the air. R. is an annual, varying from one foot to six feet in height. There are many other distinguishing characters of the varieties in cultivation; some having long awns, and some being awnless; some having the chaff (*paleæ*), when ripe, yellow, white, red, black, &c. The seed or grain of R. grows on little separate stalks springing from the main stalk; and the whole appearance of the plant, when the grain is ripe, may be said to be intermediate between that of barley and of oats. R. requires a moist soil, sometimes flooded; and the cultivation of it has in many places been attended with an increase of intermittent fevers, and of general unhealthiness, the rice-fields being artificially flooded at certain seasons. The cultivation of R. is most extensively carried on in India, China, Cochin-China, and other S.E. parts of Asia, Japan, Egypt, S. Carolina, Georgia, and other S. states of N. America. The quantity exported from India, whence we obtain our chief supplies, was, in 1871, estimated at 16,336,335 qrs. valued at £4,468,000. The total import into this country in 1880 was 7,889,710 cwts., value £3,755,199.

In some parts of the East, canals are carried along the sides of hills, in order to the irrigation of land for the cultivation of rice. In Carolina, R. is sown in rows, in the bottom of trenches, which are about 18 inches apart; the trenches are filled with water to the depth of several inches, till the seeds germinate; the water is then drawn off, and afterwards the fields are again flooded for rather more than a fortnight, to kill weeds. They are flooded again, when the grain is near ripening.—In Europe, the cultivation of R. is confined to the most southern regions. It is most extensively carried on in the plains of Lombardy, and in Valencia in Spain. Attempts have been made to cultivate it in more northern parts of Europe, but without success. Marshy situations, where there is always the same abundance of water, are not so suitable to R. as those in which the supply of water is regulated according to the season and growth of the plant.

Like most cultivated plants, it is very liable to variation, and in India and Ceylon, at least 120 known varieties are cultivated. The best of all R. known in the market is that of Carolina, yet the introduction of R. into that country took place only about the last years of the 17th or the first of the 18th century. Its cultivation there, however, rapidly extended.

R. is known in India as *Paddy*. Another use of this name is to designate R. in the husk.

In China, R. is generally sown pretty thickly on very wet land, and afterwards transplanted to the land which it is finally to occupy. The plants *tiller* or spread at the root very much, so that

each sends up several or many stalks. The rice-grounds are carefully kept clear of weeds, although often so wet that a man cannot walk in them without sinking to the knees. In many parts of China, and in other warm countries, it is common to obtain two crops of R. in a year.

R. is shelled and quickly dried before being brought to market. Good Indian R. has the following composition:

	Per cent.
Moisture	13·00
Nitrogenous Matter	7·44
Starch	77·63
Fatty or oily matter	0·70
Ash	1·23
	100·00

R. contains, therefore, according to the prevalent views of modern chemists, a smaller amount of *flesh-forming* substances, and a larger amount of *fat-forming* or *heat-giving* substances than any other grain. As a food, it is particularly well adapted for hot climates, as it appears to be almost a cure for dysentery and other bowel complaints, independently of which it is a sufficiently nutritious food without being heated. Owing to the small quantity of gluten which it contains, it is capable by itself only of an imperfect fermentation, and is unfit for being baked into bread. It is, however, subjected to fermentation in many countries. The beer made from R. by the Japanese is called *Saki*, and is in general use among them; but before being drunk, it is heated in kettles. Several kinds of *Rice wine* are made by the Chinese, some of them highly esteemed, and very intoxicating. A spirit is distilled from the lees, called *Shou-choo* or *Sam-choo*. The common Arrack (q. v.) of the East is made from rice, and rice is also employed to a very great extent by distillers in Britain.

Rice Starch is made in considerable quantity in Britain. It is sold under the name of *Patent Starch*, and is used in laundries and muslin manufactories.—The straw of R. is used to make straw-plait for bonnets.

The refuse of R., which remains when it is cleaned for the market, and consists of the husk, broken grains, and dust, is valuable as food for cattle. It is known as *Rice-meal* and *Rice-dust*.

CANADA R. (*Zizania aquatica*), the WILD R. of North America, is a species of grass quite different from the true R., and of a different genus. It is common in North America, and particularly abundant in the north-western parts of it; growing in miry places and shallow water, often in the margins of lakes. It has a culm 7—8 feet high, with broad diffuse leaves, and a large terminal panicle of male flowers, with a spike of female flowers at the summit. The flowers have six stamens. The seeds are about half an inch long, slender, farinaceous, affording very good meal, and much used by the Indians where the plant abounds. Attempts to introduce this plant into Britain have hitherto proved unsuccessful; but there are many northern regions apparently more suitable to it, and it has not received all the attention it deserves.

RICE-PAPER. See PAPER.

RICHARD I., king of England, surnamed CŒUR DE LION, was the third son of Henry II. by his queen Eleanor. He was born at Oxford in September 1157. In the treaty of Montmirail, entered into 6th January 1169, between Henry and Louis VII. of France, it was stipulated that the duchy of Aquitaine should be made over to R., and that he should do homage for it to the king of France; also, that he should marry Adelais, youngest daughter of Louis. In 1173, R. joined his mother and his brothers Henry and Geoffrey in their rebellion against the king. The rebels submitted in September 1174, when two castles in Poitou were allotted to Richard. In 1183, a second family feud broke out in consequence of R. refusing to do homage to his elder brother Henry for the duchy of Aquitaine. In this war, his father sided with R. against Henry and Geoffrey. It was ended by the death of Prince Henry, when R., actuated probably by jealousy of his youngest brother John, declared himself the liegeman of France for his possessions in that country. This step led to a war between the king of England and Philip of France, in which R. fought against his father. The balance of success being decidedly with France, a treaty in accordance with this fact was about to be executed, when, by the death of Henry II., on 6th July 1189, R. became king of England. He landed in his own country on 15th August 1189, and was crowned in Westminster Abbey on the 3d September following. In the hope of gaining salvation, and with the certainty of following the occupation which he loved best, he now set out with an army to join the third crusade, then about to leave Europe. He united his forces to those of France on the plains of Vezelai, and the two armies (numbering in all 100,000 men), marched together as far as Lyon, where they separated and proceeded by different routes to Messina, where they again met. Here R. bethrothed his nephew Arthur to the infant daughter of Tancred, king of Sicily, with whom he formed a close alliance. The Sicilian throne was at that time claimed by the Emperor Henry VI.; and the alliance with Tancred, from this cause, afterwards turned out a very unlucky one for Richard.

Having settled a difference which now arose between him and Philip respecting his old engagement to Philip's sister Adelais, the English king, on 7th April 1191, sailed from Messina for Cyprus, carrying along with him Berengaria, daughter of Sancho VI., king of Navarre. He had fallen in love with this princess, and he married her in the island of Cyprus, where he halted on his way to Palestine. But even love did not make him forget his favorite pastime of war: he attacked and dethroned Isaac of Cyprus, alleging that he had ill used the crews of some English ships which had been thrown on his coasts. Having then presented the island to Guy of Lusignan, he set sail on 4th June 1191, and on the 10th of the same month he reached the camp of the crusaders, then assembled before the fortress of Acre. The prodigies of personal valor which he performed in the Holy Land have made the name of Richard the Lion-hearted more famous in romance than it is in history. The man was the creation and impersonation of his age, and the reader who follows his career may perhaps be more interested than he would be by the lives of greater men, or by the history of a more important period. On 9th October 1192, he set out on his return to England. After some wanderings and adventures, he became the captive of the Emperor Henry VI., who shut him up in a castle in the Tyrol. John, meanwhile, ruled in England, and he and Philip of France had good reasons for wishing that R. should never return to his kingdom. He disappointed them; not, however, until he had paid a heavy ransom, and even, it is said, agreed to hold his kingdom as a fief of the empire. On 13th March 1194, he found himself once more in England. His brother John, who had acted so treacherously towards him, he magnanimously forgave, but with Philip of France he could not deny himself the pleasure of a war. In the contest which followed he was generally victorious, but in the end it proved fatal to himself. He was killed by an arrow shot from the castle of Chaluz, which he was besieging, on 26th March 1199. If R. had the vices of an unscrupulous man, he had at least the virtues of a brave soldier.—See *Chronicles and Memorials of Richard I.*, by W. Stubbs, from MS. in Lib. of Corpus Christi Col., 1864.

RICHARD PLANTAGENET, second son of John, king of England, was born on 5th January 1208. In 1226, he was created Earl of Cornwall by his brother Henry III. In 1232, he put himself at the head of the party opposed to Hubert de Burgh, whose influence was at that time supreme in the councils of the king. Immense wealth, a calm, practical temperament, and a shrewd eye for his own worldly interest, were the elements which combined to make R. P. a considerable power in the state. His influence prevailed, and De Burgh was driven from his position with loss both of honors and estate. In 1256, R. P. was elected titular king of the Romans; and though his election was disputed, he was crowned at Aix-la-Chapelle. Subsequently, he exercised some of the nominal rights which belonged to his sovereignty. In the great struggle which took place between Henry III. and his nobles, R. P. at first acted the part of a mediator; subsequently, however, he took a decided part with his brother against the party which was headed by Simon de Montfort; and on 14th May 1264, he was taken prisoner by that leader at the battle of Lewes. De Montfort shut him up in Kenilworth Castle, from which he was released at the end of a year. The rest of his life does not seem to have been marked by any event of historical importance. He was thrice married: in 1230, to Isabel, daughter of the Earl of Pembroke; in 1243, to Sanchia of Provence, sister of Queen Eleanor; and in 1267, to Beatrice, daughter of Theodoric de Falkmonte. He died on the 2d of April 1272. His character seems to have been unmarked either by great virtues or great vices.

RICHARD II., king of England, the second son of Edward the Black Prince and Joanna of Kent, was born at Bordeaux on 3d April 1366. He succeeded to the throne on the death of his grandfather, Edward III., 28th June 1377. He being a minor, the government was vested in a council of twelve, from which were excluded the king's three uncles, John of Gaunt, Duke of Lancaster; the Earl of Cambridge, afterwards Duke of York; and the Earl of Buckingham, afterwards Duke of Gloucester. This arrangement is, however, supposed to have been collusive, and intended to lull the popular suspicion of Lancaster, under whose control the council really was. The reign of R. is interesting to the student of English constitutional history. We find the recently-established House of Commons eagerly pressing forward to procure a share of political power, by means of the efficient engine of which it had then acquired the sole control—the right of taxation. Again, we find the laboring classes now beginning to aspire to be freed from the state of bondage in which they had hitherto been kept. The famous capitation tax, im-

posed in 1380, gave rise in the following year to the rebellion of Wat Tyler (q. v.). In June 1382, R. was married to Anne of Bohemia, daughter of the Emperor Charles IV. The next two years were occupied with a war with France, transferred in 1385 to Scotland, where for a while the king conducted it in person. In the absence of John of Gaunt in Spain, the Duke of Gloucester had put himself at the head of affairs; and an attempt which R. made at this time to free himself from control having been defeated, several of his counsellors were put to death, which step, on the part of the victorious party, was approved of by parliament, by whom further executions were ordered among the king's adherents; and the sentences were carried into effect. In 1389, however, R., by a sudden movement, succeeded in throwing off the yoke. Gloucester was obliged to retire; but from indolence and want of capacity, the king soon allowed the reins of government to slip from his own hands into those of the Duke of York, and Lancaster's son, Henry of Bolingbroke.

In 1394, the Queen died, and soon after a marriage treaty was concluded between R. and Isabella, infant daughter of Charles VI. of France. Gloucester reprobating this marriage, which seems to have been unpopular, R. caused him to be privately arrested and conveyed to Calais, where he died, or was murdered, as has been conjectured. On the meeting of parliament, the king had his own way; the Earl of Warwick was banished, and the Earl of Arundel beheaded. Having triumphed over his foes, R. now began to quarrel with his friends. A misunderstanding having taken place between Bolingbroke and Mowbray, Duke of Norfolk, the king, desirous to be rid of both, sent the former into banishment for ten years, and the latter for life. But Bolingbroke had been assiduously cultivating the popularity which his cousin had been as assiduously throwing away; and the result became apparent in 1399. On his return, in that year, from a military expedition in Ireland, R. found that Bolingbroke had, in his absence, landed in England; that he had soon found himself at the head of a formidable army, and that the Duke of York, had yielded and gone over to his side. The army which the king had had with him in Ireland, also, no sooner landed than it almost entirely passed over to the invader. R. found himself without force or friend, while Bolingbroke, now styling himself Duke of Lancaster, was at the head of 80,000 men. Meeting the conqueror at Flint Castle, R. was carried captive in his train to London. On 29th September 1399, he formally resigned his crown. On the following day, the resignation was ratified by parliament, and the crown conferred on Lancaster. By order of the peers, R. was confined secretly in a castle, but where is not known. In the February following his resignation, the nation was told that he was dead, and his body, or what was supposed to be it, was brought with much pomp from Pontefract Castle, and shown to the people. There were rumors at the time of his having been murdered and long afterwards of his being alive and in Scotland. But nothing really authentic is known regarding the end of Richard II.

RICHARD III., king of England, was the youngest son of Richard Duke of York, and the great-grandson of Edmund Duke of York, the fifth son of Edward III. R. was born at Fotheringay Castle on 2d October 1452. On the defeat and death of their father in 1460, he and his brother George, afterwards Duke of Clarence, were sent by their mother to Utrecht, where they remained for a short while under the protection of the Duke of Burgundy, until the crown was won by their eldest brother, Edward IV. In 1470, R. along with Edward remained in Flanders, whither they had fled on the success achieved for Margaret of Anjou by the Earl of Warwick. In 1471, he led the van of his brother's army at Barnet; he also rendered efficient assistance at the crowning victory of Tewkesbury. It is said that he and Clarence murdered Prince Edward, son of Henry VI.. after the battle. It has also been popularly believed that he murdered Henry himself in the Tower. Now Duke of Gloucester, in 1472 he married Lady Anne Neville, daughter of Warwick and widow of Prince Edward. He has been generally accused of complicity in the judicial murder of his brother Clarence in 1478, and Shakspeare has placed the charge almost beyond the power of historical criticism to efface. The evidence, however, seems to be almost null. In 1483, on returning from an expedition into Scotland, he heard of the death of his brother the king. He met the Duke of Buckingham at Northampton, where it is believed that those measures were concerted which resulted in the execution of Hastings and others, the confinement in the Tower of the infant children of the late king, and the placing of the English crown on the head of Richard III. His reign dates from 26th June 1483. He was crowned at Westminster on the following 6th of July. For some time he seems to have been really popular. He was well received on a tour which he made in the northern counties.

On reaching York, however, on his return, he heard of a formidable insurrection which had broken out in the south in favor of his nephew, Edward V. But the bold and remorseless nature of R. was on this occasion triumphant. It was soon known over the land that the royal children were dead. Little doubt has ever been held that they were murdered, or that the deed was done at the instigation of their uncle. The insurrection was quelled, and Buckingham, who had been at the head of it, found guilty of treason and executed. The parliament, which met on 23d January 1484, declared the issue of the late king to be bastard, and the property of the late rebels confiscated. R. now offered to marry the Princess Elizabeth, daughter of Edward IV., to his eldest son, Edward, on whose premature death he offered to marry the princess himself, his own queen being still alive. On the death of Anne, however, supposed to have been murdered by poison, on 16th March 1485, R.'s counsellors dissuaded him from marrying Elizabeth, on the ground of the popular indignation which the step was sure to excite. Meanwhile the crimes which his ambition had already led him to commit, had excited the deepest disgust both among nobility and people. One by one his adherents were dropping off, and crossing to France to join the Earl of Richmond. At last the storm burst. On the 7th August 1485, Richmond landed at Milford Haven. On the 21st of the same month was fought the decisive battle of Bosworth. It deprived Richard both of his crown and life, and decided the long war of the Red Rose and the White in favor of the House of Lancaster. R. was doubtless a man of great energy and ability, but in his aims, selfish and unprincipled. It must, however, be kept in view that his age was one in which human life was held of little value, and deception regarded almost as an accomplishment. See Life by J. H. Jesse (London, 1862.)

RICHARD OF CIRENCESTER—in Latin, *Ricardus Corinensis*—a well-known early English chronicler, was born at Cirencester in Gloucestershire, in the first half of the 14th c., but nothing whatever is known of his family or circumstances. In 1350, he entered the Benedictine monastery of St. Peter, Westminster—whence he is sometimes called the 'Monk of Westminster'—and remained there for the rest of his life. His leisure was devoted to the study of British and Anglo-Saxon history and antiquities. In the prosecution of his investigations, R. is said to have visited numerous libraries and ecclesiastical establishments in England, and we know for certain that in 1391 he obtained a license from his abbot to visit Rome. He died in 1401 or 1402. R.'s principal works are *Historia ab Hengista ad Ann.* 1348, in two parts, of which the first (preserved in the public library of Cambridge) treats of the affairs of England from the Saxon invasion to the death of Harold; two theological productions (in the Peterborough library), a *Liber de Officiis Ecclesiasticis*, and a *Tractatus super Symbolum Majus et Minus;* and above all his *De Situ Britanniæ*, a treatise on the ancient state of Great Britain. This work—of which, however, it must be admitted that the authenticity is doubtful—was, curious to say, first brought to light by Dr. Charles Julius Bertram, professor of English at Copenhagen in 1747, who professed to have discovered it in the Royal Library there, and who sent a transcript of it, together with a 'fac-simile' of the original, to the celebrated English antiquary, Dr. Stukeley. This gentleman published an analysis of it in 1757, and in the same year Professor Bertram published the whole treatise, along with the 'remains' of Gildas and Nennius, under the title *Britannicarum Gentium Historiæ Antiquæ. Scriptores tres, Ricardus Corinensis, Gildas Badonicus, Nennius Banchorensis.* A new edition with an English translation and a 'fac-simile,' and a biography of the supposed author, appeared at London in 1849, and a reprint forms one of the 'Six Old English Chronicles' in Bohn's 'Antiquarian Library' (1848). If we could feel quite sure that the work was genuine, it would be of the highest importance for the study of British and Roman-British antiquities, but unfortunately Bertram's 'original' (like the 'original' of Macpherson's *Ossian*, and Joe Smith's *Book of Mormon*) is not to be found, nor does it appear that anybody ever saw it but himself, so that Gibbon's praise, 'that he [Richard] shows a genuine knowledge of antiquity very extraordinary for a monk of the 1t4h century,' must be regarded with suspicion.

RICHARDSON, SAMUEL, the first great English novelist, was born in Derby in the year 1689. His father, though originally connected with a higher grade of society, was a joiner. It was his ambition to educate his son for the church; but for this means were found deficient, and at the age of 17, with simply such an education as a country school could then furnish, the young man fared forth to London, where he became apprentice to one John Wilde, a printer. In the discharge of his business duties he was exact and careful, and on the expiration of his apprenticeship he became foreman of Mr. Wilde's establishment. Some years afterwards, he started as printer on his own account in Salisbury Court, Fleet Street; and on finding his success assured, he wedded Miss Allington Wilde, the daughter of his late employer. After her death in 1731, he was again married to a Miss Leake. By each lady he was blessed with six children, of whom only four daughters along with their mother survived him. Throughout

life, in his business relations, he was prosperous; very early he had influence to secure the lucrative post of Printer of the Journals of the House of Commons; in 1754, he became Master of the Stationers' Company; and in 1760, he purchased the moiety of the patent of King's Printer; but died on 4th July of the year following.

Richardson's genius flowered late. Till he had turned 50, his relations with literature, except in the way of printing it, were of the most slight and amateur kind; but in 1740 he surprised the world with his *Pamela*, which had instant and great success. Its continuation, to which the author was stung by the attempt of some hungry scribe to make a meal or two by the issue of a pretended sequel, entitled *Pamela in High Life*, was, however, pronounced much inferior. Memorable in itself, the work is now to most readers more so, as having suggested to Fielding his *Joseph Andrews*, originally conceived as a parody of Richardson's somewhat prudish moralities. The exquisiteness of the satire was not appreciated by Richardson; and he never forgave Fielding for it, or could speak of him after with common temper or patience.

In 1748, he issued the first four volumes of *The History of Clarissa Harlowe*—by common consent his masterpiece—a work which in its progress to completion excited the most intense interest. His third and last great work, *The History of Sir Charles Grandison*, was published in 1753. As a whole, this is less interesting than its predecessors; and in his representation of the life of the fashionable classes, of which he had no clear personal knowledge, the writer succeeds but indifferently.

R.'s method of minute elaboration has in itself some tendency towards an effect of tedium; moreover, the epistolary vehicle which he has chosen, though with certain advantages of its own, does not subserve rapidity of movement; and as his stories run to immense length, their perusal involves some effort of patience. But in the depth and simplicity of his sentiment, his profound knowledge of the heart, and mastery of elemental emotion, there are singular sources of attraction; and in virtue of the overwhelming effects of pathos in which the interest of his *Clarissa* culminates, a place must always be assigned him among the very few potent masters of genuine tragic passion. His specialty lies in subtle analysis of the intricacies of female mind and emotion; and in this particular field he has scarcely perhaps been surpassed. A curious sort of passionless confidential intimacy with women, it seems from his earliest years to have been his instinct to cultivate; throughout life he was the center of a circle of female friends and admirers, who came to him with their little delicate secrets, as to a kind of lay father-confessor; and of the fruits of his nice observation of them he has given us to the full in his novels. The success of these is said to have bred in him a somewhat inordinate vanity, the only little flaw in a character unusually blameless and amiable. Of works of less importance he published, besides occasional contributions to periodicals, *The Negotiations of Sir Thomas Roe in his Embassy to the Ottoman Porte from* 1621 *to* 1628 (1740, fol.); *An Edition of Æsop's Fables, with Reflections; Familiar Letters to and from several Persons on Business and other Subjects;* and in 1804 there appeared his *Correspondence Selected and Published, with a Biography by Anna Letitia Barbauld.*

RICHARDSON, Sir John, K.C.B., M.D., LL.D., &c., a celebrated traveler and naturalist, was born November 5, 1787, at Dumfries, of which town his father, Gabriel Richardson, Esq., was several years provost. In his 14th year, he left the Academy of Dumfries to study at the University of Edinburgh, with a view to the medical profession. After obtaining his diploma, R. entered the royal navy, and in 1807 was appointed assistant-surgeon to the *Nymphe* frigate, in which he was present at the battle of Copenhagen. Sometime later, the *Nymphe* was engaged in the blockade of the Tagus, when, after twice volunteering to go in the boats on cutting-out expeditions, R. was transferred to the flag-ship. After the convention of Cintra the ships left the Tagus, and R. was nominated to the *Blossom* sloop of war, in which he served on the coast of Africa, Lord Exmouth removing him to the *Bombay*, 74, in 1810. His next services were in the *Cruiser*, on the Baltic and North Sea stations; afterwards surgeon of the 1st battalion of Royal Marines, stationed in Canada, and later doing service in Georgia, R. having charge of the hospital ship for the sick and wounded of the brigade. His next appointment, 1819, was that of surgeon and naturalist to the overland expedition under Franklin. In 1822, R. returned to England, and early in 1824 became surgeon to the Royal Marines at Chatham. In 1825—1827, he accompanied Franklin in his overland expedition to the mouth of the Mackenzie, and by orders of the Admiralty was detached to survey the coast between that river and the Coppermine, executing the task with singular success and ability. On returning from this expedition, R. resumed his duties at Chatham, remaining there till his promotion, 1838, to be physician of Haslar Hospital, and inspector of naval hospitals and fleets. In 1846, R. received the honor of knighthood; and two years later, moved by genuine friendship and unsurpassed self-devotion, set out to search for and if possible save his former traveling companion, Sir John Franklin, of whom nothing had been heard for upwards of two years.

On March 25, 1848, R., accompanied by Mr. Rae, departed from Liverpool to look for the missing expedition between the Mackenzie and Coppermine Rivers. Landing at New York, R. hastened by way of Montreal and the Canadian lakes to the head-waters of the Mackenzie, which he descended, and then turned eastward by Capes Bathurst and Parry. Contrary to former experience, the sea towards Cape Krusenstern was found closely packed with dangerous drift-ice. After immense labor the party reached Cape Hearne, where it was found necessary to abandon the boats, and after 12 days' fatiguing march, through half-frozen swamps and over hills covered with snow, succeeded in gaining Fort Confidence, at the north point of Great Bear Lake. Here R. spent the winter in scientific observations, returning to England in 1849, and resuming his duties at Haslar. In 1855, R. tendered his resignation, after 48 years of almost unexampled activity in the public service. Moved in all his actions by a high sense of honor and sincere piety, possessed of the most unselfish nature, and a mind so acute as almost intuitively to form correct judgments, united with the humble and loving disposition of a child, R., during his long career, was one of the most lovable as well as useful men of the present century. Up till his death, 5th June 1865, he possessed much of the elasticity of youth; and whenever a scientific society assembled, he was found leaving for a time his quiet home by the Lake of Grasmere to take part in the deliberations.

R. was a fellow of the Royal Societies of London and Edinburgh, of the Royal Geographical Society, member of the Geographical Society of Paris, and of many other literary and scientific bodies in Great Britain, the continent of Europe, and America. He contributed largely to the account of Franklin's first expedition (Lond. 1823); and to that of the second expedition (Lond. 1828). In 1836, appeared *Fauna Boreali-Americana, the Fish; A Boat Voyage through Rupert's Land and the Arctic Sea* (Lond. 1851); *The Polar Regions* (1861). Besides zoological appendices to the voyages of Parry, Ross, Back, &c., his contributions to the Journals and Transactions of various societies have been very numerous. A recent work is the *Museum of Natural History*, in conjunction with several other distinguished naturalists.

RICHELIEU, Armand Jean du Plessis, Cardinal, Duc de, was born of a noble but impoverished family at Paris, September 5, 1585, and was educated for the military profession at the College de Navarre. On the retirement to a religious life, however, of his elder brother, who held the bishopric of Luçon, R., with a view to succeeding to this preferment, betook himself to ecclesiastical studies, and underwent the preliminary examination for his degree at the Sorbonne. In 1607, he was consecrated Bishop of Luçon at Rome by Cardinal de Givry, in presence of Pope Paul V., and for some time devoted himself zealously to the discharge of his duties in his diocese. At the States-General in 1614, being appointed one of the representatives of the clergy, he attracted the notice of the queen-mother by an address which he delivered in the presence of the young king, Louis XIII.; and by his appointment in 1616 as secretary at war and foreign affairs, the way seemed opened to his success in political life; but in one of the vicissitudes of state intrigue common at that period, he soon found it necessary to withdraw from court, and return to his diocese.

Meanwhile a rupture occurred between the queen-mother and the king, and R., through the agency of a very remarkable man—the celebrated Capuchin Father Joseph—whose fortunes thenceforward were inseparably united with those of R., succeeded in effecting their reconcilation (August 1620) and the restoration of the queen to her position at court. The foundation of R.'s influence in consequence was solidly laid; but he appears to have acted with much tact and patient forbearance. He formed an alliance with the powerful favorite, the Duc de Luynes, and in 1622 was named cardinal, and two years later, 1624, he was made minister of state—a position which, although frequently menaced, and constantly beset by every variety of court intrigue, he retained to the end of his life. His first important measure was the conclusion of the alliance with England, by the marriage of Henrietta, sister of the king, with Charles, then Prince of Wales, in 1624. His successful conduct of the war of the Valteline, an affair of much delicacy for a cardinal, as presenting the pope himself as the antagonist of France, tended still more to strengthen his power. His enemies, however, were constantly on the watch for opportunities of undermining his influence, and even of bringing about his death. The queen withdrew her favor, and the king, while he trusted him implicitly, never ceased to fear him. The crisis of the struggle took place December 11, 1630, when R. himself believed that his fate was inevitable. His disgrace, indeed, had been decided; the king, fearing

to meet him face to face, had refused him an audience. His attempts to force an entrance to the king at the Luxembourg were defeated; but Louis, in his weak fear of R., having withdrawn to Versailles, the cardinal there succeeded in obtaining an audience, and having once effectually overborne the weakness and alarmed the fear of the sovereign, his supremacy remained from that day firmly and irrevocably established. This famous day is known as *Le Journée des Dupes*.

The administration of R. forms an epoch in the history of the constitution of the kingdom of France, as well as of her relations with other countries. It is memorable for several great measures, or series of measures, through which the posture of affairs underwent a complete and permanent change. Of these, the first and the most lasting in its results was that by which the absolute authority of the sovereign was established. From the medieval period, the power of the French kings had been controlled, and in many cases overridden by the feudal privileges of the nobles; and in the stormy conflicts of the 16th and of the beginning of the 17th centuries, the power of the crown had often been reduced to a cipher. By a succession of vigorous and energetic, and it must be added not unfrequently unscrupulous measures, R. succeeded in breaking down the political power, and subduing the arrogant assumptions of the great families; the heads of several among which were brought to the scaffold, while not a few were condemned to life-long imprisonment. Among his most inveterate and most powerful adversaries was Gaston, Duke of Orleans, brother of the king; but R. triumphed over him, and even the queen-mother, Maria de Medicis, was obliged to bow before the unbending spirit of R., and to withdraw into exile at Cologne; and R,, at the close of his career, delivered up the royal authority, which he had wielded for 18 years, almost without a single constitutional check upon its absolute exercise.

Another of the great enterprises of this minister was the overthrow of the Huguenot party as a political power, and a rival of the throne in France. The siege and capture of Rochelle, which he conducted in person (1628), was followed by the submission of the other Huguenot strongholds. R., however, secured for the Huguenot body a certain measure of religious toleration; and, on the whole, is confessed to have used his success in this conflict with moderation.

In the external relations of France, the great object of all his measures was the overthrow of the preponderance of Austria. With this view he did not hesitate to foment the internal disaffections of Germany, even allying himself with this design with the German Protestants, and even with the great champion of the Protestant cause, Gustavus of Sweden; and in connection with his anti-Austrian policy, he also took part with the disaffected Spanish provinces in the Netherlands. His designs on Belgium, however, failed of success. With similar views he lent his support to the revolt of Catalonia against Philip IV., and sent an army into Piedmont; nor is there any part of his foreign policy to which he adhered with such pertinacity to the very end of his life.

His internal administration of France has been severely criticised. He was reckless and unscrupulous in the use of means against his enemies, and the expenditure which his foreign wars entailed led to many and oppressive impositions. His own personal expenditure was magnificent even to prodigality, but he is aquitted of all sordid schemes of self-aggrandizement.

R. died at Paris, 4th December 1642. Notwithstanding his many distracting occupations, the writings which he left behind fill several volumes. Some of these, ascetical or controversial, were written before his entrance into political life. Of his later writings, his *Testament Politique* and his *Memoirs* have attracted much notice. He even indulged occasionally in literature, and wrote two plays of indifferent reputation. His letters are numerous, and many of them full of interest. He was a liberal patron of literature, and to him France owes the establishment of the Royal Printing Presses and the foundation of the French Academy.

RI'CHMOND, a market-town and parliamentary and municipal borough in the North Riding of Yorkshire, on the left bank of the Swale, 42 miles north-west of York. The parish church is chiefly in Gothic, but partly in Norman architecture; the grammar-school has an endowment of £270 a year, and attached to it are six scholarships. Though the trade of R. is now much less extensive than in earlier ages, iron and brass founding and tanning are carried on, and there are a paper and several corn mills. The borough returns one member to the House of Commons. Pop. of municipal borough in 1871, 4443; in 1881, 4502.

The Earldom of Richmond was conferred by the Conqueror upon his kinsman, Alan Rufus, Count of Bretagne; but came into the possession of the crown when Henry, Earl of Richmond, succeeded Richard III. as Henry VII. The title of Duke of Richmond was afterwards conferred by Charles II. upon his son Charles Lennox, in whose family it still remains. The castle, surrounded by picturesque scenery, stands on a rock overlooking the river. In the vicinity are some ruins of a small monastery, founded in 1258.

RICHMOND, a rising town of Surrey, 10 miles west-south-west of London by railway, stands partly on the summit and declivity of Richmond Hill, and partly on the level right bank of the Thames. The rich and beautiful scenery of the vicinity is seen with advantage from the terrace, which stretches along the brow of the hill. The parish church contains the tombs of Thomson the poet, and of Edmund Kean the tragedian. The banks of the Thames are studded with villas, and around the town are numerous nurseries and kitchen gardens. Pop. (1881) 19,068, who derive their subsistence chiefly by providing for the wants of the immense number of visitors and pleasure-seekers who frequent the town, especially during summer.

R., which was formerly called Scheen or Sheen, received its present name from Henry VII., who named it after his own earldom. It was a royal residence in the time of Henry I., and since that time the sovereigns of England have frequently resided here, and here Edward III., Henry VII., and Elizabeth died. Richmond Park, 8 miles in circuit, is open to the public.

RICHMOND, the capital of Virginia, U. S. America, on the left bank of the James River, at the head of tide water, 150 miles from its mouth, lat. 37° 32′ 17″ N., long. 77° 27′ 28″ W., 100 miles south of Washington, picturesquely situated on the Richmond and Shockoe Hills, on the lower falls of the James River, and regularly laid out and built, and surrounded with beautiful scenery. The capitol is a stately building in the center of a park of 8 acres, the grounds of which are ornamented with trees and statuary. There are also handsome state and county edifices, penitentiary, theater, orphan asylum, 50 churches, 3 colleges, 7 daily and 14 other newspapers, several cotton and tobacco factories, extensive flouring-mills, forges, furnaces, and machine shops. Tobacco and flour are the principal articles of export from R. Vessels drawing 10 feet can come within a mile of the center of the city; those of 15 feet to three miles below. A canal round the falls gives a river navigation 200 miles further, and a canal and several railways connect it with the great network of southern railways. R. was founded in 1742. In 1811, the burning of a theater destroyed the lives of 70 persons, including the governor of the state. In June 1861 it was selected as the Confederate capital, and from that period was the objective point of a series of formidable military expeditions for its capture, under Generals M'Dowell, M'Clellan, Burnside, Hooker, Meade, and Grant, and defended by General Lee with a large army and formidable lines of fortifications, until the seizure of the lines of supply by Generals Grant and Sheridan, compelled its evacuation after a series of sanguinary battles, April 3, 1865. A considerable portion of the city was destroyed by the retreating Confederates. Pop. (1870) 51,038; (1880) 63,803.

RICHMOND, a city of Indiana, U. S., on the east fork of Whitewater River, 70 miles north-west of Cincinnati, and the focus of several railways. It was founded by a colony of Friends in 1816. The river gives water-power to factories of cotton, wool, flour, and several extensive implement factories. R. has a brisk trade with a fertile and populous country. There are 20 churches and 8 newspapers. Pop. (1860) 6603; (1870) 9445; (1880) 12,743.

RICHTER, JEAN PAUL FRIEDRICH, better known as 'Jean Paul,' a German humorist and sentimentalist of the greatest singularity, hence called by his countrymen *Der Einzige* (The Unique), was born at Wunsiedel, in Bavaria, March 21, 1763. His father, who was a poor schoolmaster at the period of R.'s birth, subsequently became parish priest at Schwarzenbach, on the Saale; but his circumstances always remained straitened, and he died burdened with debt, while his son was attending the gynasium at Hof. Nevertheless, R. went to the university of Leipzig in 1780 to study theology, which did not prevent him from roving freely over the whole circle of literature. The exact extent of his scholary acquirements cannot well be ascertained; his studies were never systematic, and it is probable that he was not deeply read in any single branch of learning, but he carried in his head or in his note-books a vast confused miscellany of facts, literary, scientific, philosophical, and theological, and strewed them with oriental profusion over the pages of his works, where they do duty as metaphors, or illustrations after the most grotesque and wonderful fashion. The English satirists, Pope, Swift, and Young, appear to have been special favorites with him; and among his own countrymen, Hamann and Hippel. But the most marvelous thing about his student-life was not the extent or variety of his reading, but the fact that he had the heart to read at all! During the whole time he was plunged in the most miserable poverty. He could hardly get a single private pupil, and passed many a day without tasting food. Hunger was, in truth, his constant companion. In desperation he betook

himself to literature for a subsistence, but it was long before he won recognition.

His first composition, *Das Lob der Dummheit* (The Praise of Folly), modelled on the *Moriæ Encomium* of Erasmus, could not find a publisher; his second, written, he tells us, while he was surrounded by 'unpaid debts and unsoled boots,' *Grönländische Processe* (Greenland Lawsuits, 2 vols., Berl. 1783—1785), did succeed in getting itself published but not read, and at length the heroic fortitude of R. gave way. In 1785, he fled from the city to avoid incarceration for debt, and took refuge with his mother at Hof. Here his circumstances were little better; and in 1786, he was glad to accept a tutorship at Topen in the family of Herr von Oerthel. In 1790, at the request of several families of Schwarzenbach, he removed thither to take charge of the education of their children, and lived in this way as a private schoolmaster for some years. Meanwhile, he had not given up authorship. In 1788, appeared at Gera his *Auswahl aus des Teufels Papieren* (Selection from the Devil's Papers), which, however, in spite of its captivating title, did not prove more popular than its predecessors. R. seemed destined to failure as a writer. His sarcastic, far-glancing, and grotesquely-sportful humors were so unlike anything else in literature, and so oddly, not to say extravagantly, expressed, that the mass of readers could make nothing of them at all, and perhaps charitably regarded the author as crazy.

But in 1793 the turning-point in his fortunes and fame occurred. In that year, a work which he had published at Berlin, *Die Unsichtbare Loge* (The Invisible Lodge), and which was a sort of romance based on his experience as a schoolmaster, proved unexpectedly successful, and R. began to grow a little more familiar with the sight of gold. It was followed by *Hesperus* (4 vols., Berl. 1794), the work by which he is perhaps best known out of Germany; *Quintus Fixlein* (Baireuth, 1796); *Biographische Belustigungen unter der Gehirnschale einer Riesin* (Biographical Recreations under the Cranium of a Giantess, Berl. 1796); *Blumen-, Frucht-, und Dornenstücke* (Flower, Fruit, and Thorn Pieces, 4 vols., Berl. 1796—1797), the opening chapter of which contains his magnificent 'Dream of the Dead Christ,' translated into English by Carlyle; *Jubelsenior* (The Parson in Jubilee, 1797); and *Das Campanerthal* (Erfurt, 1798), a work on the immortality of the soul, which attracted the notice and won for its author the friendship of Herder.

R. was now one of the greatest celebrities of Germany; his books had become quite the rage, especially among educated women. He himself, too, was personally a great favorite; there was something in his conversation and manner so winning, joyous, and charmingly tender, that it excited not only friendship but love. We read of one brilliant woman, Charlotte von Kalb, who actually sought to obtain a divorce in order that she might marry R.; and of another who committed suicide because he would not return her unlawful passion. This last incident affected R. profoundly. He was not only perfectly innocent in all his relations with the other sex, but pure and high-minded to a degree, and he had remonstrated with the unhappy maiden in the most wise and delicate manner. In 1801, after he had become famous, he married Caroline Mayer, daughter of Professor Mayer of Berlin, and with his young wife traveled about Germany a good deal, visited Goethe and Schiller, with neither of whom, however, he became intimate, and formed a closer acquaintance with old Gleim, Wieland, &c.; but ultimately settled at Baireuth, in Bavaria, where he devoted his time with the most honorable assiduity to work. His aërial, fantastic, many-hued creations—his solemn images of glory and gloom—his riant humors—his burlesque speculations on life, manners, and, indeed, on the *omne scibile*—his innumerable descriptions of nature, soft-glittering as with morning dew, flowed from him as from inexhaustible fountains. The productions belonging to his later period of a humorous kind are, *Titan* (4 vols., Berl. 1800—1803), considered by R. himself his greatest work; *Flegel Jahre* (happily rendered by Carlyle 'Wild Oats,' 4 vols., Tüb. 1804—1805); *Katzenberger's Badereise* (2 vols., Heidelb. 1809); *Des Feldpredigers Schmelzle Reise nach Flätz* (Tüb. 1809); and *Der Komet, oder Nikolaus Markgraf* (3 vols., Berl. 1820—1822).

Among works of a professedly reflective or philosophical character (though the elements of humor and poetry are by no means absent), we may mention his *Vorschule der Aesthetik* (3 vols., Hamb. 1804), *Levana oder Erziehungslehre* (Brunswick, 1807), a treatise on education; and numerous other pieces. R. died November 14, 1825. In his latest years he was afflicted with a decay of his physical powers, and in his last year with total blindness. The death of his son Max, in 1821—a youth of great promise—inflicted an incurable wound on his heart.—See *Wahrheit aus Jean Paul's Leben* (Bresl. 1826—1833), a work begun by R. himself; Döring's *Leben und Characteristik Richters* (2 vols., Leip. 1830); Spazier's *Jean Paul Friedrich Richter ein Biographischer Commentar zu dessen Werken* (5 vols., Leip. 1833). Some of his pieces have been translated into English by Carlyle and others; Carlyle has also given us two admirable essays on the life, writings, and genius of the man, to which we refer our readers.

RI'CINUS. See CASTOR-OIL PLANT.

RI'CKETS, or RACHI'TIS (from the Gr. *rhachis*, the spine, because a peculiar form of spinal curvature results from the affection), is regarded by some writers as a special disease of the bones, and by others as merely one of the various forms of scrofula. Whichever view be correct, there can be no doubt that the general symptoms in rickets are closely allied to those in scrofula, and that the same general plan of treatment is equally useful in both affections. The characteristic symptom in rickets is the imperfect development, atrophy, softness, and consequent distortion of some or many of the bones. The bones thus affected consist of a sort of gelatinous tissue, which will bend without breaking; and they are so soft that they may be cut with the knife. On microscopico-chemical examination, the structural arrangement of the bone is found to be unaffected, while there is a great deficiency of the earthy salts to which the normal bones owe their firmness.

While 100 parts of healthy bone contain about 32 per cent. of organic matter, and 68 per cent. of inorganic matter, or earthy salts, the proportions are altogether reversed in rickets. Thus, in this disease, Marchand found 79·4 per cent. of organic matter, and 20·6 of earthy salts in a femur; while Ragsky found 81·12 per cent. of organic matter, and only 18·88 of earthy salts in a humerus: thus showing that these bones contained less than one-third of the normal quantity of earthy salts. The weight of the body acting on bones thus constructed causes them to bend, and the thighs or shins are abnormally arched, or the spine is curved, or, in slighter cases, only the normal form of the ankle is modified. In aggravated cases, the chest is so affected as to give rise to the condition known as *pigeon-breasted;* the lower jaw is imperfectly developed, and the teeth project; and the pelvis becomes so altered in form as to render future child-bearing in the highest degree perilous. Rickets is exclusively a disease of childhood, and generally attacks the children of the poor.

The treatment must be mainly directed to the improvement of the general health. Free exposure to pure, bracing air, sponging with sea-water, or sea-bathing if the little patient can bear it, an abundance of animal food, cod-liver oil, iron, and quinia, include all that need be said about general treatment. Dr. Druitt recommends a jelly containing phosphate of lime (with the view of restoring to the bones the salt in which they are specially deficient). It is well worthy of further trial, and may be prepared as follows: Boil about four ounces of ivory-dust in water for ten minutes; then strain off the water, and throw it away with the impurities which it has taken up. Add more water in which the dust should be stewed till the jelly is extracted, and the dust itself is soft enough to crush between the teeth. Lemon-juice, wine, sugar, or other flavoring ingredients, may be added; and the softened ivory dust should be eaten with the jelly.

When a child with crooked legs is brought to a surgeon, he must carefully ascertain whether the crookedness depends on mere relaxation of the joints, or whether it lies in the bones themselves. In the former case, the child will probably grow up straight when his general health improves; whereas in the latter case (if the femur or tibia is absolutely bent), the surgeon must give a very guarded opinion.

RICKMAN, THOMAS, a distinguished architect, was born at Maidenhead in 1776. He was unsettled in early life, and tried several employments both in London and Maidenhead. He managed his father's business of druggist for some time, and afterwards became a clerk in an insurance office. He seems to have always had a love for architecture, and to have studied it carefully. In 1808, he began to give his full attention to it, and wrote the classification of Gothic styles, which has rendered him famous. He first pointed out the features which distinguish the different periods of that style. He divided it into four periods, and called them Norman, Early English, Decorated, and Perpendicular (q. v.), and these names and the dates he assigned to them are still the most frequently used.

R. became after this an architect in Birmingham, and was employed to design a great many buildings, especially churches. He died in March 1841. His work is called *An Attempt to discriminate the Styles of Architecture in England from the Conquest to the Reformation.* It was first written for Smith's *Panorama of Science and Art*, and has passed through several editions; that by Parker of Oxford (1847) is the best.

RI'COCHET, in Artillery, is the bounding of a shot along the ground which takes place when a gun is fired low. Ricochet firing is found extremely useful both in its actual and moral effect in clearing the face of a ravelin, bastion, or other rather long line of fortification. If well directed, the ricochet shot bounding along will dismount guns, scatter the gunners, and greatly intimidate the garrison. Vauban first introduced ricochet firing at the siege of Phillipsburg in 1688. The defence against this sort of attack

consists in earthen traverses along the threatened line, or in a bonnet (see FORTIFICATION) at the point of parapet nearest the enemy. In the field, ricochet, where the shot or shell is made to bound forward at least ten times, produces most disastrous and demoralizing effects on masses of cavalry and infantry, whom it hews down in long lines.

RIDDLE (Ger. *räthsel*), a paraphrastic presentation of an unmentioned subject, the design of which is to excite the reader or hearer to the discovery of the meaning hidden under a studied obscurity of expression. In the present day, the riddle is a mere *jeu d'esprit*—a sort of witty pastime for idle people; we only meet with it under the form of Conundrum (q. v.), but anciently—and its antiquity is very great—it held a far higher place, and was put to far more important uses, although in its inferior phase of conundrum it was likewise a part of the intellectual entertainment at Greek, and latterly at Roman banquets. Among the easterns, it naturally associated itself with their symbolical modes of thought, and was also, as it still is, abundantly employed for didactic purposes. The so-called Proverbs or sayings attributed to Solomon frequently assume the form of riddles. Josephus relates, on the authority of Dius, the Phœnician historian, and of Menander of Ephesus, that Hiram, king of Tyre, and Solomon had once a contest in riddles or dark sayings, in which Solomon first won a large sum of money from Hiram, but ultimately lost it to Abdemon, one of Hiram's subjects—a curious instance of philosophical gambling.

Every reader of the Old Testament is familiar with the riddle which Samson proposed to the Philistines, and the 'enigmas' (as the Septuagint has it) that the Queen of Sheba proposed to Solomon, though it is perhaps doubtful if the latter were more than hard or difficult questions plainly put. The riddle is found in the Koran, and several books of riddles exist in Arabic and Persian. It would appear that they were also known to the ancient Egyptians, while among the Greeks they were allied in the earliest times with the *oracula*, or mystic utterances of the inspired priests, and were generally, as is the case with Samson's riddle, in verse; but in Greece they first came into vogue about the time of the 'Seven Wise Men,' one of whom, named Kleobulos, as also his daughter Kleobuline, was celebrated for the composition of metrical riddles (*griphoi*), some of which are still remembered. Even the greater poets did not refuse to introduce the riddle into their writings, or to devote whole poems to the subject—as, for example, the *Syrinx*, commonly ascribed to Theocritus. Homer, according to a statement in Plutarch, died of chagrin at not being able to solve a riddle; and the riddle of the Sphinx (see ŒDIPUS) is probably the most celebrated in the whole circle of philosophical puzzles. Among the Romans, professional riddle-makers did not make their appearance till the latest period of Roman literature, the reason assigned for which is the superior gravity and earnestness of the Roman genius, which, it is said, did not easily find pleasure in such modes of intellectual activity. Appuleius wrote a *Liber Ludicrorum et Griphorum*, but it is no longer extant, and almost the only name we can fix upon is a certain Cælius Firmianus Symposius, whose riddles, comprising a hundred hexametrical triplets, are termed by Aldhelmus (8th c.), apparently with justice, *Carmina inepta*.

The riddle, but more perhaps as an amusement for the baronial hall on winter-nights, or for the monastic mess-room, than as a serious intellectual effort, was much cultivated during the middle ages. This character of lively or amusing puzzle it has ever since for the most part retained. Many specimens of what would now be termed 'riddle' or 'conundrum books' exist in French, English, and German collections of manuscripts, and were printed at an early period. One of these, entitled *Demands Joyous*, which may be rendered 'Amusing Questions,' was printed in English by Wynkin de Worde in 1511. Many of these 'joyous demands' are simply coarse jests; but others, again, illustrate the simple, child-like religious belief of medieval Christendom—e. g., Demand: 'What bare the best burden that ever was borne?' Response: 'The ass that carried our Lady when she fled with our Lord into Egypt.' Some are really fitted to excite risibility—e. g., Demand: 'What is that that never was and never will be?' Response: 'A mouse's nest in a cat's ear.'—'What is the worst bestowed charity that one can give?' 'Alms to a blind man; for he would be glad to *see* the person hanged that gave it to him.' The Reformation, at least in Protestant countries, checked, if it did not wholly stop, the merry pastime of riddle-making; but in the 17th c. it began to creep into favor again. Le Père Ménestrier, a learned Jesuit, wrote a grave treatise on the subject; and in France, riddles soon rivalled in popularity the madrigals and sonnets of the period. The Abbé Cotin was a famous fabricator of riddles, and published a *recueil* of his own and those of his contemporaries, preceded by a dissertation, in which he modestly dubbed himself *Le Père de l'Enigme* (The Father of the Riddle); but, as a French critic remarks, posterity has not recognized his paternity.

In the 18th c., the taste for the manufacture of riddles continued to increase, and most of the brilliant French *littérateurs*, such as Boileau, Voltaire, and Rousseau, did a little in this line, until, finally, the *Mercure de France* became a fortnightly repository of riddles, the solution of which was sufficient to make a reputation in society. In Germany, Schiller gave a broader development to the riddle. In his hands, it once again became something grave and sibylline, and obtained in expression a high degree of literary beauty and force. A good collection of the best riddles is to be found in Ohnesorgen's collection, entitled *Sphinx* (6 vols. Ber. 1833).

RIDGE, the upper angle of a roof, usually covered with lead or zinc, and sometimes with stone or tile. Ridges are often ornamented with a cresting or running design, and recently cast-iron has been much used for this purpose.

RI'DING (Saxon, *trithing*, third part), a term applied to three parts into which the county of York is divided, termed respectively East, West, and North Riding. A similar division existed in several other counties in the anglo-Saxon period; there were the *laths* of Kent, the *rapes* of Sussex, the *parts* of Lincoln. The trithing, lath, or rape was formed of three or more hundreds, and presided over by a trithing-man or lath-grieve. In *Domesday Book*, we find Yorkshire divided, as at present, into three ridings, and subdivided into wapentakes. See WAPENTAKE.

RIDING-MASTER, an officer in the cavalry, military train, and artillery, whose duty it is to instruct the officers and men in the management of their horses. He is most commonly selected from the ranks; his pay is 9*s*. a day, rising by length of service to 10*s*. 6*d*. and 12*s*.; besides which, he receives £7 per troop per annum for riding-house expenses; and he is believed to make some profit out of this allowance. The riding-master has the relative rank of lieutenant, and, after an aggregate service of 30 years, including at least 15 years as riding-master, he has the right to retire on 10*s*. a day, with the honorary rank of captain.

RIDLEY, NICHOLAS, one of the most noted leaders of the Reformation in England in the 16th century, was a native of Northumberland, and born about the commencement of the century. He was educated at the foundation-school of Newcastle-upon-Tyne, and subsequently at Pembroke Hall, Cambridge. He became a Fellow of this college in 1524, and ultimately President. The spirit of the Reformation had already begun to penetrate the universities both of Oxford and Cambridge. Tyndale and Bilney had taught the new doctrines in the latter place; and Ridley, no less than Cranmer and Latimer, all Cambridge students about the same period, had probably caught something of their spirit. This reforming tendency was greatly strengthened by a tour on the continent of Europe, which he undertook on the completion of his studies. He encountered some of the most active Reformers abroad, and after a three years' absence, he returned, with his principles firmly grounded in favor of the new course of things. He became proctor to the university of Cambridge, and in this capacity protested against the claims of the papal see to supreme ecclesiastical jurisdiction in England. He was also chosen public orator, and, under the patronage of his friend Cranmer, advanced first to be one of the king's chaplains, and then, in 1547, nominated Bishop of Rochester. He distinguished himself by his vehement denunciations of the idolatrous use of images and of holy water, and very soon became one of the most prominent, as he remained one of the most consistent and inflexible supporters of the Reformed doctrines. He joined actively in the measures of Edward VI.'s reign, and on the deprivation of Bonner, Bishop of London, Ridley became his successor, three years subsequent to his elevation to the see of Rochester. In this high position he distinguished himself by his 'moderation, his learning, and his munificence.'

He earnestly promoted the Reformation, yet without bigotry or intolerance, he exerted himself in the foundation of Christ's Hospital, and of the hospitals of St. Bartholomew and St. Thomas in Southwark, the two latter of which have become eminent as schools of medicine—the former as a school of classical and general instruction. He assisted Cranmer in the preparation of the 41 articles, afterwards reduced to 39. On the death of Edward VI., he warmly espoused the unfortunate cause of Lady Jane Grey; and on its speedy failure, and the accession of Mary, his known connection with it, as well as his general activity in the cause of the Reformation, exposed him to the vengeance of the papal party, again ascendant. He was committed to the Tower in 1553, and in the subsequent year, when a convocation was convened at Oxford for the discussion of the doctrine of transubstantiation, he was removed thither along with Cranmer and Latimer, in order that he might engage in the discussion. It was not to be expected, however, that any good would issue from such a step as this. The discussion proved a mere pretence; the Reformers were adjudged defeated and obstinate heretics, and condemned to suffer at the stake. On the 16th October 1555, R. was led forth to execution, along with his friend and fellow-reformer, Latimer.

He suffered in front of Baliol College, cheerful, steadfast, and consistently enduring as he had been throughout his life. He was, according to Burnet, one of the ablest of all who advanced the Reformation in England. His character is pure, elevated, and self-denying. Foxe says of him he was 'wise of counsel, deep of wit, benevolent in spirit.' His gentleness wins our sympathy, while his scholarly and calm intrepidity excite our admiration.

RIENZI, Cola di, the famous Roman tribune, was born at Rome in 1313. His parentage was humble, his father being a tavern-keeper, named Lorenzo (by abbreviation, Rienzo), and his mother a washerwoman. Until his twentieth year, he lived among the peasants of Anagni; then he returned to his native city, where he studied grammar and rhetoric, read and re-read the Latin historians, philosophers, and poets (Greek was scarcely yet known in Italy), and excited his imagination, while at the same time he colored his speech, with the prophetic enthusiasm of the inspired writers. The assassination of his brother by a Roman noble, whom he found it impossible to bring to punishment, is considered to be the incident that finally determined him to deliver the city, as soon as he was able, from the barbarous thraldom of the barons. He assumed the significant title of 'consul of orphans, widows, and the poor.' In 1343, he was appointed by the heads of the Guelph party spokesman or orator of a deputation sent to the papal court at Avignon to beseech Clement VI. to return to Rome in order to protect the citizens from the tyranny of their oppressors. Here he formed a close friendship with Petrarch, through whose assistance he obtained a favorable hearing from his Holiness, who appointed him notary to the City Chamber. In April 1344, R. returned home, and sought to obtain the countenance of the magistrates in his ideas of reform; but reform, he found, was impossible without revolution; yet he did not *conspire*, properly speaking, to the very last moment. During three years, he loudly and openly—perhaps even ostentatiously—menaced the nobles, for the enthusiasm of R. for a nobler and juster government, though sincere, was showy and vain. The reason why the nobles took no steps to crush him was because they thought him mad. At last, when R. thought he could rely on the support of the citizens, he summoned them together on the 20th of May 1347, and surrounded by 100 horsemen and the papal legate, he delivered a magnificent discourse, and proposed a series of laws for the better government of the community, which he termed *il buono stato*, and which were unanimously approved of.

The aristocratic senators were driven out of the city, and R. was invested with dictatorial power. He took the title of 'tribune of liberty, peace, and justice,' and chose the papal legate for his colleague, but reserved to himself the direction of affairs, after having, however, suggested the institution of a syndicate, to which he should be responsible. The pope confirmed the eloquent dictator in his authority; all Italy rejoiced in his success, and foreign lands, even warlike France (according to Petrarch), began to dread the reviving majesty of the Eternal City. A bright dream now seems to have flashed across R.'s imagination—the unity of Italy and the supremacy of Rome! Every great Italian has dreamed that dream from Dante to Mazzini. R. despatched messengers to the various Italian states, requesting them to send deputies to Rome to consult for the general interests of the Peninsula, and to devise measures for its unification. These messengers were everywhere received with enthusiasm, and on the 1st of August 1347, two hundred deputies assembled in the Lateran Church, where R. declared that the choice of an emperor of the Holy Roman Empire belonged to the Roman people, and summoned Ludvig of Bavaria and Karl of Bohemia, who were then disputants for the dignity, to compear before him. This step was wildly impolitic. R. had no *material* power to enable him to give efficacy to his splendid assumption. The pope was indignant at the transference of authority from himself to his subjects; and the barons, taking advantage of certain ceremonial extravagances which the dictator had committed, and which had diminished the popular regard for him, gathered together their forces, and renewed their devastations. After some ineffectual resistance, R. resigned his functions, weeping all the while, and withdrew from Rome, which was entered by the barons two days after. His tenure of power had lasted only seven months. In the solitudes of the Neapolitan Apennines, where he found refuge, R. would seem to have recovered his enthusiasm and his faith.

Regarding his fall as a just chastisement of God for his love of wordly vanities, he joined an order of Franciscan hermits, and spent nearly two years in exercises of piety and penitence—all the while, however, cherishing the hope that he would one day 'deliver' Rome again. This ambition to play a distinguished part made him readily listen to a brother-monk, who, about the middle of 1350, declared that, according to the prophecies of Joachim of Flores, of Cyrillus, and of Merlin, R. was destined, by the help of the emperor Karl IV., to introduce a new era of happiness into the world. R. betook himself at once to Prague, and announced to the emperor that in a year and a half a new hierarchy would be established in the Church, and under a new pope, Karl would reign in the West, and R. in the East. Karl, not knowing very well what to say in reply to such language, thought it safest to put the 'prophet' in prison, and then wrote to inform his friend the pope of the matter. In July 1351, R. was transferred to Avignon, where proceedings were opened against him in reference to his exercise of tribunitial power. He was condemned to death, but his life was spared at the earnest entreaties of Petrarch and others; and the next two years were spent in an easy confinement in the French papal city. Meanwhile the state of matters at Rome had become worse than ever. The great families were even more factious, more anarchical, more desperately fond of spilling blood than formerly; and at last Innocent VI. sent Cardinal Athornoz to re-establish order. R. was also released from prison, and accompanied the cardinal.

A residence was assigned him at Perugia; but in August 1354, having borrowed money, and raised a small body of soldiers, he made a sort of triumphal entry into Rome, and was received with universal acclamations. But misfortune had impaired and debased his character; he abandoned himself to good living, and his once generous sentiments had given place to a hard, mistrustful and cruel disposition. The barons refused to recognize his government, and fortified themselves in their castles. The war against them necessitated the contraction of heavy expenses; the people grumbled; R. only grew more severe and capricious in his exactions and punishments. In two months his rule had became intolerable, and on the 8th of October, an infuriated crowd surrounded him in the Capitol, and put him to death with ferocious indignities.

RIE'SENGEBIRGE (giant mountains), a mountain range about 23 miles long by about 12 miles broad, between Bohemia and Prussian Silesia. See Bohemia.

RIE'SI, a town of Sicily, in the province of Caltanisetta, and 13 miles south from Caltanisetta. It is situated at the base of a mountain of the same name, not far from the left bank of the Salso. There are sulphur-mines in the mountain. Pop. (1871) 11,548.

RIE'TI (ancient, *Reate*), a city of Central Italy, in the province of Perugia, in Umbria, is situated at the foot of a hill, on the banks of the Velino, 45 miles north-east of Rome. It is walled, its streets are regular, and it has a fine cathedral, and many benevolent institutions. It is the seat of an archbishop. R. was a noted city of the Sabines. Pop. 12,900.

RIFF, The, a portion of the coast of Morocco which extends from Tangier on the west to near the western frontier of Algiers, having a length of about 210 miles, with a breadth of 58. The name, in the Berber language, which is that of the inhabitants, signifies a mountainous and rugged coast. The Riff mountains, which stretch along near and parallel to the coast, are green and wooded, and are here and there intersected transversely by fertile valleys or deep ravines, each of them possessing its brook or rivulet, which descends to the Mediterranean. The R. region is separated from the parallel mountain chain south of it by an extensive, fertile, and well-watered plain, in which stands the city of Fez. The inhabitants of the R. are almost wholly Berbers, who are employed in feeding and breeding cattle, fishing, and occasional piracy. On account of the injuries inflicted by them on merchant vessels, most of the maritime states of Europe agreed to pay an annual sum as quit-money. However, in 1828, Austria declined further payment of the tax. A Venetian vessel was seized by the pirates, in the harbor of Rabat, but the arrival of an Austrian fleet off the port produced restitution of the ship and its cargo, as well as the formal renunciation of all further claims. France followed the same course by declaring war against the Sultan of Morocco, and obtained compensation, in 1844, since which period piracy has much diminished. Its example was followed by the Spaniards in 1859. The sultan, however, had always discountenanced piracy, but his authority in the R. was too weak to compel obedience.

RIFLE-BIRD (*Ptiloris Paradiseus*), a bird of the family *Upupidæ* with a long curved bill, and in size about equal to a large pigeon. It inhabits the south-eastern districts of Australia, and is found only in very thick 'bush.' The male is regarded as more splendid in plumage than any other Australian bird. The upper parts are velvety black, tinged with purple; the under parts velvety black, diversified with olive-green. The crown of the head and the throat are covered with innumerable little specks of emerald green, of most brilliant lustre. The tail is black, the two central feathers rich metallic green.

RIFLED ARMS were invented for the purpose of remedying certain defects essentially connected with cylindrical smooth-bore guns. These defects, which are chiefly owing to atmospheric resistance, showed themselves in the erratic motion of the ball,

especially when fired at a long range, and arose from the following causes: *First*, The ball never fitted tightly, and, in consequence of this, its center was below the center of the bore. A portion of the explosive force of the powder escaped over the top of the bullet, and was not only wasted, but exercised a downward pressure on the ball, tending to squeeze it *into* the under side of the barrel, and so great was this pressure, that in guns of soft metal, as brass, a perceptible dint was produced after a few rounds. Another and more important consequence of the looseness of the ball was, that the action of the powder on it was necessarily irregular, and its resulting motion along the barrel was a series of oblique impacts, now against one side, now against the other, and the direction of its motion after expulsion was necessarily not in line with the axis of the barrel, and depended upon the side of the barrel with which it was last in contact.

Secondly, Balls can never be perfectly homogeneous, and the violent and sudden pressure of the exploded powder produces a slight change of shape; consequently, the center of gravity can never accurately coincide with the center of the sphere, the air resists its forward motion unequally, and true flight is precluded. *Thirdly*, As a consequence of the friction of the ball against the sides of the barrel, it acquires a rotatory motion, the direction of its rotation after expulsion being determined by the particular point of the muzzle with which it was last in contact. Thus, if it finally touched the top or bottom of the muzzle, the plane of rotation of the anterior surface of the ball would be in line with its progressive motion, and the rotation would be in an upward or downward direction; if it last rebounded from the right side, the plane of rotation would be in line with its path, and the rotation of the anterior surface from left to right, and so on. The ball, in its rapid flight, compresses the air in front, and produces a vacuum behind; the denser, because more compressed, air in front, attempts to rush round the sides of the ball to fill up the vacuum. Now (see fig. 1), let us suppose that the ball, while in rapid advance, is also revolving in a horizontal plane, and from left to right, the side A, whose rotation *conspires with* the motion of translation, resists, by its friction, the attempt of the air to reach the vacuum by that side; while the side B, whose rotation is against the motion of translation, conspires to aid the air in reaching the vacuum. It follows from this, that the air is denser in front of A than in front of B; its resistance on the side A is greater than that on B, and the ball, in consequence, is deflected towards the side on which the resistance is least (towards the right in this instance). If the ball struck the top of the muzzle, its revolution would be in a vertical plane in line with the barrel, and in an upward direction, under which circumstances the ball would tend, first, dowwards from the first reason, and then upwards from the third; while, if it struck the bottom of the muzzle, the contrary would be the case.

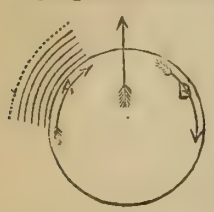


Fig. 1.

Horizontal section of a spherical bullet, the straight arrow showing the direction of its forward motion or *motion of translation*, and the curved arrows that of its motion of rotation. The ball, in this instance, is supposed to have struck against the *right* side of the muzzle.

These aberrations of the ball from its true theoretical path, as was evident to artillerists, could never be wholly annihilated while smooth-bores were used, and they set themselves to discover how they might be counteracted. It occurred to them that this could best be managed by securing that the plane of rotation of the ball should be at right angles to its motion of translation, as the irregularities in its structure, which produce aberrations of the first and second kind, would thus act equally in all directions, producing an exact counterbalance, while the aberration from the ball's rotation would wholly disappear; and the constancy of the vertical transverse position of the plane of the ball's rotation was obtained by making one or more spiral grooves along the interior of the barrel.

As early as 1498, the citizens of Leipzig possessed the germ of the future rifle, for their arms had a grooved bore, but the grooves were straight. Not many years after, in 1520, Augustin Kutter (or Koster) of Nürnberg was celebrated for his rose or star-grooved barrels, in which the grooves had a spiral form. It took its name from the rose-like shape of the bore at the muzzle; and, setting aside superiority of workmanship subsequently developed, Kutter's arm was the veritable rifle, and to him, therefore, so far as history shows, is due the invention of this terrible weapon, which reduces the flight of the projectile to a question of the individual skill of the marksman. The spiral groove gives to the bullet, if it fits into the grooves, a rotation rapid in proportion to the force of the explosion and the sharpness of the twist in the spiral. This revolution of the bullet on its own axis keeps that axis, gravity excepted, in the line in which it leaves the piece.

In 1628, Arnold Rotsiphen patented a new way of 'makeing gonnes,' which, from a subsequent patent granted him in 1635, appears to have consisted, among other improvements, in rifling the barrels. It would be tedious to enumerate the various principles of rifling which were tried during the two centuries following Rotsiphen—suffice it to say, that scarcely a form of rifling now prevails but had its prototype among the old inventions. The difficulty of mechanical appliances making the rifling true, deferred, however, their general introduction, and the cost of rifled arms limited their use to the purposes of the chase. The revolutionary government of France had rifles issued to portions of their troops, but they met with so indifferent a success that Napoleon recalled them soon after he came to power. In the Peninsula, however, picked companies of sharpshooters practised with rifles with deadly effect on both the English and French sides. During the American war, 1812—1814, the Americans demonstrated incontestably the value of rifles in warfare; but many years were yet to elapse before they were definitively placed in the hands of soldiers, many of those of every nation in the Crimea having fought with the ineffective and almost ridiculous 'Brown Bess.' Soon after the French invaded Algeria, they had armed the Chasseurs d'Orleans with rifles, to counteract the superior range of the Arab guns. The inutility of the old musket was shown in a battle during the Kaffir war, where our men discharged 80,000 cartridges, and the loss of the enemy was 25 men struck. After experiments with the old musket, it was found that its aim had no certainty whatever beyond 100 yards. It was soon discovered that a spherical ball was not the best missile; one in which the longer axis coincided with the axis of the gun flying truer—the relative length of the axis and the shape of the head being matters of dispute.

The first war-rifle was that of Captain Delvigne, proposed in 1826, and adopted for a few men in the French army; but this still included the old and rude plan of forcing the leaden ball through the grooves by blows of the ramrod, it being of course requisite that the projectile should occupy the grooves tightly. In 1842, Colonel Thouvenin invented a *carabine à tige*, in which the breech had a small pillar screwed into it, round which the powder lay, and on the end of which the bullet rested, its base being flattened out by the force of the ramrod. Colonel Delvigne added a conical bullet to this rifle, and the combined invention was issued to the Chasseurs d'Afrique in 1846. But the *tige*, or pillar, became bent by usage, and was found otherwise objectionable. It was superseded by using with a grooved barrel the Minié bullet, which, being made smaller than the bore of the piece, could be almost dropped into the barrel. It was of lead, and in its base it contained a conical recess, to receive the apex of a smaller iron cup. The force of the explosion drove this cup into the bullet, causing the lead to expand into the grooves of the barrel. (It is right, however, to state that this contrivance is claimed for a Mr. Greener as early as 1836.) The Prussians, meanwhile, had armed their troops with the needle-rifle (*Zündnadelgwehr*), now superseded by the *Mauser*. In England, however, no improvement took place until 1851, when 28,000 rifled muskets to fire the Minié bullet were ordered to be issued. Notwithstanding the many advantages of the Minié system, it was found defective in practice. Experiments were set on foot in all directions, and resulted in 1853 in the production of the Enfield rifle, which had three grooves, taking one complete turn in 78 inches, and fired a bullet resembling the Minié, except that a wooden plug was substituted for the iron cup. From 1853 to 1865, this was the weapon of the British army. In 1865, the adoption of Breech-loading Arms (q. v.), caused the Enfield to be converted into a breech-loader by fitting the 'Snider' breech mechanism to the Enfield barrel.

This arrangement was, however, only temporary, and after a most exhaustive series of trials before a special committee on breech-loading rifles, the Henry barrel was in 1871 adopted in conjunction with the Martini breech for the new small-bore rifle for the British army, now known as the Martini-Henry rifle. No fewer than 104 different kinds of breech-loading small-arms were submitted to this committee, who decided that the Henry .45-inch bore barrel 'was the best adapted for the requirements of the service,' on account of its 'superiority in point of accuracy, trajectory, allowance for wind, and penetration,' and also on account of its great durability. The Henry system of rifling is the invention of Mr. Alexander Henry, gunmaker, Edinburgh, and its essential peculiarity consists in the form of the rifled bore. Figs. 2 and 3 represent an end section of a barrel rifled on this system. The rifling forms 7 plane surfaces A (fig. 3), and the periphery of the projectile, which is indicated by the dotted circle C, touches the planes A, at the center. In addition to the bearing surfaces thus obtained, there are 7 angular projections B, which extend inward from the planes A, so that the apex of each of the projections B is concentric with the center of the surfaces of its contiguous planes A. These angular ridges fill up to a great extent the spaces between the angles of the planes A, and the periphery of the projectile, thus reducing the windage, and from their peculiar construction facilitating the expansion of the bullet to the major diameter of the bore, so that the rotatory or spiral motion

of the projectile is obtained with greater certainty; at the same time, the figure of the projectile is so little altered that it traverses



Natural Size.

Fig. 2.

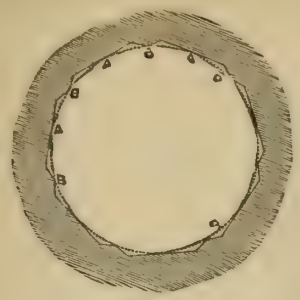


Fig. 3.

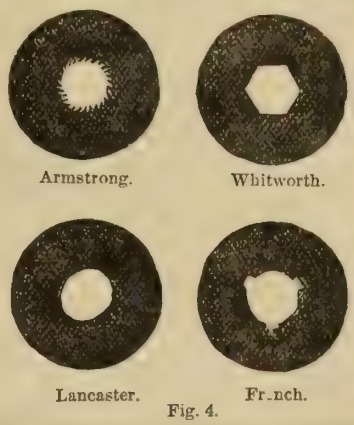
through the air with less resistance, and consequently its flight is rendered more accurate.

The length of the Henry barrel is 32½ inches. The mean diameter of the bore is ·450 of an inch, and the rifling takes one complete turn in 22 inches. Its bullet is solid, with a slight cavity in the rear, and weighs 480 grains, the charge of powder being 85 grains. The range, accuracy, and penetration of the 'Henry' barrel is nearly twice that of the present Enfield-Snider barrel, while the highest point of its trajectory at five hundred yards is 2 ft. lower, or 9 ft. as compared with 11 ft. The maximum range of the Henry barrel is about 3200 yards at an angle of 28° 15′. A new barrel has, however, been produced by the Royal Small-Arms Factory, and by 1883, has been issued for trial in small numbers. The grooves are of the form termed 'ratchet,' and are shallower and more numerous than in the Henry barrel, which it is intended to supersede. Their spiral is also sharper, viz., 1 turn in 15 inches, and the bore is reduced to ·40 inch diameter. The cartridge for this barrel is more of a trumpet than a bottle shape; the bullet is lighter (384 grains), but the charge of powder remains the same (85 grains). The trajectory of this arm is very flat owing to its enormous muzzle velocity, viz., 1570 feet per second. It is also exceedingly accurate, and has a maximum range of over 4000 yards. As it is intended to retain the Martini breech action, the new rifle complete is called the Martini-*Enfield*.

The term magazine arms or repeating arms is applied to firearms which contain, or have attached to them, a case, holding from 4 to 10 (and more) cartridges, which, being in connection with the lock action of the weapon, supplies a reserve of ammunition which can be rapidly fired in cases of emergency; the arm is also capable of being used as a 'single loader' on ordinary occasions. The idea is an old one, the first practical application of which was the revolver, if we except certain ancient flint-lock weapons of a past age. The best-known systems at the present time are the Spencer, Winchester, Vetterli, Krag, Kropatchek, Burton, Hotchkiss, Green, Jarman, and Mannlicher. All the great powers are adopting some form of magazine rifle for army and navy.

As with small-arms, so with cannon, rifling is no new discovery. In the museum at St. Petersburg is a cannon which was rifled in nine grooves as early as 1615. In 1661, the Prussians experimented with a gun rifled in 13 shallow grooves. By 1696, the Germans had tried elliptical bores. From thence till 1833, many attempts were made to rifle cannon, with more or less success. In 1833 and 1836, Monsieur Montigny of Brussels tried rifled guns with considerable success. In 1845, Colonel Cavalli of the Sardinian service commenced experiments with his rifled cannon: two Swedish officers next produced rifled cannon; but none of these systems were permanently adopted. The Crimean war set inventors vigorously at work, and many admirable guns have resulted from their attempts, the great difficulty of the day being to decide which is most effectual. The first point was the metal; and here cast-iron was found quite useless, being incapable of resisting the explosion of the large charges necessary to force closely fitting projectiles through rifled barrels. Several plans were resorted to. Sir William Armstrong welds coils of wrought-iron round a mandrel into one homogeneous mass of extraordinary tenacity, which he again strengthens by similar rings round the breech. Mr. Whitworth forces rings of wrought-iron over the barrel by hydraulic pressure; the Woolwich system is to shrink coils of wrought-iron over an inner tube of mild steel toughened in oil, and it gives perfect satisfaction. The French rifle brass guns, and use small charges; having also guns of wrought-iron. The Austrians have made a new bronze alloy (the invention of General Von Uchatius) which has proved extremely strong; the Belgians have tried Bessemer's steel. The system of rifling was the next important matter. Mr. Lancaster adhered to his oval bore; Sir William Armstrong produced a bore rifled in a great number of small sharp grooves (this gun was adopted by the British government); Mr. Whitworth retained a hexagonal bore; and the French government adopted a bore with two, and subsequently three rather deep spiral grooves.

After careful experiments, the Austrian, Spanish, Dutch, and Italian governments have concurred in the French system. These several bores are shown below in section. In the Armstrong, the rotation is communicated to the projectile by the latter being cased with lead, which the explosion forces into the grooves. The numerous fine grooves impart a very correct centering to the shot, and give extreme accuracy of range; but they render the gun a delicate weapon. In the Whitworth, the shot is constructed to pass freely through the spiral hexagonal bore, windage being prevented by a greased wad. Lancaster's shot are elliptical, to correspond with the bore. The French projectiles have ribs or studs of projecting metal to correspond to the grooves.



Armstrong. Whitworth.

Lancaster. French.

Fig. 4.

(The Ellipse of the bore in the Lancaster is exaggerated to show the principle.)

The Armstrong gun was officially adopted into the British service in 1859, as the best weapon then known, but it has been superseded by an improved version known as the Woolwich gun. This gun has a modified form of the French rifling; but generally with a larger number of grooves (from 32 to 33) according to size of gun.

The Americans have several types of rifled ordnance. Herr Krupp's cannon are famous over the world. The Gatling, mitrailleuse, and Nordenfeldt gun are rifled machine-guns, and may be described as either single or many barrelled, with a cartridge feeding, firing, and extracting arrangement, which permits of a continuous rain of bullets, either of the ordinary rifle calibre, or, as with the Nordenfeldt naval pattern, of an inch or so in diameter, capable of piercing the sides of torpedo boats. The machine is mounted for field service on a wheeled carriage with a large supply of ammunition. See REVOLVER; SHOT; SHELLS; FIREARMS; CANNON.

RIFLEMEN are troops armed with rifles, and employed more or less as sharp-shooters. The name has nearly lost all meaning, for the whole infantry are now riflemen; but as late as 1854, the riflemen were quite the exception, the army generally having the smooth-bore 'Brown Bess.' During the French war, the 60th and 95th Regiments were armed as riflemen, taught light infantry drill, and clothed in dark green. The 95th became the Rifle Brigade. For the Volunteer riflemen, see VOLUNTEERS.

RI'GA, capital of the Russian government of Livonia, and next to St. Petersburg the most important Baltic seaport. It lies on the right bank of the Dwina, crossed here by a bridge of boats and a new railway bridge 10 miles from the mouth of the river at Dünaburgon, on the Gulf of Riga, where there is a fortress defending the Dwina. Ships come up to Rige. R. has ample railway connections with most part of Russia and Germany. It was till of late defended by walls and bastions. These are now removed; and the city proper is separated from its three suburbs by promenades on both sides of the encircling canal. A citadel stands on the north of R. The chief buildings are the cathedral, the church of St. Peter, the town-hall, and the ancient castle; also the modern bourse, theater, asylums, hospitals, and schools. Of more than a dozen stone churches, 7 are Lutheran, 4 Russian, 1 Anglican; and there are 10 wooden ones besides. R. possesses numerous official, literary, educational, and beneficent institutions. Its manufactures are mainly of cotton, machines, tobacco, starch, soap, candles, leather; and its large exports are chiefly flax, hemp, grain, linseed, and wood. Half of the total population (168,850 in 1880) are Germans; and of the remainder, half are Russians and half are Lithuanians.

R. was founded in the beginning of the 13th c. by Albert Buckshoevden, Bishop of Livonia, and soon became a first-rate commercial town, and member of the Hanseatic League. The

Teutonic Knights possessed it in the 16th century. In 1621, R. was taken by Gustavus Adolphus, and held under Swedish dominion till 1710, but was finally annexed to Russia in 1721.

RIGA, GULF OF, an inlet in the north-east of the Baltic Sea, washes the shores of the three Baltic Provinces, Courland, Livonia, and Esthonia. It is over 100 miles in length from north to south, and is about 70 miles in breadth. The islands of Oesel, Dagö, Mohn, and Worms stand in the entrance to it, and narrow the mouth of the gulf to a passage about 20 miles in width. The chief river which falls into the gulf is the Dwina. Sandbanks render navigation in some parts dangerous.

RIGGING, in a ship, is a combination of very numerous ropes to afford stability to the masts, and to lower and hoist the sails. Notwithstanding the complication which the cordage of a rigged ship presents at first sight to the eye, the arrangement is remarkably simple. In all substantial points, the rig of each mast is the same; to understand one is, consequently, to understand all. In the accompanying diagrams, the same notation is observed throughout, spars being shown by capital letters; sails by italic letters; *standing* rigging, by Roman numerals; and *running* rigging, by Arabic numerals. To avoid a confusing number of symbols and needless repetition, the corresponding ropes, &c., on each mast bear the same numbers, and in the key, the name of such rope *per se* is only given. To find the full title of a rope, it is necessary to prefix (unless it pertain to the bow-sprit or gaff) the name of the mast (mizzen, main, or fore) to which it belongs. For example, the spars marked D are, counting from the left, i. e., the stern, called respectively mizzen-royal-mast, main-royal-mast, and fore-royal-mast; the standing-ropes marked IV, are the mizzen-stay, main-stay, and fore-stay; and the running-ropes bearing the figure 5, are mizzen-braces, main-braces, and fore-braces.

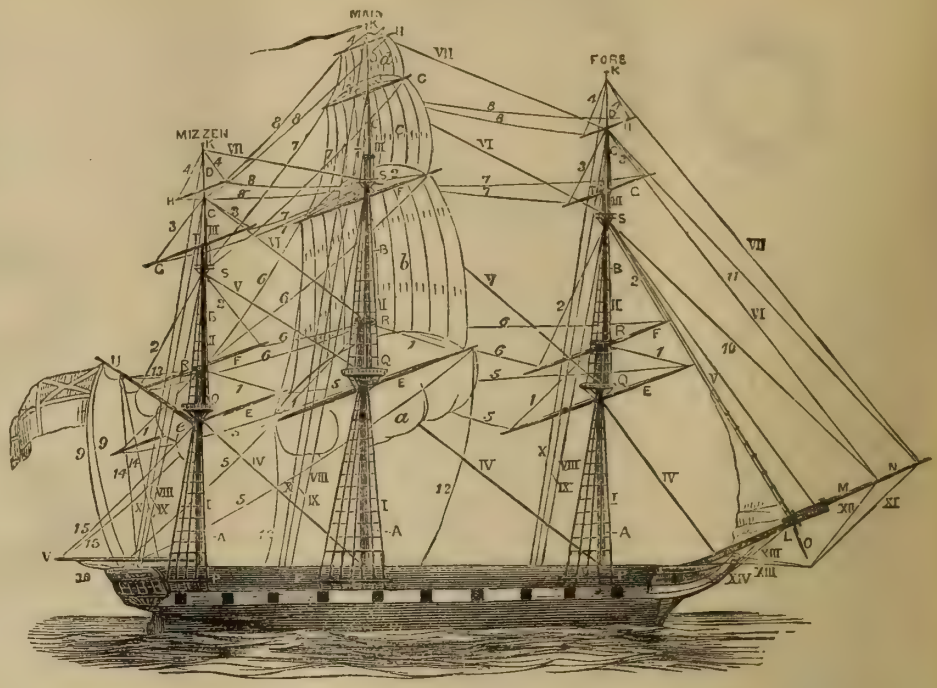


Fig. 3.

Spars, &c.—A, Mast; B, Topmast; C, Topgallantmast; D, Royal-mast; E, Yard; F, Topsailyard; G, Topgallantsail-yard; H, Royal-yard; K, Truck; L, Bowsprit; M, Jib-boom; N, Flying Jib-boom; O, Martingale; P, Chains; Q, Top; R, Cap; S, Crosstrees; T, Topmast Cap; U, Gaff; V, Boom, or Spanker-Boom.
Sails.—*a*, Mainsail; *b*, Topsail; *c*, Topgallantsail; *d*, Royal; *e*, Spanker.
Standing Rigging.—I. Shrouds; II. Topmast Shrouds, crossed by Ratlings; III. Topgallant Shrouds; IV. Stays; V. Top-mast Stay; VI Topgallantmast Stay; VII. Royal stay; VIII. Topmast Backstay; IX. Topgallantmast Backstay; X. Royal Backstay; XI. Flying Jib boom Martingale Stays; XII. Jib-boom Martingale Stays; XIII. Martingale Back-stays; XIV. Bobstays.
Running Rigging.—1, Lifts; 2, Topsail Lifts; 3, Topgallantsail Lifts; 4, Royal Lifts; 5, Braces; 6, Topsail Braces; 7, Topgallant Braces; 8, Royal Braces; 9, Signal Halyards; 10, Jib-stay; 11, Flying Jib-stay 12, Sheet; 13 Peak Halyards; 14, Vangs; 15, Topping Lifts; 16, Spanker Sheet.

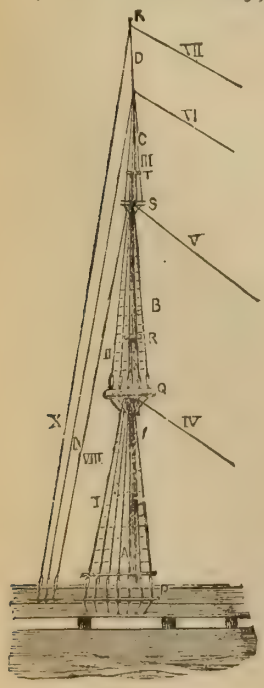


Fig. 1

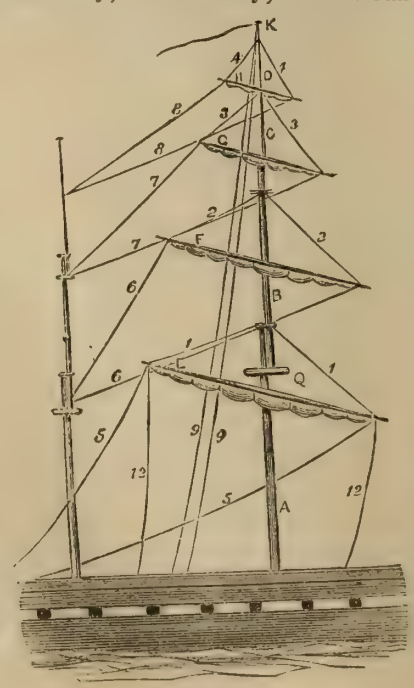


Fig. 2.

Rigging is either *Standing* or *Running*. The former is employed in maintaining, in fixed position, the masts and bow-sprit; the latter runs freely through numerous blocks, and its functions are to raise and lower the upper masts and the yards, to trim the sails, to hoist the signals and other flags, and occasionally to furl the sails.

Each mast has the following standing rigging: at each side *shrouds* (I., II., III.), consisting of several very thick (usually plaited) ropes; in front, the *stay* (IV., V., VI., VII.); and behind, the *backstays* (VIII., IX., X.), coming down to the ship's sides behind the shrouds. Across the lowermast and topmast shrouds, thin ropes, called ratlings, are hitched horizontally, and form convenient ladders for the men to use in going aloft. The standing rigging of the lower mast reaches the chains on the ship's sides; while the shrouds of the topmast and topgallantmast are worked into the top, their stays to the tops of the masts nearer the bow in each case (the bowsprit serving as an anterior mast for the fore-rigging); all the backstays, however, are brought down to the ship's sides. In steamers, the mainstays require modification, in order to avoid the funnel; they are often adjusted on a plan similar to that of the backstays. The standing rigging of the bowsprit consists of the bobstays (XIV.), generally of chain; the martingale stays (XI., XII.), and martingale backstays (XIII.), which all exert an adverse pressure to that of the stays from the foremast, topmast, &c.

The *running* rigging is of four classes: 1. Lifts for the upper masts and the jib-boom. These are not shown in the diagrams, from the fact that they run parallel, and closely contiguous to the masts, topmasts, and bowsprit.

2. The lifts for the yards and sails. Each yard has two lifts, one proceeding from a point near either extremity, and passing through a pulley at the head of that section of the mast to which the sail or yard belongs. They are worked either on the deck or in the top. The yard-lifts are shown by the numbers 1, 2, 3, 4. The gaff and boom have separate lifts working into the mizzen-top (13, 15). Each jib-sail has a lift (not shown), which acts parallel and close to IV., V., 10, or 11. If the ship carry stay-sails, there will be lifts parallel to the main and mizzen topmast stays and higher stays.

3. The ropes for adjusting the sails when spread. These comprise, first, the sheets for hauling down the lower corners of each sail—specimens are shown at 12; secondly, the braces for turning the yards about, to trim the sails to the wind. Each yard has two braces, one from either end passing to an adjoining mast, except the main braces, which are brought to the ship's side near the stern. The braces are shown as Nos. 5, 6, 7, 8. The vangs and

spanker sheet (14, 16) perform similar offices for the spanker. There are minor ropes in connection with the sails, for assisting in furling, reefing, spreading, &c.; but it would have rendered the diagram too complicated to have inserted them.

4. Ropes in connection with the flags. Each mast has at its head a *truck*, containing two or more small pulleys. Over each of these, a thin halyard is passed, and brought down double to the deck. On these, any required flag is rapidly bent and hoisted with great ease. There are two pair of similar halyards to the gaff-peak; and when the ship is to be decorated on any festive occasion, similar halyards are affixed to the end of each yard-arm.

In different classes of ships, slight modifications occur in the rigging, to suit particular circumstances, but the main principles of rigging are as detailed above for all sizes of decked vessels. See SAILS.

RI'GHI, a mountain of Switzerland, in the canton of Schwyz, between Lakes Lucurne, Zug, and Lowerz, is isolated, and commands extensive views of some of the finest Swiss scenery. It is easily accessible; six mule-paths and the R. railway opened in 1871, lead to the summit, which, though it forms an admirable natural observatory in favorable weather, is only 5905 feet above the sea. Verdant pastures clothe the entire summit, and the slopes are belted with forests. Crowds of tourists, of both sexes, ascend the R. every season, in order to enjoy the fine views, which, in clear weather, it commands. There is a large hotel at the top, where tourists pass the night, in order to see the sun rise. The native spelling is *Rigi*.

RIGHT, in Legal language, is that kind of interest or connection with a subject-matter which serves as a foundation for an action or suit, or other protection of a court of law or equity; and hence it means an interest that can be enforced, for if it is such as a court of law or equity cannot take notice of, it may be called a natural or moral, but it is not a legal right. Strictly speaking, right merely means a relation between external nature and some person or other, and therefore there is no such thing as abstract rights, for a right is only intelligible when predicated of some person who can exercise or enforce it. There is an old practical division of all rights into rights of the person and rights of things. In the former class are included such divisions as rights of personal security and liberty; rights connected with marriage, infancy, &c.; while in the latter class are included the general rights arising out of the possession of real and perspnal property. There are various subjects which do not fall under either division exclusively; indeed, none of the usual divisions of rights can be said to be more than vaguely descriptive of their subjects.

It might naturally be expected that the correlative legal expression for rights should be wrongs, but this is not the case, the word wrong being used technically to mean only that class of infringements of one's rights which are connected with the person or the personal use of property. Thus, the refusing or withholding payment of a debt is not correctly called a legal wrong; but an assault or injury to one's person, or to one's property, irrespective of any contract, is properly called a wrong or a tort. The word right is also used more or less technically, in a narrower sense. An action, called a writ of right, had for its object to establish the title to real property; but it was abolished, the same object being secured by the order of ejectment. A *petition of right* is a proceeding resembling an action by which a subject vindicates his rights against the crown, and recovers debts and claims, the first step being a petition, which is allowed by the home secretary, and referred for trial to a court of law. A *right of way*, is a right of a private owner or occupier to a way over the land of an adjoining proprietor, as incidental to his possession of a house, or premises, or land. *Right of action*, means simply a right to commence an action in one of the courts of law to recover damages or property. *Right of common*, means a right of one, who is not the owner or occupier of waste land, to send cattle to graze upon it, or to cut turf, or exercise some partial right of property over it. *Right of entry*, is a right to possess and use land or premises, &c.

RIGHTS, DECLARATION AND BILL OF. The convention which called the Prince and Princess of Orange to the throne of England, set forth, in a solemn instrument known by the name of the *Declaration of Rights*, those fundamental principles of the constitution which were to be imposed on William and Mary on their acceptance of the crown. This declaration, drawn up by a committee of the Commons, of which Mr. (afterwards Lord) Somers was chairman, and assented to by the Lords, began by declaring that King James II. had committed certain acts contrary to the laws of the realm. The king, by whose authority these unlawful acts had been done, had abdicated the throne; and the Prince of Orange having invited the estates of the realm to meet and deliberate on the security of religion, law, and freedom, the Lords and Commons had resolved to declare and assert the ancient rights and liberties of England. It was therefore declared, that the power of suspending and of dispensing with laws by regal authority is illegal; that the commission for creating the late Court of Commissioners for Ecclesiastical Causes, and all commissions and courts of the like nature, are illegal; that the levying of money for the use of the crown by prerogative, without grant of parliament, is illegal; that it is the right of the subjects to petition the king, and all prosecutions for such petitioning are illegal; that the raising or keeping of a standing army in time of peace, except with consent of parliament, is illegal; that Protestant subjects may have arms for their defence; that the election of members of parliament should be free; that freedom of speech in parliament should not be questioned in any place out of parliament; that excessive bail ought not to be required, or excessive fines imposed, or cruel or unusual punishments inflicted; that jurors should be duly impanneled, and that jurors in trials for high treason should be freeholders; that grants and promises of fines and forfeitures before conviction are illegal; and that for redress of all grievances, and the amendment, strengthening and preserving of the laws, parliaments ought to be held frequently.

All these things the Lords and Commons claimed as their undoubted rights and liberties; and having done so, they resolved that William and Mary should be king and queen of England for their joint and separate lives, the administration being during their joint lives in William alone; and that on their decease the crown should descend to the issue of the queen, then to that of Anne and her posterity, and, failing them, to the issue of William.

This Declaration of Rights was presented to the Prince and Princess of Orange at Whitehall, and accepted by them along with the crown. Being originally a revolutionary instrument, drawn up in an irregular assembly, it was considered necessary that it should be turned into law. The Declaration of Rights was therefore brought forward in the parliament, into which the convention had been turned, as a Bill of Rights, and passed the Commons; but an amedment proposed in the Lords regarding the settlement of the crown on the issue of the Princess Sophia, in the event of Mary, Anne, and William all dying without issue, led to several ineffectual conferences between the two Houses, which ended in the measure being dropped. The bill was, however, reintroduced in the following session of parliament (1689) without the proposed amendment, when it passed both Houses, and obtained the royal assent—a clause, however, being added, which originated in the House of Lords, to the effect that the kings and queens of England should be obliged, on coming to the throne, in full parliament or at the coronation, to repeat and subscribe the declaration against transubstantiation, and that a king or queen who should marry a papist would be incapable of reigning in England, and his subjects would be absolved from their allegiance.

RIGHTS OF MAN, a famous statement of rights, principally drawn up by Dumont, author of the *Souvenirs de Mirabeau*, and solemnly adopted by the French National Assembly on the 18th August 1789. It declares that all mankind are originally equal; that the ends of the social union are liberty, property, security, and resistance to oppression; that sovereignty resides in the nation, and that all power emanates from it; that freedom consists in doing everything which does not injure another; that law is the expression of the general will; that public burdens should be borne by all the members of the state in proportion to their fortunes; that the elective franchise should be extended to all; and that the exercise of natural rights has no other limit than their interference with the rights of others. Mirabeau endeavored in vain to induce the Assembly to postpone publishing any declaration of rights until after the formation of the constitution; but the deputies, feeling that a contrary course might imperil their popularity, issued the declaration—a proceeding which Dumont himself afterwards compared to placing a powder-magazine under a building, which the first spark of fire would blow into the air. Louis XVI., under the pressure of the events of the 5th of October, after first refusing, was induced to yield his adhesion to it. The dogma of the equality of mankind on which the declaration rests, had before been set forth in the American Declaration of Independence of 1776. Thinkers are now much less inclined than they were in the age of Rousseau to build social theories on such abstract, *a priori* assumptions; and the truth of this doctrine of original equality is directly impugned. Dumont himself asks: 'Are all men equal? Where is the equality? Is it in virtue, talents, fortune, industry, situation? Are they free by nature? So far from it, they are born in a state of complete dependence on others, from which they are long of being emancipated.'

The principles laid down in the *Rights of Man* were attacked by Edmund Burke in his *Reflections on the French Revolution*, who represented the declaration as a digest of anarchy. It was in reply to Burke's *Reflections* that Thomas Paine published in London his *Rights of Man*, an apology for, and commentary on,

the principles of the French constitution, for which he was prosecuted for libel on an information by the attorney-general, and found guilty.

RIGID DYNAMICS is that portion of theoretical Dynamics (q. v.) which, based on the theory of the free and constrained motion of *points*, applies the principles thence deduced to a *system* of points rigidly connected, so as to bear throughout the whole continuance of their motion the same invariable position with relation to each other; in other words, as no body in nature can be considered as a point, but is truly a system of points, rigid dynamics has for its aim to apply the abstract theory of dynamics to the cases actually occurring in nature. For a long time, problems of this sort were not resolved by any general and adequate method, but each class was worked out according to a method specially applicable to its particular circumstances. The great general principle discovered by the French geometer, commonly known as *D'Alembert's principle*, which applies equally to all such problems, and removes the necessity for specially investigating each particular case, was an inestimable boon to mechanical science. It is thus stated in his *Traité de Dynamique:* 'In whatever manner a number of bodies change their motions, if we suppose that the motion which each body would have in the following moment, if it were perfectly free, is decomposed into two others, one of which is the motion which it *really* takes in consequence of their mutual actions, then the other component will be such, that if each body were impressed by a force which would produce it alone, the whole system would be in equilibrium. In this way every dynamical problem can be compelled to furnish an equation of equilibrium, and so be changed into a problem of *Statics* (q. v.); and thus the solution of a difficult and complex problem is effected by means of the resolution of a much easier one. D'Alembert applied his principle to various problems on the motions and actions of fluids, the precession of the equinoxes, &c.; and subsequently, in a modified form, the same general property was made the basis of a complete system of dynamics, by La Grange, in his *Mécanique Analytique.*

RI'GOR MO'RTIS is the term usually given to the peculiar temporary rigidity of the muscles that occurs shortly after death. It begins immediately after all indications of irritability (see MUSCLE) have ceased, but before the commencement of putrefaction. In the human subject it most commonly begins to show itself about seven hours after death, although cases are occasionally met with in which 20, or even 30, hours may have elapsed before it begins to appear. This condition of rigidity usually lasts for about 30 hours; but it may pass off in ten hours or less, or may be prolonged to four or six days. The muscles of the neck and lower jaw are first affected, then those of the trunk, then those of the upper extremities, and lastly those of the lower extremities. In its departure, which is immediately followed by decomposition, the same order is followed.

This subject has been admirably discussed by Dr. Brown-Sequard in the 'Croonian Lecture' for 1861, and contained in *The Proceedings of the Royal Society* for that year. In this lecture he examines successively the relations existing between muscular irritability, *post-mortem* rigidity, and putrefaction, in a variety of cases. The following are his chief conclusions: 1. Paralyzed muscles are endowed with more irritability than healthy muscles; cadaveric rigidity sets in late, and lasts long; and putrefaction appears late, and progresses slowly. 2. Experiments made on numerous animals show that when muscular irritability is increased by a diminution of temperature, the increase has the same effect upon rigidity and putrefaction as when it is caused by paralysis. As a general rule, when there was a difference of 14° to 18° F. in the temperature of two animals of the same age and species, irritability and rigidity lasted twice or three times longer in the cooler animal than in the other, and putrefaction in the former was much less rapid.

3. It was maintained by John Hunter that cadaveric rigidity does not take place after death by lightning; but it is now known that this view is not generally true. When lightning destroys life by producing such a violent convulsion of every muscle in the body that muscular irritability at once ceases, the ensuing rigidity may be of such short duration as to escape notice; but if it causes death by fright, hæmorrhage, or concussion of the brain, cadaveric rigidity will appear as usual. 4. In animals that have been over-driven, hunted to death, &c., rigidity comes on very quickly, lasts for a very short time, and is rapidly succeeded by putrefaction; and various facts quoted by Brown-Sequard show that over-exertion acts similarly in man. 5. The nutrition of the muscles exerts a modifying influence on rigidity and putrefaction. In cases of death from decapitation, strangulation, sudden hæmorrhage from a wounded artery, &c., cadaveric rigidity does not begin till 16 or 18 hours after death, and lasts from six to eight days; while in a case of death from exhaustion, after a prolonged typhoid fever, rigidity became evident within three minutes after the last breathing, while the heart was still beating; disappeared in a quarter of an hour, and was at once succeeded by signs of putrefaction before the man had been dead an hour. 6. When death follows violent and prolonged convulsions (as in cases of tetanus, hydrophobia, &c.), cadaveric rigidity sets in soon (usually within an hour after death), and ceases before the end of the tenth hour; and when the convulsions were caused by strychnine, similar results were obtained.

From these facts this accomplished physiologist deduces the general law, that 'the greater the degree of muscular irritability at the time of death, the later the cadaveric rigidity sets in, and the longer it lasts, the later also putrefaction appears, and the slower it progresses.'

The exact cause of this rigidity is not accurately known. The old view that it depended on the coagulation of the blood is no longer tenable. It most probably results from the spontaneous coagulation of a fibrinous material contained in the muscular juice.

R'IGVEDA, the first and principal of the four Vedas. See VEDA.

RI'MA-SZO'MBATH, a market-town of Hungary, on the river Rima, 23 miles north-east of Pesth. Articles in wood are largely manufactured, and there is a trade in linen and bullock's hides. Pop. (1880) 4500.

RI'MINI (ancient *Ariminum*), a city of Central Italy, province of Forli, in Romagna. It is situated on the river Marecchia, and though the ancient harbor has been gradually filled up by the sands brought down by that stream, the port is still the resort of a large number of vessels engaged in fisheries, which employ nearly half the pop. of the town. Pop. (1871) 10,000. R. has fine streets, well-built houses, a handsome town-hall with porticoes, many fine churches, among others the cathedral built by Leon Battista Alberti, the interior of which is full of monuments; outside it is adorned with sarcophagi. It has a library, many superior schools, and two orphan asylums. Among its ancient monumental edifices still remaining, may be numbered the marble Bridge of Augustus over the Marecchia, and the marble Arch of Augustus. Its manufactures are glass and sail-cloth. R. was founded by the Umbri; it was conquered by the Romans, sacked by Sulla, frequently destroyed by the Barbarians, then given by Charlemagne to the Church.

RINDERPEST. See CATTLE-PLAGUE.

RINFORZA'NDO (Ital., strengthening), in Music, a direction to the performer indicating increased tone and emphasis.

RING (Sax. *ring* or *hring*, a circle or circular line), a circle of gold or other material. The practice of wearing rings has been widely prevalent in different countries, and at different periods. Rings have been used to decorate the legs, arms, feet, toes, neck, fingers, nose, and ears. The practice of wearing rings suspended from the nose, which is bored for that purpose, has been found among various savage tribes, more particularly the South-Sea islanders. Bracelets, necklaces, and ear-rings have been worn among nations both savage and civilized; but the most universal and most famous use of rings is on the finger. Finger-rings are alluded to in the Books of Genesis and Exodus; Herodotus mentions that the Babylonians wore them; and from Asia they were probably introduced into Greece. The rings worn in early times were not purely ornamental, but had their use as signet-rings. The Homeric poems make no mention of rings, except ear-rings; but in the later Greek legends, the ancient heroes are described as wearing finger-rings; and every freeman throughout Greece seems afterwards to have had one. The practice of counterfeiting signet-rings is alluded to as existing in Solon's time. The devices on the earlier rings were probably cut in the gold; but at a later period, the Greeks came to have rings set with precious stones, which by and by passed from articles of use into the category of ornament. Persons were no longer satisfied with one ring, but wore two or three—and their use was extended to women. The Lacedæmonians wore iron rings. The Romans are said to have derived the use of rings from the Sabines; their rings were at first, as those of the Greeks, signet-rings, but made of iron. Every free Roman had a right to wear one; and down to the close of the republic, the iron ring was worn by those who affected the simplicity of old times. Ambassadors, in the early age of the republic, wore gold rings as a part of their official dress—a custom afterwards extended to senators, chief magistrates, and in later times to the equites, who were said to enjoy the *jus annuli aurei*, from which other persons were excluded.

It became customary for the emperors to confer the *jus annuli aurei* on whom they pleased, and the privilege grew gradually more and more extensive, till Justinian embraced within it all citizens of the empire, whether *ingenui* or *libertini*. The signs engraved on rings were very various, including portraits of friends or ancestors, and subjects connected with mythology or religion; and in the art of engraving figures on gems, the ancients far surpassed artists of modern times. The later Romans, like the

Greeks, crowded their fingers with rings, and the more effeminate among them sometimes had a different ring for summer and winter. Rings entered into the groundwork of many oriental superstitions, as in the legend of Solomon's ring, which, among its other marvels, sealed up the refractory Jins in jars and cast them into the Red Sea. The Greeks mention various rings endowed with magic power, as that of Gyges, which rendered him invisible when its stone was turned inwards; and the ring of Polycrates, which was flung into the sea to propitiate Nemesis, and found by its owner inside a fish; and there were persons who made a lucrative traffic of selling charmed rings, worn for the most part by the lower classes.

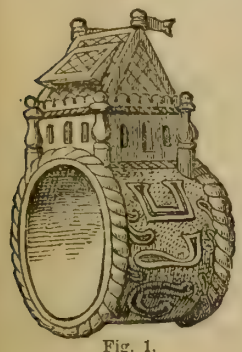


Fig. 1.

Various explanations have been given of the connection of the ring with marriage. It would rather appear that wedding-rings were worn by the Jews prior to Christian times. Fig. 1 shows a Jewish marriage ring beautifully wrought in gold filigree, and richly enamelled, now in the possession of Lord Londesborough. It has been said that as the delivery of the signet-ring to any one was a sign of confidence, so the delivery of a ring by the husband to the wife indicated that she was admitted into his confidence. Another explanation is, that the form of the ring symbolizes eternity and constancy; and it has been alleged that the left hand was chosen to denote the wife's subjection to her husband, and the third finger, because it thereby pressed a vein which was supposed to communicate directly with the heart.

The third finger has always been selected as the finger on which official rings are to be worn. Bishops on their consecration receive a ring to be worn on the third finger of the right hand, in order to indicate ecclesiastical authority, and doctors were formerly in use, for a similar reason, to wear a ring on the same finger. A ring has been much used at betrothal as well as marriage, and in many parts of the continent of Europe a wedding-ring is worn by the husband as well as the wife. In Britain, rings are occasionally worn on all the fingers except the first finger and thumb; the Germans usually wear a signet-ring on the first finger. During the 16th, 17th, and 18th centuries it was a very common practice to have mottoes inscribed on rings (fig. 2), including wedding-rings, and the motto was called the *posy* or *chanson*. The ring was the symbol of the dominion of Venice over the Adriatic; and yearly, on Ascension Day, a ring was thrown by the doge from the ship *Bucentaur* into the sea, to denote that as the wife is subject to her husband, so is the Adriatic Sea to the republic of Venice.



Fig. 2.

In pagan times in Europe, the ring seems to have been connected with fidelity or with espousals. Fig. 3 shows a form of

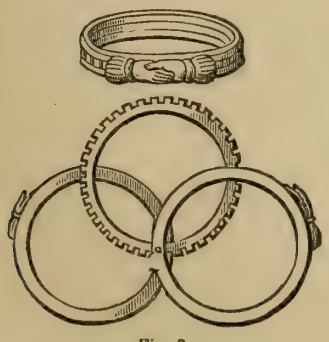


Fig. 3.

betrothal ring called a *gimmal*, or linked ring, which was used in later times; the upper fig. shows the three parts brought together; the lower fig., the parts separately. By an ancient Norse custom, described in the *Eyrbrygia Saga*, when an oath was imposed, he by whom it was pledged passed his hand through a silver ring, sacred to that ceremony; and in Iceland the ceremony of betrothal used to be accompanied by the bridegroom passing his four fingers and thumb through a large ring, and in this manner receiving the hand of the bride, as represented in a woodcut in an old edition of *Olaus Magnus*. As lately as 1780, the practice existed in Orkney of a man and woman plighting their faith at the Standing Stones of Stennis by joining their hands through the perforated stone of Odin.

Rings were greatly used in ancient Egypt. They were called *tebh*, finger-rings, and *khatem*, signets, both kinds being represented in the sculptures and mentioned in the hieroglyphs. Besides these two classes, solid rings of gold and silver were used as money. Rings for the fingers are of the most remote antiquity, and were the emblems of rank and power. They were of two kinds; the solid ring, made of gold, silver, copper, or iron, having a square or oval bezel, on which the subject to be impressed was sunk or cut in intaglio. The oldest of these were of gold, iron not having been in use till the Roman rule over Egypt, or about the 1st c. A.D. A remarkably fine specimen is one of a Hemphite priest or flamen of the monarch Cheops, who lived in the time of the 26th dynasty, about the 5th c. B.C. But rings of this class are probably not so old as the other kind, which have a square or oblong plinth of gold, stone, or glass, on which the subjects are engraved also in intaglio. These plinths are pierced through their long axis to admit the metal ring on which they revolve, and are secured to it by wire coiled round the ring at the place of insertion. Scarabæi of glazed steatite, set in frames of gold or silver, were often used for bezels. The bezels have their base engraved with hieroglyphs and other subjects, the names of monarchs, figures of deities, mottoes, and devices. Such rings were used by functionaries; and in the account of the investiture of Joseph in the Book of Genesis, a ring was put on his finger as a symbol of his rank.

The poorer classes had rings of ivory or blue porcelain, with solid oval bezels, having in intaglio similar subjects. Rings appear to have been placed on all the fingers, and even the thumb, and the hands of ladies were loaded with these costly ornaments. A cat, emblem of the goddess Bast or Pasht, the Egyptian Diana, was a favorite subject of ladies' rings. The third finger of the left hand was the ring finger. Some remarkable instances of gold rings with revolving bezels have been found, as that of Thothmes III. in the collection of Lord Ashburnham, and another with the name of the monarch Horus, which contained gold to the value of £20. Such rings could give two impressions, like the seal and counterseal of modern times.—Wilkinson, *Mann. and Cust.*, vol. iii. pp. 370 and foll.; Bonomi, *Trans. R. Soc. Lit.*, New Series, vol. i. p. 108; Prisse, *Mon. Egypt.*, Pl. xlvii.; also *Antique Gems and Rings*, by King, 2 vols., 1872; *Finger Ring Lore*, by William Jones, F.S.A., 1876.

RINGBONES consist of a circle of bony matter round the horse's coronet, are most common in the fore limbs of draught horses with short upright pasterns, and much worked upon the hard roads; but they also occasionally appear on the hind limbs of lighter-bred horses. They seldom cause lameness, except when rapidly and recently formed; but as they are apt to stiffen the neighboring joints, they constitute unsoundness. Rest should be enjoined, and cold bran poultices or swabs, kept cool and moist by any refrigerant mixture, applied continuously until heat and tenderness are removed, when the fetlock is to be fired or dressed with fly-blister, or the ointment of the red iodide of mercury.

RING DOVE. See PIGEON.

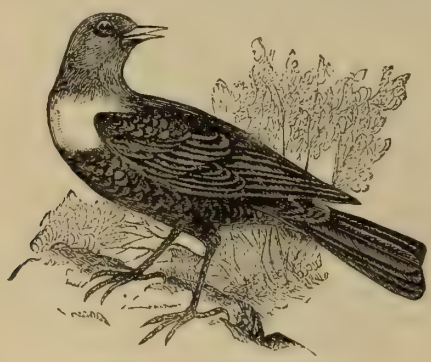
RING MONEY. At an early stage of society, prior to the invention of coinage, but after the inconveniences of direct barter had been discovered, the precious metals, formed into rings, were used as a medium of exchange; these same rings being also serviceable in some cases as personal ornaments. The use of ring money among the Egyptians is proved by representations of gold and silver money in their paintings, an instance of which is to be seen in one of the grottoes in the Hill of Shek Aba at Quorneh, which bears the cartouche of Amunoph II. inscribed on its walls. The gold or silver rings were formed of a wire or bar of metal bent into a circle, but not quite united at the extremities, so that it could be easily made into a chain, from which portions could be detached at pleasure. It seems probable that the individual loops were not adjusted to a particular weight, but that each bundle of loops amounted in the aggregate to a particular weight. A metallic currency of this kind seems to be alluded to in the incident in the Book of Genesis, of the Hebrew patriarchs finding their money 'in full weight' at the mouth of their sacks. Ring money, both of gold and silver, similar to what is represented in the Egyptian paintings, was brought by Mr. Bonomi from Nubia. Some of the silver rings had been worn as bracelets, and were ornamented with engraved work. This kind of currency has probably never gone out of use in some parts of Africa since the remote period when it was employed in paying the exactions of the Pharaohs. Ring money for African traders is regularly manufactured at Birmingham of copper, or an alloy of copper and iron, and known under the name of 'Manillas.'

The ring money of the East found its way at an early period to Western Europe, including the British Islands. In Sweden and Norway its use seems to have continued down to the 12th c., or even later. A Norse law made about the year 1220, alludes to an established ring money, of which each ring was of a definite weight. The medieval ring money had so far advanced beyond the Egyptian as to have each ring adjusted to a special weight, for which it might pass without weighing. Cæsar mentions gold

and iron rings as used in Gaul and Britain for money; and gold and silver, and occasionally brass, ring money has been dug up in many parts of Britain, consisting of bars of metal bent in a circular shape; the ends in what seem to be the older specimens are left plain; in those of later times, they are flattened and ornamented. One example, found in one of the *Weems*, or subterranean dwellings of the island of Shapinshay in Orkney, is composed of three bars of gold twisted together like a cord. A remarkable silver chain of 33 rings, weighing above 93 ounces, was dug up in 1805 near Inverness, in the course of the excavations for the Caledonian Canal, and is now in the museum of the Scottish Antiquaries. Some of the larger specimens of gold ring money are very highly decorated. The gold torque worn round the neck of the Gallic warriors, weighing sometimes as much as four pounds, besides being a personal ornament, was adjusted to a certain weight as money.

Among the various modifications of ring money in use in different countries, may be mentioned the silver fish-hook money of Ceylon, mentioned by Tavernier, of the form of a flat wire bent into a hook, and issued as late as 1659. Specimens of it have lately been dug up.

RING OUZEL (*Turdus torquatus*, or *Merula torquata*), a species of thrush, rather larger than the blackbird, which it much resembles. It is a native of Europe, and chiefly of the western parts of it; spends the winter in the south of Europe or in Africa, and visits more northern regions in summer. It is of frequent occurrence in many parts of the British Islands. It is seldom seen in the more cultivated and thickly-peopled districts, but prefers mountain slopes, heaths, and their vicinity. It makes its nest generally in heathy banks, often under a bush. The nest is of coarse grass, within which is a thin shell of clay, and an inner lining of fine dry grass. The R. O. is a constant visitor of gardens in the neighborhood of its haunts, committing great depreda-



Ring Ouzel (*Turdus torquatus.*)

tions, particularly when cherries are ripening. In Scotland it is known as the *Moor Blackbird*. It is of a bark-brown color, almost black; the feathers edged with blackish-gray, the feathers of the wings more conspicuously edged with gray; a crescent-shaped white collar on the throat. The song consists of a few loud, clear, and plaintive notes.

RI'NGWORM is a popular term for several distinct forms of skin-disease which occur in patches of a circular or annular form on the body, and especially on the scalp. Thus, a species of Lichen (q. v.), known to dermatologists as *Lichen circumscriptus*, in which the papules assume a circular arrangement, is commonly



Parasitic Fungus from the Root of the Hair in a case of True Ringworm, highly magnified.

(Copied from Aitken's *Science and Practice of Medicine*, 3d ed.)

A, isolated spores; B, spores united at their ends; C, C, empty tubes; D, sporular tubes.

regarded as ringworm; and the two species of Herpes (q. v.), known as *Herpes circinatus* and *H. Iris*, in which the vesicles occur in circular patches and in concentric rings, are usually included in the same term. None of these are, however, cases of true ringworm (*Tinea tondens*), which is a disease dependent on the presence of a special vegetable (fungous) parasite, now known to botanists as the *Trichophyton tonsurans*, or hair-plant, and discovered in 1845 by Malmsten. It consists of oval, transparent spores or globules, about $\frac{1}{7000}$th of an inch in diameter, for the most part isolated, but sometimes connected by articulated filaments. This fungus is seated in the interior of the hair-roots, and the hairs and the fungi simultaneously increase in size. The diseased hairs lose their elasticity and break, when they have risen a line or two above the scalp. In these cases the short stump of hair soon loses all its characteristics. If the hair breaks before emerging from the scalp, a little prominence is formed, consisting of fungus, epidermis, and sebaceous matter, and the assemblage of such little prominences gives the scalp the rough appearance known as goose-skin. This parasite exists, according to Dr. Aitken—whose *Science and Practice of Medicine* contains an excellent abstract of all that is known regarding parasitic diseases—'in the *Herpes tonsurans* of Cazenave, which is the *Porrigo scutulata* of Willan, the *Tinea tonsurans* of Bazin, and the *Trichosis furfurans* of Erasmus Wilson and Dr. Wood.' There are three varieties of true ringworm, which are described by Aitken under the following names: (1.) Ringworm of the Body (*Tinea circinatus*); (2.) Ringworm of the Scalp (*Tinea tonsurans*); and (3.) Ringworm of the Beard (*Tinea sycosis*).

1. *Ringworm of the Body* first appears as a rose-colored and slightly-elevated spot about the size of a fourpenny-piece, on which a bran-like desquamation of epidermis soon begins, accompanied by slight itching. This spot gradually increases in size, but retains its circular form; and as it extends, the healing process commences at the center, so that the circular red patch is converted into a ring, enclosing a portion of healthy skin; and a ring thus formed may continue to increase till it reaches a diameter of four inches, or even more. It is apt to affect the face, the neck, the back, and the outside of the wrist. This form of ringworm frequently terminates spontaneously.

2. *Ringworm of the Scalp* usually occurs in children, and is especially prevalent when the nutrition is defective, or there is a scrofulous taint in the constitution. It appears in the form of round, scaly, irritable patches on different parts of the head; and the irritation often occasions the formation of minute vesicles. The hairs at these spots become dry and twisted, and are easily extracted; and when the disease advances, they break close to the scalp if an attempt is made to extract them. The stumps, and the epidermis surrounding them, become covered with a characteristic grayish-white powder, consisting of the sporules of the fungus. The diseased parts are slightly elevated and puffy, and differ from the healthy scalp in color, being bluish or slate-colored in dark persons, and grayish-red or yellow in fair patients. The inflammation will last as long as the growth of the fungi continues; and even when they die spontaneously, as sometimes occurs, the affected spots remain permanently bald, in consequence of the hair-bulbs having become obliterated.

3. *Ringworm of the Beard* is chiefly met with on the chin, hairy part of the cheeks, and upper lips of men; but it occasionally attacks the axillæ and pubic region of women. It commences like ringworm of the body, but when the deeper structures become affected, pustular indurations, resembling Acne (q. v.), occur, and the hairs become readily detached. On examining the hairs under the microscope, it is seen that they are thickened; that their bulbs are partially disorganized; and that the medullary portion is atrophied.

The essential point in the treatment of all the varieties of true ringworm, is to apply to the roots of the hairs a preparation which will destroy the fungus; but before this can be done, the hair must be removed, if the disease has not already effected the removal sufficiently. This is best effected with small pincers about three inches long, and constructed so that the two extremities, which should be a couple of lines broad, shall come together very exactly. Or, in place of using the forceps, an ointment, composed of lime and carbonate of soda, of each 1 part, and 30 parts of lard, may be applied, which will soon remove the hair. French dermatologists recommend the application of 'l'Huile de Cade,' or 'oil of pitch,' obtained by the dry distillation of the wood of the *Juniperus oxycedrus*, to the part from which the hairs are to be removed, believing that it lessens the sensibility, and tends to loosen the attachment of the hair. In order to destroy and remove the plant, lint dipped in a solution of sulphurous acid should be continuously applied—sulphurous acid being probably the most energetic parasiticide at present known. Amongst the solutions that have been applied with the same object, may be mentioned that of corrosive sublimate, 1 part to 250 of water. The general health must be at the same time attended to, and the internal use of cod-liver oil may usually be advantageously combined with the local applications.

Ringworm in the lower animals, as in the human subject, con-

sists of the growth of a vegetable fungus on the surface of the skin, is common amongst young animals, is decidedly contagious, and communicable from man to the lower animals, and probably, also, from the lower animals to man. Commencing with a small itchy spot, usually about the head or neck, or root of the tail, it soon spreads, producing numbers of scurfy circular bald patches. It is unaccompanied by fever, and seldom interferes seriously with health. After washing with soap and water, run over the spots lightly every day with a pencil of nitrate of silver, or rub in a little of the red ointment of mercury, or some iodide of sulphur liniment.

RINNS OF GALLOWAY. See WIGTONSHIRE.

RIOBA'MBA, a town of Ecuador, 100 miles south from Quito, situated among the Andes, on an affluent of the Pastasa, a large branch of the Amazon. It is sometimes called New R., having been built instead of a former town of the same name, which was destroyed by an earthquake in 1797, and the ruins of which are 9 miles distant, at the foot of Chimborazo. Pop. about 16,000, in great part consisting of Indians.

RI'O BRA'NCO, a river of Brazil, the largest affluent of the Rio Negro, rises near the sources of the Orinoco, in lat. about 3° N., long. about 64° W. It flows first east to long. 61° W., and then south-south-west to the Rio Negro, which it joins after a course estimated at 700 miles in length. At its junction with the Negro it is upwards of a mile in breadth, and its lower course resembles a string of lakes connected by narrow canals. Its navigation is much impeded by rapids and waterfalls.

RIO BRAVO DEL NORTE, or RIO GRANDE. See BRAVO DEL NORTE.

RI'O DE JANEI'RO, a maritime province in the south-east of Brazil, bounded on the S. and E. by the Atlantic. Area 26,530 sq. m.; pop. without the city (1872) 782,724. The coast on the north-east is low and lined with lagoons; but in the south the scenery of the shores is unusually beautiful. Mountain-ranges occupy the middle of the province, among which the peaks of the Organ Mountains, rising to from 6000 to 7000 feet, are conspicuous. Of the rivers the Parahiba is the chief. The soil is fertile, and the principal productions are sugar, coffee, cocoa, cotton, rice, and maize. The province is traversed by a railway. The capital is Praia Grande or Netherohy, which, including the district of St. Domingo, contains about 25,000 inhabitants. The largest and most important town, however, is Rio de Janeiro (q. v.).

RIO DE JANEIRO, generally called RIO, the capital of the Brazilian empire, and the largest and most important commercial emporium of South America, stands on a magnificent harbor, 75 miles west of Cape Frio, in lat. 22° 54′ S. long. 43° 15′ W. The harbor or bay of R., said, and apparently with justice, to be the most beautiful, secure, and spacious bay in the world, is land-locked, being entered from the south by a passage about a mile in width. It extends inland 17 miles, and has an extreme breadth of about 12 miles. Of its numerous islands, the largest, Governor's Island, is six miles long. The entrance of the bay, guarded on either side by granite mountains, is deep, and is so safe, that the harbor is made without the aid of pilots. On the left of the entrance rises the peak called, from its peculiar shape, Sugar-loaf Mountain; and all around the bay, the blue waters are girdled with mountains and lofty hills of every variety of picturesque and fantastic outline. The harbor is protected by a number of fortresses. The city stands on the west shore of the bay, about 4 miles from its mouth. Seven green and mound-like hills diversify its site; and the white-walled and vermillion-roofed houses cluster in the intervening valleys, and climb the eminences in long lines. From the central portion of the city, lines of houses extend four miles in three principal directions. The old town, nearest the bay, is laid out in squares; the streets cross at right angles, are narrow, and are paved and flagged; and the houses, often built of granite, are commonly two stories high. West of it is the elegantly built new town; and the two districts are separated by the Campo de Santa Anna, an immense square or park, on different parts of which stand an extensive garrison, the town-hall, the national museum, the palace of the senate, the foreign office, a large opera-house, &c. From a number of springs which arise on and around Mount Corcovado (3000 feet high, and situated 3¼ miles south-south-west of the city), water is conveyed to R. by a splendid aqueduct, and supplies the fountains with which the numerous squares are furnished.

Great municipal improvements have within recent years been introduced; most of the streets are now as well paved as those of the finest European capitals; the city is abundantly lighted with gas; and commodious wharfs and quays are built along the water-edge. R. contains several excellent hospitals and infirmaries, asylums for foundlings and female orphans, and other charitable institutions, some richly endowed; about fifty chapels and churches, generally costly and imposing structures, with rich internal decorations; and several convents and nunneries. In the College of Pedro II., founded in 1837, the various branches of a liberal education are efficiently taught by a staff of eight or nine professors; the Imperial Academy of Medicine, with a full corps of professors, is attended by upwards of 300 students; there is also a theological seminary. The national library contains 100,000 vols. The trade and commerce of R. is great, and is annually increasing. In the period 1870—80, the value of the total imports was about £9,500,000 per annum; the total value of exports varied from £9,000,000 to £10,500,000. In the year 1878–79, the value of coffee exported was £9,242,156; gold in bars and dust, £192,630; diamonds, £46,774; tobacco, £79,635; hides, £84,686. In 1875–76, the total shipments of coffee amounted to £8,891,138. The value of imports, consisting of silk, linen, cotton, and woollen goods, iron, &c., was £9,000,000 in 1877. In 1877, 3411 foreign vessels, of 1,657,452 tons, entered and cleared the port. Steam communication with other ports of Brazil is frequent; European steamships arrive and depart almost daily, and there is telegraphic connection with Europe. The capital and its environs are served by two railways, and eight different lines of tramway. Pop. (1872) 274,972.

The vicinity of R. was first settled by the French in 1555, but was occupied in 1567 by the Portuguese, who founded the present city, and gave to it the name of St. Sebastian. For the space of 140 years after its foundation, the city enjoyed a state of tranquil prosperity, and in 1763 it superseded Bahia as the seat of government, and became the residence of the viceroys of Portugal. On the proclamation of independence in 1822 (see BRAZIL), R. became the capital of the Brazilian empire.

RIO GRANDE, a name sometimes applied to the upper course of the river Parana (q. v.) in Brazil.

RIO GRANDE, a river of Senegambia (q. v.).

RIO GRANDE, or RIO GRANDE DEL NORTE. See BRAVO DEL NORTE.

RIO GRANDE DO NORTÉ, a small maritime province of Brazil, occupies the north-east angle of the country, and is bounded on the N. and E. by the Atlantic. Area, 22,000 sq. m.; pop. (1872) 233,979. It derives its name from a river, formerly called the Rio Grande, and now called the Potengi, which flows into the Atlantic at Natal; but the principal river is the Piranhas. The surface is flat along the shores, which are skirted by many dangerous shoals, but is hilly and mountainous in the interior. Salt is obtained in large quantity from a number of salt lakes, and building-stone is abundant. The soil, generally sterile, is fertile on the river-banks. The principal crop raised is cotton, and large herds of horses and cattle are reared on the pastures, which are extensive. About 35,000 bags of cotton were exported in 1881. The capital is Natal (q. v.).

RIO GRANDE DO SUL, or, to give the name in full, SAO PEDRO DO RIO GRANDE DO SUL, a maritime province of Brazil, constituting the extreme south portion of the empire of that name. It is bounded on the N. and W. by the river Uruguay, on the S.W. by the republic of Uruguay, and on the S.E. by the Atlantic. Area, 85,239 square miles; pop. (1872) about 455,000. The central districts are occupied by a range of mountains, which runs almost parallel to the Uruguay, and from which the land falls away into plains towards the Uruguay on the west, and the Atlantic on the east. Between the mountains and the flat coast regions are the large lakes Merim and Des Patos—the latter, 175 miles long and about 40 miles broad. Its salubrity of climate and fertility of soil admirably adapt it for European immigration. The great wealth of the province is in its flocks and herds, which are reared in great numbers on the *campinas* or prairies. It is stated that 500,000 cattle, whose hides and flesh are preserved, are slaughtered here annually, while as many more are driven northward for ordinary consumption. All the cereals and fruits of Central Europe can be grown here advantageously, and the inhabitants are awakening to the importance of developing the immense agricultural resources of the province. A considerable area is now covered with crops of maize, beans, wheat, and potatoes, and the agricultural products, which, till recently, were of little account, now form one-eighth of the whole exports. The gold-mines of the province have yielded in one year 6100 ounces, the value of which is stated at £25,000.

The principal articles of export of the province are beans, horns, hair, cattle and horse hides, grease and tallow, jerked or dried beef, tongues, mandioc flour, and maize. Of the most of these articles, the quantity exported has increased so rapidly as in a few years to be considerably more than doubled. Half of all the imports of the province consists of cotton, woollen, and linen manufactures, coals, earthenware, and hardware from Great Britain. The principal towns are Porto Alegre (q. v.) and Sao Pedro (or Rio Grande). The latter, a prosperous and increasing seaport at the south extremity of the Lake des Patos, and close to the sea (pop. 18,000), imported in 1882 goods to the value of £1,393,000. The chief articles of export were, beef valued at

£500,000; and hides, tallow, and hair, &c., £893,000. The shipping entered in 1881, consisted of 554 vessels of 133,777 tons; and cleared, 555 of 133,208 tons. The trade is conducted almost wholly by Englishmen and Germans.

RIOM, a small town of France, in the dep. of Puy-de-Dôme, is picturesquely situated on a hill, 1173 feet above the sea, 8 miles north-north-east of Clermont. It is built of dark lava, and is a perfect treasure of domestic architecture, especially of the Renaissance period. Linen, leather, and brandy are manufactured. Pop. (1876) 8733.

RI'O NE'GRO, one of the principal affluents of the Amazon, rises in an unexplored district of the south of the United States of Colombia (New Granada), flows in a general south-south-east direction, and joins the Amazon at Manaos, after a course estimated at 1000 miles in length. It receives from the north the Cassiquiare (q. v.), by means of which communication is established between the Orinoco and the Amazon; also the Cababuri, Padaviry, Branco, and other large streams; from the south comes its greatest affluent, the Vaupes. It is 1½ miles broad when it enters the Amazon.

RIO NEGRO, a river of South America, forms the greater part of the boundary between the Argentine Republic and Patagonia. At its source, it is called by the natives Melly-roumey-co—i. e., *four small rivers*—from the fact that it is formed by four head-waters from the bosom of the Cordilleras. It is afterwards called by the natives Courou-roumey-co, or Black River (Span. Rio Negro), from the dark color of its waters, caused by the depth and narrowness of its channel. It flows first north-east, then east and south-east through the plains to the Atlantic, into which it falls in lat. 41° 3′ S., after a course of upwards of 700 miles. Shoals and islands obstruct its channel, and it is navigable only for 20 miles above its mouth.

RIONE'RO, a large town of Southern Italy, in the province of Potenza, 7 miles south of Melfi; pop. 12,051. It produces grain, maize, pulse, and wine. The inhabitants are agriculturists and shepherds. There is a great trade carried on in maple snuff-boxes, which are manufactured here.

RIOSE'CO, MEDINA DE, a small town of Spain, in the province of Valladolid, and 26 miles north-west of the city of that name, stands on two hills in a fertile district. In the middle ages, it was the center of considerable trade, but it has much declined in recent times. The chief church is that of Santa Maria, a beautiful Gothic edifice, richly decorated, and containing several excellent pictures. Here, in 1808, a Spanish army, 50,000 strong, under Blake and Cuesta, was defeated, with a loss of 6000 men, by 12,000 French troops, under Bessières. The chief result of this battle was that Joseph Bonaparte was placed on the throne of Madrid. After the defeat, the unresisting town was sacked with more than wonted barbarity. Pop. (1877) 4776.

RIOT is the legal name of an offence which consists in the assembling of three or more persons for an illegal purpose, or for the carrying out of a legal purpose in an illegal manner. Riots often commence in some supposed private wrong. Some degree of violence is incidental to a riot, and a degree of intimidation to the neighborhood. A riot cannot take place unless at least three persons act in concert. When a riot becomes formidable, it is usual for the authorities to take active measures to disperse it. Thus, any justice of the peace may command the persons assembled to disperse peaceably by a form of words called reading the Riot Act, which is as follows: 'Our Sovereign Lady the Queen chargeth and commandeth all persons being assembled immediately to disperse themselves, and peaceably to depart to their habitations, or to their lawful business, upon the pains contained in an Act of King George for preventing tumults and riotous assemblies—God save the Queen.' If the rioters, after this formal proclamation, remain more than one hour afterwards, they are guilty of felony, and may be seized, and carried before a justice. Sometimes it is difficult to distinguish between an illegal assembly and one which is legal, though noisy and tumultuous, and the opinion of the justice of the peace is not conclusive as to its illegality. Sometimes the Riot Act is read more than once during the disturbance, in which case the second or third reading does not supersede the first.

RIOUW' a Netherlands residency or government in the Eastern Archipelago, since Siak and dependencies were taken from it, consists of the peninsula of Tandjong Pinang, the Lingga-Riouw Archipelago, a part of the coast of Sumatra, north of Djambi, and the adjoining kingdom of Indragiri; also the Tambilan, Anambis, and Natuna islands. Area about 3000 sq. miles. Pop. (1873) of the residency, 69,386, including 144 Europeans, 27,782 Chinese (25,678 being males), and 41,303 natives.

The islands of the archipelago are mountainous, the peak of Lingga rising to 3712 feet. Many of them are covered with heavy timber and a dense underwood, through which it is difficult to force a way. As far as is known, the prevailing rocks are granitic and sandstone. Gold is found in Lingga, and tin was formerly extensively wrought; but the richer mines of Sinkep and the Carimon islands, in the southern entrance of the Strait of Malacca, now yield the largest amount of that ore. Coal is also found in the Riouw-Lingga islands.

The climate is not considered unhealthy though at times the heat is intolerable. The chief products are sago, pepper, damar resin, gambir, gutta-percha, ratans, cotton, fruits, and many varieties of fine timber. Edible nests are found in abundance, and the waters swarm with fish. Agar-agar, tripang or bêche-de-mer, and shell-fish are largely collected. The native Malays chiefly gain a living by fishing, and the Chinese have extensive *Uncaria gambir* and pepper gardens. Imports (1872), £372,422; exports, £369,213.

The industries are manufacturing gambir, distilling arrack, weaving silks, shipbuilding, wood-cutting, tile and brick making, together with extensive fisheries. The original inhabitants are Malays, who are more numerous in Lingga than the other islands. The strangers are Europeans in the pay of the Netherlands colonial government, Chinese, Buginese, and Javans. The town is at the north-west end of Tandjong Pinang, 54′ 4″ N. lat., and 104° 26′ 30″ E. long., in a beautiful bay where there is safe anchorage. Pop. 8609.—See *Journal of the Ind. Archip.* vol. i.; Crawford's *Descriptive Dict.*; *De Residentie Riouw*, door J. J. de Hollander; and Colonial Reports of 1875—1876.

RI'PON, a market-town, and municipal and parliamentary borough, in the West Riding of Yorkshire, 23 miles north-west of York. The market-place, to which the four principal streets lead, is spacious, surrounded by good houses and shops, and has in its center an obelisk 90 feet high. R. is a bishop's see. The cathedral, founded 1109—1114 is cruciform, is surmounted with two uniform towers, 110 feet high at the west end, and also by a center tower. It is esteemed one of the best proportioned churches in the kingdom. Trinity Church, built in 1826, is a fine cruciform edifice in Early English. There are other places of worship, two hospitals, and a number of important schools. The principal branches of industry are machine-making, tanning, and malting. About two miles from R. are the famous ruins of Fountains Abbey, adjoining the grounds of Studley Royal, seat of the Marquis of Ripon. Pop. (1871) 6806; (1881) 7390.

RIPPLE-MARK. Undulations similar to those observed on sandy shores, and produced by the particles of sand being drifted along by the water, have been observed on the surface of sandstones of all ages. They may be held generally as indicating that the deposition of the bed on which they occur took place on a sea-beach, or under water not more than ten feet deep. Recent ripple-marks have, however, been observed at a depth of 60 feet, and there is reason to believe that mud and sand may be disturbed at much greater depths by currents of water. Loose sand also may be driven by the wind into ripple-waves, that cannot be distinguished from those produced by the receding tide.

R'ISHI (from the obsolete Sanscrit *r'ish*; see, kindred with *dr's'-*, *δερκ-*) is the title given to the inspired poets of the Vedic hymns, as they were supposed to have 'seen,' or, in other words, received, the Vedic hymns from the deity through the sense of sight. 'The R'ishis,' Yâska (q. v.) says, 'see the hymns with all kinds of intentions.' They were therefore the oldest poets of India, and the word R'ishi itself becomes thus even identified with Vedic poetry. At a later period, however, the title Ri'shi was given to renowned authors, though they were not considered as inspired by a deity, as, for instance, to the authors of the Vedic Kalpa, works which, by all Hindu writers, are admitted to be of human authorship.—Compare Goldstücker, *Pân'ini*, &c., p. 64, ff.

RISING, in Heraldry, a term applied to a bird when represented opening his wings as if about to take flight.

RISING IN THE AIR. The name of a belief (prevalent in the middle ages) that the bodies of holy persons were sometimes lifted up and suspended in the air during the continuance of a religious ecstasy. Calmet states in his work on Apparitions that this singular phenomenon might be produced by the fervor of the Holy Spirit; by the ministry of good angels; or by a miraculous favor of God, who desired thus to do honor to his servants in the eyes of men. Numerous instances are recorded in the *Acta Sanctorum*. St. Philip of Neri, in his religious ecstasies, was elevated in the air, sometimes to the height of several yards, almost to the ceiling of his room, and this quite involuntarily. He tried in vain to hide it from the knowledge of those present, for fear of attracting their admiration. St. Ignatius de Loyola was sometimes raised up from the ground to the height of two feet, while his body shone like light. St. Robert de Palentin rose also from the ground sometimes to the height of a foot and a half, to the great astonishment of his disciples and assistants. In the life of St. Dunstan it is stated that, a little time before his death, as he was going up stairs to his apartment, accompanied by several persons, he was observed to rise from the ground; and as all

present were astonished at the circumstance, he took occasion to speak of his approaching death. In a recent biography of Girolamo Savonarola, it is also stated that while that martyr was in prison, shortly before his execution, he was observed once, while in prayer, raised from the ground, and was seen distinctly suspended in the air for some short period.

These relations account for the frequency with which representations of saints are exhibited in an aërial position in medieval paintings and works of art. This belief falls in with one of the alleged phenomena of modern spiritualism (q. v.).

RISK, in point of law, is used chiefly in reference to the sale of goods, and injury or loss to the goods before delivery. On such occasions, the question, in English law, is governed by the previous question, whether the property has passed or not by the sale. If it has, then whoever is the owner must bear the loss of the goods. In Scotland, the risk is with the buyer of goods, whether the right of property has passed or not. See CARRIER.

RISO'TTO, an elegant Italian dish, consisting chiefly of rice. Onions are shredded into a frying-pan with plenty of butter, and they are fried together until the onions become very brown, and communicate their color to the butter. The butter is then run off, and to this is added some rich broth, slightly colored with saffron, and the whole is thickened with well-boiled rice, and served up instead of soup, at the commencement of a dinner.

RISSOLE, a culinary preparation used as an *entrée*. It consists of meat or fish of any kind finely minced and made into small forms, which are then coated with a very thin crust either of pastry or of bread-crumbs mixed with yolk of egg, and fried. There is great variety in this dish.

RISTORI, ADELAIDE, a celebrated Italian tragic actress, was born in 1821 at Cividale in Frioul. Her parents were strolling players, and she almost began life in the theater. At the age of 14, she played in *Francesca da Rimini*, and in a few years became the leading Italian actress. Her talents, her beauty, and her grace made her a universal favorite. In 1847, her marriage with the Marquis Capranica del Grillo (who died in 1861) temporarily interrupted her dramatic career; but after two years, she returned to the stage, and appeared at Rome in 1849 in Alfieri's tragedy of *Myrrha*. But the French attack on the city caused her to desert the theater for the hospital, where she employed herself assiduously in nursing the wounded. After having acted in 1850 and succeeding years at Rome and Turin in various characters of Alfieri with immense applause, she presented herself before a French audience in 1855, when Rachel was in the height of her fame, a proceeding considered in the light of a challenge by the first Italian actress to the first French actress. Even at Paris she obtained a triumph, her genius creating an enthusiasm which could not be repressed. Without all the sympathetic sensibility of Madame Rachel, she surpassed her in vivacity and expression. She has since appeared with success in England, the United States, &c.

RITE (Lat. *ritus*) is in general an external sign or action employed in religious use, and designed either to express or to excite a corresponding internal religious feeling. Such are, for instance, the uplifting or outstretching the hands in prayer, the imposition of hands in blessing, &c. The ancient Jewish religion abounded with rites and ceremonies, and through their excessive multiplication in the religions of the Gentiles, religion degenerated almost entirely into outward form. A marked distinction in this respect is drawn by our Lord (John iv. 23) between the old and the new law, which one class of Christians have interpreted as a condemnation of all external ceremonial, while even those who contend for the retention of ceremonies in Christian worship, require that their use should always be accompanied and elevated by the corresponding internal spirit. The great ground of difference in the Puritan controversy in England and the corresponding disputes in continental churches, was the lawfulness of ceremonies. See GENUFLEXION, PURITAN.

The name rite is sometimes used to signify the aggregate of all the ceremonies used in a particular religious office, as the 'rite' of baptism or of the Eucharist. In a still wider sense, it is used of the whole body of distinctive ceremonial, including the liturgy employed by a particular community of Christians. In this way we speak of the 'Roman rite,' the 'Greek rite,' the 'Syrian rite,' the 'Armenian rite,' the 'Coptic' or the 'Slavonic rite.'

RITENU'TO (Ital. kept back), a term in music implying that the speed of the movement is to be diminished.

RITORNE'LLO (Ital. return), in Music, in its original sense, a short repetition like that of an echo, or a repetition of the closing part of a song by one or more instruments. The same term has, by later usage, been applied to all symphonies played before the voices begin which prelude or introduce a song, as well as the symphonies between the members or periods of a song.

RITSCHL, FRIEDR. WILH., one of the first (perhaps the very first) classical philologists of modern times, was born at Grossvargula in Thuringia, 6th April 1806. He studied at Leipzig under Hermann, and from 1826 to 1829 at Halle, where he eagerly availed himself of the lectures and society of Reissig. In 1832, he was called to Breslau as extraordinary professor, receiving at the same time a joint-directorship of the philological seminary there. Two years afterwards, he became ordinary professor, and spent the winter and spring of 1836—1837 on a learned tour through Italy. In 1839, he accepted an invitation to Bonn as professor of classical literature and rhetoric. The Prussian government conferred on him the rank of privy-councillor in 1856. His first literary works were devoted to the Greek grammarians, as the edition of Thomas Magister (Halle, 1832), the acute and penetrating treatise, *De Oro et Orione* (Bresl. 1834), and the richly elucidatory *Die Alexandrin. Bibliotheken und die Sammlung der Homerischen Gedichte durch Pisistratus* (Bresl. 1838), sufficiently prove; but by far his greatest work is his edition of Plautus (Bonn, 1848—1853), executed with the richest critical apparatus. It was accompanied by a comprehensive *prolegomena* on the Plautinian metres. The work secured for him a splendid reputation among his countrymen.

Among the numerous productions of R. which may be regarded as preparatory to this *chef-d'œuvre*, the most important is his *Parerga Plautina et Terentiana* (Leip. 1845). Subsequently his literary activity took another direction—viz., a systematic treatment of Latin inscriptions, with the view of illustrating the history of the Latin language. His labors in this department have been crowned with success, for R. has thrown more light upon the successive phases of the language than any other single individual. To this field belong his *Lex Rubria* (Bonn. 1851), *Titulus Mummianus* (Berl. 1852), *Monumenta Epigraphica Tria* (Berl. 1852), *Inscriptio Columnæ Rostratæ* (Berl. 1852), *Anthologiæ Latinæ Corollarium* (Berl. 1853), *De Sepulcro Furiorum* (Berl. 1853), *De Fictilibus Litteratis, &c.*, (Berl. 1853), *Poesis Saturninæ Spicelegium* (Bonn, 1854), *De Titulo Metrico Lambacsensi* (1855), *De Varronis Hebdomadum Libris* (1856), *In Leges Viselliam, Antoniam, Corneliam Observationes Epigraphicæ* (1860), and *Proœmiorum Bonnensium Decas* (1862). Besides these works, R. contributed a large number of learned dissertations to the programmes of the university of Bonn, in the *Transactions* of the Archæological Institute of Rome, and in the *Rheinisches Museum für Philologie*. On the twenty-fifth anniversary of his appointment to Bonn, there began to be published *Symbola Philologorum Bonnensium in Honorem Frid. Ritschelii* (1864—1867). In 1867, R., 30 of whose pupils were then professors in German universities, was appointed foreign associate of the French Academy of Inscriptions and Belles Lettres. He died in 1876.

RITTER, HEINRICH, German philosopher, was born at Zerbst in 1791, studied theology at Halle, Göttingen, and Berlin, from 1811 to 1815, and in 1824 was created Professor Extraordinarius at Berlin University. In 1835, he accepted a call to the university at Kiel, and went thence in 1837 to Göttingen. R. owes his literary fame especially to his profound works on the history of philosophy. The principal are: *Ueber die Bildung des Philosophen durch die Geschichte der Philosophie* (On the Education of the Philosopher through the History of Philosophy), 1817; *Welchen Einfluss hat die Philosophie des Cartesius auf die Ausbildung der des Spinoza gehabt?* (What Influence has the Philosophy of Descartes exercised on that of Spinoza?) Leip. and Altenb. 1817; *Ueber die Philos. Lehre des Empedokles* (On the Philosophical Doctrine of Empedocles), 1820, in Wolf's *Literary Analecta; Geschichte der Ionisch. Phil.* (History of the Ionian Philosophy), Berl. 1821; *Geschichte der Pythagorisch. Phil.* (History of the Pythagorean Philosophy), Hamb. 1826; *Bemerkungen üb. die Phil. d. Megarisch. Schule* (Remarks on the Philosophy of the Megaric School), Rheinisches Museum, 2d series; *Gesch. der Phil.* (History of Philosophy), vol. i.—xii. Hamb. 1829—1853; 2d ed., vol. i.—iv., 1836—38; *Vorlesungen zur Einleitung in die Logik* (Introductory Lectures to Logic), Berl. 1823; *Abriss der Philosophisch. Logik*, Berl. 1824; *Die Halb-Kantianer und der Pantheismus* (The Half-Kantians and Pantheism), Berl. 1827; *Ueber das Verhältniss der Philosophie zum wissenschaftlichen Leben ueberhaupt* (On the Relation between Philosophy and Scientific Life in General), Berl. 1835; *Ueber die Erkenntniss Gottes in der Welt* (The Recognition of God in the World), Hamb. 1836; *Uber das Böse*, (On Evil), Kiel, 1839; Philosophical Essays (Kiel, 1839—1840); *System der Logik und der Metaphysik* (Gött. 1856); *Die Christliche Philosophie* (2 vols. Gött. 1858—1859); *Encyclopädie der Philosophischen Wissenschaften* (vols. 1 and 2, Gött. 1862—1863). R. was not a partisan of any philosophical school, but a critic of all. He died in 1869.

RITTER, KARL, an illustrious geographer, was born August 7, 1779, in Quedlinburg, in Prussia, studied in Halle, was nominated in 1820 Professor Extraordinarius of Geography at Berlin University, became subsequently member of the Academy, and Director of Studies of the Military School. He died 28th September 1859. With R., as the founder of general comparative

geography, begins a new epoch in the history of geographical science. His chief works are: *Die Erdkunde im Verhältnisse zur Natur und Geschichte des Menschen* (Geography in its Relation to Nature and the History of Men), 17 vols. Berl. 1822—1854.—The work is divided into 4 parts, 1. Introduction and East Asia, in 5 vols., containing Middle Asia, High Asia, Siberia, China, and India, vol. ii.—vi.; 2. West Asia, in 5 vols. (vols. vii.—xi.); 3. Arabia (vol. xii.—xiii.); 4. The Sinai Peninsula, Palestine, Syria (vol. xiv.—xvii.), with four indexes, and an Atlas of Asia. Introduction to an Essay on a more Scientific Treatment of Geography (Berl. 1852); *Europa, ein geographisch., historisch., statistiches Gemälde* (Europe, a Geographical, Historical, Statistical, Picture), 2 vols. Frankf. 1807; *Die Stupas, oder die architect. Monumente, &c.* (The Stupas, or the Architectural Monuments on the Indo-Bractrian Royal Road, and the Colossus of Bamyan), (Berl. 1838). Many of his antiquarian and historico-antiquarian researches are contained in the *Monatsberichten* of the Berlin Geographical Society, and in the *Zeitschrift für allgemeine Erdkunde, &c.* Other noteworthy productions are: *Die Colonisirung von Neu Zealand* (Berl. 1842); *Blick auf das Nilquelland* (Berl. 1844); *Der Jordan und die Beschiffung des Todten Meeres* (Berl. 1850); *Ein Blick auf Palæstina und die Christliche Bevölkerung* (Berl. 1852).

RI'TUAL (Lat. *rituale*, a book [or collection] of rites), the name of one of the service-books of the Roman Church, in which are contained the prayers and order of ceremonial employed in the administration of certain of the sacraments and other offices of the church. The ceremonial of the offices of the Roman Church administered by bishops is contained in the books entitled *Pontificale* and *Ceremoniale Episcoporum*. The priestly offices are detailed in the Ritual. In its present form it dates from the Council of Trent, which directed a revision of all the different rituals then in existence, which were numerous, and exhibited considerable variety of detail. Paul V., in 1614, published an authoritative edition, which has frequently been reprinted, and of which a further revision was issued by Benedict XIV. Besides the Roman Ritual, there are many diocesan rituals, some of which are of much historical interest. In the Greek Church, as in the other eastern communions, the Ritual forms part of the general collection (which contains also the Eucharistic service) entitled *Euchologion*. In the Anglican Church, also, the *Book of Common Prayer* may be said to contain the Ritual. The most approved commentary on the Roman Ritual is that of Barrufaldo (2 vols., Florence, 1847).

RI'TUALISM, the name popularly but inaccurately given to the remarkable increase of ceremonial in the Church of England since the year 1863. It may be considered as a development of Tractarianism, though it is one not contemplated by the authors of that movement, whose aim was rather to disseminate doctrines than to introduce ritual changes. Its collateral causes may be said to be: (1) The great advance of æsthetic taste, and the increased cultivation of the fine arts in the service of religion. (2) The extended study by the clergy of ancient liturgies, and the connection discovered to exist between them and the offices of the English Church. With the spread of High Church principles, certain changes in the mode of conducting divine service had been introduced by the clergy, which, though unpopular at first, were widely adopted, and up to a certain point, had received the sanction of the law. But the restored church with low and open benches—the separated chancel—the altar-table with coverings of different color according to the ecclesiastical seasons, and candlesticks, and a cross upon or over it—choral services, and weekly celebration of the communion, were all that had hitherto been attempted. To these comparatively small alterations, important additions have recently been made—viz. (1) Special vestments at the celebration of the holy communion, and at certain other times, viz., for the celebrant, an alb and stoles, of different color, and chasuble; for the assisting ministers, albs with tunicles, according to the seasons. At other times, a cope is worn instead of a chasuble. (2) Lighted candles on the altar at holy communion. (3) Incense burned either in a 'thurible' or in a standing vessel. (4) The mixing of water with wine for the communion. (5) The use of wafer-bread. (6) Elevation of the elements either during or after consecration. (7) The attendance of non-communicants at the holy communion. (8) Processions with crosses, banners, and vested attendants.

These innovations are defended by their promoters on the following grounds of (*a*) Law, (*b*) Doctrine, and (*c*) Expediency.

(*a*) The rubric at the end of the calendar in the Book of Common Prayer enacts 'that such ornaments of the church and of the ministers thereof at all times of their ministration shall be retained and be in use as were in this Church of England by the authority of parliament in the second year of the reign of King Edward VI.' The Judicial Committee of the Privy Council in the case of Westerton *v.* Liddell (1857), ruled that 'ornaments' here means, 'all articles used in divine service;' that the words, 'by authority of parliament,' &c., refer to the first Prayer-book put forth in that reign (1549); and that 'the meaning of the rubric, as of the previous statute of Elizabeth, the language of which it adopts, is, that the same dresses, utensils, and articles which were used under the first Prayer-book of Edward VI. may still be used.' Now, the first Prayer-book of Edward VI. prescribes that at the time of the communion 'the priest that shall execute the holy ministry shall put on him a white alb plain with a vestment, i. e., a chasuble, or cope;' and the assistants 'likewise the vestures appointed for their ministry, that is to say, albs with tunicles.' It is therefore inferred that the above are the only legal vestments in which the holy communion should be celebrated. To this it is objected (1) That the word 'retained' can only refer to such vestures as were in use up to the time of the last publication of the rubric—viz., the surplice in parish churches, and copes in cathedrals. (2) That the rubric, when first inserted under Elizabeth, was limited by the Injunctions and Advertisements of that reign, which aimed only at the restoration of the surplice.

(3) That whatever be the intention of the rubric, it has been so long obsolete that it is absurd to revive it. It is answered (1) That the word 'retained' must have the same meaning that it had in the rubric of Elizabeth, in which it first occurs. (2) That the Injunctions and Advertisements were not of supreme authority, and were only intended to help towards restoring a decent uniformity in divine worship. (3) That the fact that a law has become obsolete does not invalidate its force. The same reference of the ornaments rubric to the second year of Edward VI. is held to authorize other accessories known to have been in use at that time, though not specified in the first Prayer-book—such as lighted candles, incense, &c. And on the principle, that the Reformed Church was legally identical with that before the Reformation—which the 30th canon of 1603 is cited as maintaining—it is further contended that all ancient laws and usages are still in force, except where directly or implicitly abrogated by subsequent enactment. And as the chief ritual authority before the Reformation was the liturgy of Sarum (the Sarum '*use*' referred to in the preface to the present Prayer-book), it is to that standard, as far as possible, that the more advanced Ritualists desire to conform.

(*b*) The *doctrinal* grounds of defence are expressed in the following statements: (1) The Eucharist (as the Lord's Supper was anciently called) is the special institution of Christ, the single rite of continual observance which He enjoined on His disciples, and the chief act of Christian worship. It is therefore right to exalt and dignify it above all other services, and mark it as standing on different and higher ground than any other institution. (2) The Eucharist, according to the universal belief of the ancient church, is to be regarded as a sacrifice, *commemorative*, as the Jewish sacrifices were *anticipatory*, of the death of Christ—not as iterating or repeating it (which idea alone the 31st article is held to condemn), but as a solemn pleading and offering of it before God, as Christ himself offers it in heaven. Hence the position of the celebrant in front of the altar, and the use of a sacrificial vestment, as the chasuble is held to be. (3) In the Eucharist, there is a real presence of Christ, which, though spiritual, is *objective*, i. e., not dependent on the receiver, but as a result of consecration, and to a certain extent *local*. (The growth of this belief is marked by the change made in a recent edition of Keble's *Christian Year* of the words, '*not* in the hands,' in a poem on the Eucharist, to, '*as* in the hands.') Hence distinct acts of adoration, addressed, not, as is explained, to the elements, but to the Divine Presence, of which they are the vehicles and signs.

(*c*) On the ground of *expediency* also, it is contended: (1) That experience proves that the only way of attracting and gaining a hold on the vast uneducated masses of our towns and cities is by a worship addressed not merely to the ear, but to the eye. 'Ritualism,' says one of its defenders, 'is the *object-lesson* of Religion.' Services conducted in grand and beautiful buildings—brilliantly lighted—with splendid vestments, touching music, costly decorations, and every outward token of reverence and solemnity, will impress the young and the poor as nothing else can do. Those churches in London where advanced ritual prevails are said to be thronged with worshipers—mainly of the lower classes, and in great proportion of men—when others are almost empty. (2) A further argument, under this head, is connected with the desire, which has grown up of late years among the High Church party, for the restoration of the visible unity of Christendom, and specially the renewal of communion between the Church of England and both the Eastern and the rest of the Western Church; and with this view, it has become an avowed object to assimilate the Anglican service as much as possible to that of other Catholic churches.

It remains to notice briefly the effect of these innovations. It is a remarkable index of the change of popular feeling within the last twenty years, that such bold and startling changes, altering the whole character of the Anglican service, should, by a large number of people be not only tolerated, but approved. In 1859,

the attempt of the rector of St. George's-in-the-East to introduce Eucharistic vestments, led to riots which convulsed the whole of East London. In the year 1867, in about twelve churches of the metropolis—and in several country towns and villages—a far more advanced ritual, with vestments, altar-lights, and other ceremonies, regularly attracted an eager throng, not of spectators only, but of worshipers. And the spread of the movement may be judged by the statement, which appears authorized by facts, that within a few months after the first Report of the Royal Commissioners on Ritual, the vestments were introduced in more than thirty churches. On the other hand, among the 'Protestant' members of the church, and those of other denominations, the movement has provoked the loudest opposition.

Most of the bishops have, directly or indirectly, expressed their disapprobation; the press, except two or three journals, which are its strenuous advocates, is almost unanimous in denouncing it; the more moderate members of the High Church party discourage it; and active efforts have been made to arrest it by legislative interference. In the Lower House of Convocation, on the motion of the Dean of Ely, a committee was appointed to consider the subject, which, after careful examination, reported, in June 1866, that vestments and altar-lights, whether legal or not, should not be introduced without the sanction of the bishop; that the censing of persons and things, elevation after consecration, wafer-bread, and presence of non-communicants (except in special cases), were to be discouraged. In deference to this opinion, the censing of persons and things has been in some churches given up. Suits were instituted against several individuals—the Rev. A. H. Mackonochie, incumbent of St. Albans, London; the Rev. T. B. Simpson, in the diocese of Essex, and others. The points complained of in these are chiefly elevation and the mixed chalice. In the beginning of the year 1866, an opinion was obtained, at the instance of some of the bishops, from five eminent counsel, among whom were Sir R. Palmer and Sir Hugh (now Lord, Cairns, against the legality of all ritualistic innovation (the main grounds of which opinion are given in the *objections* above stated.) In reply to this, another opinion was obtained, by the Council of the English Church Union, from nine leading counsel—some of whom have since been raised to the bench—all of whom advise in favor of the legality of vestments, all but two in favor of altar-lights, and all against incense; on the mixed chalice and wafer-bread, they are nearly equally divided.

In the session of 1867, the Earl of Shaftesbury introduced a bill —founded on the 58th canon of 1603—to limit ecclesiastical vestments to the ordinary surplice and hood, in favor of which more than 600 petitions were presented; while one against it, presented by Lord Redesdale, was signed by more than 9000 clergy and lay communicants. (An earlier memorial, to the Archbishop of Canterbury, against any change in the existing law, was signed by more than 40.000 communicant members of the church.) This bill was withdrawn on the appointment by the government of a Commission 'to inquire into the Rubrics, Orders, and Directions for regulating the course and conduct of Public Worship, &c., according to the use of the United Church of England and Ireland.' The commissioners included the Archbishops of Canterbury and Armagh, and the Bishops of London, St. Davids, Oxford, and Gloucester. They published a report to the effect that 'it is expedient to restrain, in the public services of the church, all variations in respect of vesture from that which has long been the established usage of the said church; and that this may be best secured by providing aggrieved parishioners with an easy and effectual process for complaint and redress.' The evidence appended to the report supplies much information as to the various practices prevailing, and the widely different views entertained. The general conclusions appear to be that vestments, and probably altar-lights and the mixed chalice, are legal; that an ornate ritual is useful among some classes, and might, with certain safeguards, be allowed; that absolute uniformity is impossible, but that the law might be obeyed a good deal more generally than it is; that the maintenance of the present law, with a wide and liberal interpretation, but limited as a maximum to the ritual of the 2d year of Edward VI., with some recognized ecclesiastical authority to restrain unauthorized variations, would be most for the welfare of the church. The report produced no restraint on the progress of Ritualism, and in May 1873, 60.000 persons of standing and influence presented an address to the two archbishops requesting them to adopt means for checking the growth of ritualistic practices.

In April, 1874, a bill for this purpose was introduced in the House of Lords by the Archbishop of Canterbury, entitled The Public Worship Regulation Act. It was adopted by the government, but was opposed in the House of Commons by Mr. Gladstone in a series of six resolutions, and notwithstanding a considerable amount of ecclesiastical agitation, it became law in August. Its main provision is the appointment of a judge for the trial of ritualistic cases. A complaint against the use of vestments, ornaments, and rites and ceremonies, or the omission of such as are ordained in the Book of Common Prayer, in the churches or burial-grounds of the Church of England, may be presented to the bishop of the diocese by an archdeacon or churchwarden, or by three parishioners, members of the church, of full age, and a year's residence in the parish. In the event of the parties not submitting to the directions of the bishop, he shall forward the case for trial by the judge, from whose decision an appeal lies to the Privy Council.

RIVE-DE-GIER, a flourishing manufacturing town of France, in the dep. of Loire, stands on the Gier, in the middle of the best coal-field in France, 13 miles north-east of St. Etienne by railway. There is water-communication with the Rhone by means of the Canal-de-Givors, which extends from this town to Givors, on the Rhone. South of the town is the immense and well-built basin of Couson, containing 1,500,000 cubic *mètres* of water for the supply of the canal. R. was formerly a mere stronghold, surrounded by high walls, and defended by a strong castle; and in 1815, the number of its inhabitants was under 4000. In 1876, it contained 14,518 inhabitants. Around the town, there are about 50 coal-mines in operation; and the principal manufacturing establishments are silk-mills, important glass-works, factories for steam-engines, and other machinery, steel factories and foundries.

RIVER. Rivers are the result of the natural tendency of water, as of all other bodies, to obey the law of gravitation by moving downwards to the lowest position it can reach. The supply of water for the formation of rivers, though apparently derived from various sources, as from rain-clouds, springs, lakes, or from the melting of snow, is really due only to atmospheric precipitation; for Springs (q. v.) are merely collections of rain-water; lakes are collections of rain or spring water in natural hollows, and snow is merely rain in a state of congelation. The rills issuing from springs and from surface-drainage unite during their downward course with other streams, forming *rivulets;* these, after a further course, unite to form *rivers*, which, receiving fresh accessions in their course from *tributaries* (subordinate rivers or rivulets) and their *feeders* (the tributaries of tributaries), sweep onwards through ravines, and over precipices, or crawl with almost imperceptible motion across wide, flat plains, till they reach their lowest level in ocean, sea, or lake. The path of a river is called its *course;* the hollow channel along which it flows, its *bed;* and the tract of country from which it and its subordinates draw their supplies of water, its *basin*, or *drainage-area*. The basin of a river is bounded by an elevated ridge, part of which is generally mountainous, the crest forming the water-shed; and the size of the basin, and the altitude of its water-shed, determine, *cæteris paribus*, the volume of the river. See RAIN. The greater or less degree of uniformity in the volume of a river in the course of a year, is one of its chief physical features, and depends very much on the mode in which its supply of water is obtained.

In temperate regions, where the mountains do not reach the limit of perpetual snow, the rivers depend for their increase wholly on the rains, which, occurring frequently, and at no fixed periods, and discharging only comparatively small quantities of water at a time, preserve a moderate degree of uniformity in the volume of the rivers—a uniformity which is aided by the circumstance, that in these zones, only about one-third of the rainfall finds its way directly over the surface to the rivers; the remaining two-thirds sinking into the ground, and finding its way to spring-reservoirs, or gradually oozing through at a lower level in little rills which continue to flow till the saturated soil becomes drained of its surplus moisture, a process which continues for weeks, and helps greatly to maintain the volume of the river till the next rainfall. This process, it is evident, is only possible where the temperature is mild, the climate moist, evaporation small, and the soil sufficiently porous; and under these circumstances, great fluctuations can only occur from long-continued and excessive rains or droughts. In the hotter tracts of the temperate zones, where little rain falls in summer, we occasionally find small rivers and mountain torrents becoming completely exhausted; such is often the case in Spain, Italy, Greece, and with the Orange, one of the largest rivers of South Africa.

In tropical and semi-tropical countries, on the other hand, the year is divisible into one dry and one wet season (see RAIN); and in consequence, the rivers have also a periodicity of rise and fall, the former taking place first near the source, and, on account of the great length of course of some of the tropical rivers, and the excessive evaporation to which they are subjected (which has necessarily most effect where the current is slow), not making itself felt in the lower part of their course till a considerable time afterwards. Thus, the rise of the Nile occurs in Abyssinia in April, and is not observed at Cairo till about midsummer. The fluctuations of this river were a subject of perpetual wonderment to the ancient civilized world, and were of course attributed to superhuman agency; but modern travel and investigation have not only laid bare the reason of this phenomenon, but discovered

other instances of it, before which this one shrinks into insignificance.

The maximum rise of the Nile, which is about 40 feet, floods 2100 sq. m. of ground; while that of the Orinoco, in Guiana, which is from 30 to 36 feet, lays 45,000 sq. m. of savannah under water; the Brahmaputra at flood covers the whole of Upper Assam to a depth of 10 feet, and the mighty Amazon converts a great portion of its 500,000 sq. m. of silvas into one extensive lake. But the fluctuations in the rise of the flood-waters are surpassed by some of the comparatively small rivers of Australia, one of which, the Hawkesbury, has been known to rise 100 feet above its usual level. This, however, is owing to the river-beds being hemmed in by lofty abrupt cliffs, which resist the free passage of a swollen stream.

The increase from the melting of snow in summer most frequently occurs during the rainy season, so that it is somewhat difficult to determine, with anything like accuracy, the share of each in producing the floods; but in some rivers, as the Ganges and Brahmaputra, the increase from this cause is distinctly observable, as it occurs some time after the rains have commenced, while in the case of the Indus it is the principal source of flood. When the increase from melted snow does not occur during the rainy season, we have the phenomenon of flooding occurring twice a year, as in the case of the Tigris, Euphrates, Mississippi, and others; but in most of these cases the grand flood is that due to the melting of the snow or ice about the source. In illustration of the enormous variation in the volume of rivers subject to periodical rise and fall, we shall give a few instances in which the minimum and maximum delivery per second have been ascertained:

DELIVERY IN CUBIC FEET PER SECOND.

	Minimum.	Maximum.	Average for a Year.
Nile (at Assouan)..	24,000	362,000	101,000
Ganges.....	36,000	494,000	141,000
Irrawadi.....	84,000 (?)	1,000,000 (?)	350,000
Brahmaputra.....	146,000	1,800,000 (?)	520,000

The advantages of this periodical flooding in bringing down abundance of rich fertile silt—the Nile bringing down, it is said, no less than 140 millions of tons, and the Irrawadi 110 millions of tons annually—are too well known to need exposition here. Islands are thus frequently formed, especially at a river's mouth (see DELTA). Permanent and capacious lakes in a river's course have a modifying effect owing to their acting as reservoirs, as is seen in the St. Lawrence; while the Red River (North) and others in the same tract, inundate the districts surrounding their banks for miles. In tropical countries, owing to the powerful action of the sun, all rivers whose source is in the regions of perpetual snow, experience a daily augmentation of their volume; while some in Peru and Chili, being fed only by snow-water, are dried up regularly during the night.

The course of a river is necessarily the line of lowest level from its starting-point, and as most rivers have their sources high up a mountain slope, the velocity of their current is much greater at the commencement. The courses of rivers seem to be partially regulated by geological conditions of the country, as in the case of the San Francisco of Brazil, which forms with the most perfect accuracy the boundary-line between the granitic and the tertiary and alluvial formations in that country; and many instances are known of rivers changing their course from the action of earthquakes, as well as from the silting up of the old bed. The inclination of a river's course is also connected with the geological character of the country; in primary and transition formations, the streams are bold and rapid, with deep channels, frequent waterfalls and rapids, and pure waters, while secondary and alluvial districts present slow and powerful currents, sloping banks, winding courses, and tinted waters; the incline of a river is, however, in general very gentle—the average inclination of the Amazon throughout its whole course being estimated at little more than 6 inches per mile, that of the Lower Nile less than 7 inches, and of the Lower Ganges about 4 inches per mile.

The average slope of the Mississippi throughout its whole length is more than 17 inches per mile, while the Rhone is, with the exception of some much smaller rivers and torrents, the most rapid river in the world, its fall from Geneva to Lyon being 80 inches per mile, and 32 inches from Lyon to its mouth.

The velocity of rivers does not depend wholly on their slope; much is owing to their depth and volume (the latter being fully proved by the fact that the beds of many rivers remain unaltered in size and slope after their streams have received considerable accessions, owing to the greater rapidity with which the water runs off); while bends in the course, jutting peaks of rock or other obstacles, whether at the sides or bottom, and even the friction of the aqueous particles, which, though slight, is productive of perceptible effect, are retarding agencies. In consequence, the water of a river flows with different velocities at different parts of its bed; it moves slower at the bottom than at the surface, and at the sides than the middle. The line of quickest velocity is the line drawn along the center of the current, and in cases where this line is free from sudden bends or sharp turns, it also represents the deepest part of the channel. The average velocity of a river may be estimated approximately by finding the surface-velocity in the center of the current by means of a float which swims just below the surface, and taking four-fifths of this quantity as a mean. If the mean velocity in feet per minute be multiplied by the area of the transverse section of the stream in square feet, the product is the amount of water discharged in cubic feet per minute. According to Sir Charles Lyell, a velocity of 40 feet per minute will sweep along coarse sand; one of 60 feet, fine gravel; one of 120 feet rounded pebbles; one of 180 feet (a little more than two miles per hour), angular stones the size of an egg. The rate of its progression, and a general description of the erosive action of rivers, will be found under WATERFALLS.

'Rivers are the irrigators of the earth's surface, adding alike to the beauty of the landscape and the fertility of the soil; they carry off impurities and every sort of waste débris; and when of sufficient volume, they form the most available of all channels of communication with the interior of continents. . . . . They have ever been things of vitality and beauty to the poet, silent monitors to the moralists, and agents of comfort and civilization to all mankind.' By far the greater portion of them find their way to the ocean, either directly or by means of semi-lacustrine seas; but others, as the Volga, Sir-Daria (Jaxartes), Amu-Daria (Oxus), and Kur (Araxes), pour their waters into inland seas; while many in the interior of Asia and Africa—as the Murghab in Turkestan, and the Gir in the south of Morocco—'lose themselves in the sands,' partly, doubtless, owing to the porous nature of their bed, but much more to the excessive evaporation which goes on in those regions. The following are a few of the chief rivers in each continent, with the lengths of their courses in English statute miles, and their drainage areas in English geographical square miles (the Thames is given as a standard of comparison):

	Length.	Drainage Area.
EUROPE.		
Thames.....	220	5,000
Vistula.....	598	57,000
Loire.....	598	34,000
Rhine.....	690	65,000
Elbe.....	787	42,000
Dwina.....	1041	106,000
Don.....	1104	168,000
Dnieper.....	1243	170,000
Danube.....	1722	234,000
Volga.....	2762	397,000
ASIA.		
Euphrates.....	1716	196,000
Ganges.....	1557	391,000*
Indus.....	1800	372,000
Maykan or Mekhong.....	2417	216,000†
Thaluain or Salwin.....	2152	331,000
Irrawadi.....	2532	
Hoang-ho.....	2624	537,000
Obi.....	2670	925,000
Amur.....	2739	583,000
Lena.....	2762	594,000
Yenesei.....	3322	785,000
Yang-tze-kiang.....	3314	548,000
AFRICA.		
Zambesi.....	1400	432,000
Congo or Livingstone.....	2400 (?)	(?)
Nile.....	3300	520,000
AMERICA.		
St. Lawrence.....	2072	298,000
Rio Bravo de Norte.....	2138	180,000
La Plata.....	2210	886,000
Mackenzie.....	2440	442,000
Amazon.....	3545	1,512,000
Mississippi.....	3716	982,000

In Law, when a river not navigable forms the boundary of property, it is taken to belong in equal halves to the proprietors on opposite sides; and when both sides belong to one owner, then the whole of the bed belongs to him. In the common case where it is a boundary, an imaginary line, called the *medium filum*, runs down the middle, and all the bed of the river on one side belongs to the proprietor of the land on that side. This rule refers to the soil under the water, which is as absolutely the property of the riparian owner as the banks of the river themselves. As regards

* Excluding Brahmaputra, 1800 miles long, with basin of 361,000 sq. m.
† Including basin of Menam.

the water, it is true that the riparian owner on his side of the middle line has not the absolute property of the water itself, but he can use it to a limited extent—as, for example, to water his cattle, to supply the wants of his house, &c. The right of abstracting quantities of water is limited to this extent, that if, by taking more than the usual quantity required for necessary purposes, the rights of other riparian owners further down are materially injured, then the latter can bring an action to recover damages for such injury. Thus, if a riparian owner or his tenant had a mill on the river which had existed thirty or forty years, and a riparian owner further up has materially diminished the volume of water, an action of damages will be competent. So one owner cannot alter the bed or embank the river so as to injure other owners. With regard to fishing, each riparian owner has a right to fish in his half of the river, and to catch all he can find there, subject to the restrictions of the Fishery Laws. (Paterson's *Fishery Laws of the United Kingdom.*) In Scotland, the riparian owner, unless he has a grant from the crown, cannot meddle with salmon so far as net-fishing is concerned, though he may fish for salmon with the rod.

It follows that a riparian owner, when fishing with the net or rod, cannot go beyond his own half of the stream; and if he cast his line beyond the mid-stream, he would be liable to an action of trespass. But it is usual for opposite riparian owners to allow each other to fish the whole stream, for this is more convenient to both parties. The restrictions as to the times of fishing and the size of nets are stated under FISHERY. Where a river is navigable, the soil belongs to the crown, and the public have *primâ facie* a right to fish in it, though individuals may prove a title to a several or exclusive fishery there, but the burden of proof lies on such individuals. As between navigation and fishing, the right of navigation is paramount, and the fisherman must yield to the navigator.

The *Poisoning of Rivers* has begun of late years to cause serious concern, in consequence of the extension of manufactures, many of which are situated on the banks of streams, and use such streams as a drain or sewer. No person has a right so to poison or pollute a stream, and if he do so, any of the persons whose lands abut on the stream lower down may bring an action to recover damages. But if these tolerate the nuisance without complaint for twenty, or, at all events, forty years, they are forever afterwards precluded from complaining. Hence, in most cases, the manufacturers who pollute streams must be able to prove that they have been in the practice of doing so without challenge for twenty, or at most forty years. As, therefore, the law was defective in guarding salmon-rivers from this danger, the English Salmon Fishery Act enacted that all persons who poison streams without a legal right of this kind shall be liable to fine; and, moreover, even when they have the legal right, they must prove that they have used all reasonable means to counteract the ill effect of their refuse. Whoever unlawfully or maliciously puts lime or other noxious material in a pond or water with intent to destroy the fish therein, commits a misdemeanor, and may be sentenced to seven years' penal servitude. In Ireland and Scotland, the law does not materially differ from that of England as to poisoning rivers and streams; and it is an offence to put lime into streams to kill fish.—Paterson's *Fishery Laws of the United Kingdom.*

Besides the offences declared by the Salmon Acts of the United Kingdom, there are also similar penalties for poisoning waters, imposed by the Water-works Clauses Act, 10 Vict. c. 17, s. 61; the Public Health Act, the Nuisances Removal and other sanitary acts. See also the Rivers Pollution Prevention Act, 1876.

RIVER-CRAB (*Thelphusa*), a genus of crabs inhabiting fresh water, and having the carapace, quadrilateral, the antennæ very



River-Crab (*Thelphusa depressa*).

short. One species (*T. depressa*), the *Grancio* of the Italians, is very common in the south of Europe, and is often figured on ancient Greek medals. It was in ancient times, as it still is, an esteemed article of food. It is much used in Italy during Lent. It inhabits muddy lakes and slow rivers. In some it absolutely swarms. It can be kept alive in a damp place for a long time. It is often brought to market tied on strings, at such distances as to prevent fighting and mutilation. This crab spends the winter deeply imbedded in the mud.—Other species are common in warm countries. *T. cunicularis* is very abundant on the Ghauts of the Deccan, in India, burrowing in the ground, and running about among the long grass. It 'runs with considerable swiftness, even when encumbered with a bundle of food as big as itself; this food is grass, or the stalks of rice; and it is amusing to see the crabs sitting, as it were, upright, to cut their hay with their sharp pincers, and then waddling off with their sheaf to their holes, as quickly as their side-long pace will carry them.'

RIVER-TERRACES occur in some valleys, and exhibit the action of the river in scooping out its bed when it flowed at a higher level than it does now. The terrace consists of a more or less steep cliff, a few feet, or it may be yards high, with a flat terrace on a level with the top of it. The cliff corresponds to the present bank, and the terrace to the alluvial plain through which the river runs. The cliffs and terraces are repeated several times in some river-basins, and they frequently correspond on the two sides of the valley. They follow the course of the river, sloping downwards, with an inclination similar to the descent of the stream. They differ in this respect from the parallel roads formed by standing water. See GLENROY.

RIVET, a metal pin for connecting two plates of metal or other material together. The rivet is put through holes in both plates, and the projecting ends are then beaten down so as to represent the head of a nail on each side, and thus hold the plates in close contact. Rivets are of most essential importance in boiler and tank making, and in building iron ships. They are often put through the holes and beaten down while red-hot, in order that the contraction of the rivet, as it cools, may produce more intimate contact of the plates. The principle of the *riveting-machine* is simply the bringing a powerful lever to bear upon the head of the rivet, so that the smith can hammer upon the other and softened end without displacing it.

RIVIERA (sea-shore, coast), a term applied to the narrow strip of coast-land, bordering the Gulf of Genoa from Nice to Spezzia. Between Nice and Genoa it is called the Riviera di Ponente, or western coast, and the part from Genoa to Spezzia, the Riviera di Levante, or eastern coast. It abounds in the most striking scenery, uniting beauty with grandeur. The modern road that traverses it was a work of formidable difficulty; it was begun under French rule, and finished by the Sardinian government after the fall of Napoleon. The old road, which was dangerous and almost impracticable, was known as the Corniche road, and this name is often applied to the modern one. A railroad throughout the whole length of the Riviera has recently been completed.

RI'VOLI, a town of Northern Italy, on the right bank of the river Dora, 8 miles west of the city of Turin. Pop. 5600—R. must not be confounded with the village of the same name in the province of Verona, near which took place in 1797 one of Napoleon's most decisive victories over the Austrians.

RI'ZAH, a town of Asiatic Turkey, in the pashalic of Trebizond, on the coast of the Black Sea, 40 m. E. from Trebizond, with considerable trade, and manufactures of fine hempen fabrics. Pop. 30,000.

RIZZIO. See RICCIO.

ROACH (*Leuciscus rutilus*, see LEUCISCUS), a fish of the family



Roach (*Leucicus rutilus*).

Cyprinidæ, very plentiful in many of the lakes, ponds, and slow-running rivers of England and of the south of Scotland. It is also found on the continent of Europe. It is seldom more than a pound in weight, although it has been known to reach five pounds. The upper parts are dusky-green with blue reflections, passing into silvery-white on the belly, the fins more or less red. The R. is gregarious, and the shoals are often large. It is partially migratory, ascending rivers from lakes—as from Loch Lomond—to spawn. It is not much esteemed for the table. It is generally caught with bait, but sometimes with a small fly.

ROAD, in the law of Scotland, is used in the same sense as Highway (q. v.) in England. Road trustees are persons who are

authorized by act of parliament to make and manage a particular road, and levy tolls from the public to pay the expense. In England, road trustess necessarily mean the trustees of a turnpike road, the ordinary highways being repairable by the parish. In Scotland, by the early statutes, public roads were placed under the general management of the commissioners of supply and justices of the peace; but later local statutes authorized trustees to apportion statute labor amongst the local inhabitants for highways not turnpike. General Road Acts were passed, 1 and 2 Will. IV. c. 43 to 25 and 26 Vict. c. 105. By the Roads and Bridges (Scotland) Act, 1878, tolls and statute labor, where not already abolished, cease in 1883; the county roads are placed under one trust, with separate district management. The expense of maintenance falls, by assessment in each district, equally on the tenant and proprietor.

ROADS AND ROAD-MAKING. Roads form a primary element in the material advancement of a nation, being essential to the development of the natural resources of the country. Canals and railways have no doubt, in modern times, superseded to some extent the common highways; still, these retain their importance, were it only as essential auxiliaries.

The Romans were great constructers of roads, and regarded them as of vital importance for conquest and the maintenance of their empire. They are said to have learned the art from the Carthaginians. Except, where some natural barrier made it impossible, the Roman roads were almost invariably in a straight line; probably because the chief means of transport then in use were beasts of burden, and not wheeled vehicles, which made the preservation of the level of less consequence. The substantial character of the Roman roads is well demonstrated by the fact, that they have in some instances borne the traffic of 2000 years without material injury. The plan of construction was pretty uniform, being that described in the article on the APPIAN WAY, one of the earliest and most famous of them. They varied in breadth from 15 to 8 feet, and had often raised footpaths at the sides, and blocks of stone at intervals, to enable travelers to mount on horseback.

The roads made by the Romans in Great Britain gradually fell into decay, and the attempts that were now and then made to repair them were insufficient to prevent England falling into a worse state with respect to its highways than most other European countries. In 1285, one of the earliest laws on the subject of roads was passed. It directed that all trees and shrubs be cut down to the distance of 200 feet on either side of roads between market-towns, to prevent the concealment of robbers in them. The first toll for the repair of roads was levied by the authority of Edward III. in 1346, on roads which now form part of the streets of London. In 1555, an act was passed requiring each parish to elect two surveyors of highways to keep them in repair by compulsory labor; at a later period, in place of the compulsory labor, the 'statute labor-tax' was substituted. But long after this, the roads even in the neighborhood of London were wretchedly bad, and in the other parts of the country, they were still worse. For the most part, indeed, they were mere horse-tracks; the chief advantage in following them being, that they led along the higher grounds, and so avoided bogs. These trackways were usually impassable in winter; being narrow, and in many places so deep and miry as to be liker ditches than roads. So late as 1736, the roads in the neighborhood of London were so bad that in wet weather a carriage could not be driven from Kensington to St. James's Palace in less than two hours, and sometimes stuck in the mud altogether. Much curious information on the state of the roads and means of conveyance in England during the long period which elapsed from the decay of the Roman roads to the middle of the last century, will be found in vol i. of Smiles's *Lives of Engineers*.

In laying out a new line of road, the skill and ingenuity of the engineer are taxed to make the gradients easy, with as little expense as possible in excavating and embanking (see EMBANKMENT), and to do so without deviating much from the direct course between the fixed points through which the road must pass. In order to do this, an accurate survey of the tract, including the relative levels of its different parts, and the nature of the strata, is a necessary preliminary. The formation of an extended line of road often involves the construction of extensive bridges, viaducts, and the like, which require the greatest engineering skill.

The importance of easy gradients or inclinations in roads is well understood in a general way; but it gives a more precise idea of it to state that, while, for example, the force requisite to draw a wagon weighing 6 tons along a level macadamized road is 264 lbs., on a road with an ascent of 1 in 70 the force required is 456 lbs., i. e., $\frac{1}{70}$th part of 6 tons over and above 264 lbs. The greatest declivity which can be given to a road, so that horses may move down it with safety in a fast trot, varies according to its nature; for paved roads, 1 in 63—for those which are macadamized, 1 in 35—and for those laid with gravel, 1 in 15, have been considered the limit.

What is the best transverse form for a road, is a much debated question among engineers. All agree that it should be higher in the middle than at the sides, but some think it should be much higher than others. As a road can be better kept clear of water by a slight inclination in the direction of its length, than by any form which can be given to its cross-section, it seems preferable that it should be as nearly flat as possible, because every part of its breadth will then be equally available for traffic; whereas it is almost necessary to keep on the center of a highly convex road,

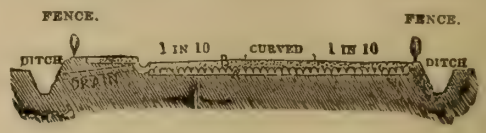


Fig. 1.—Cross Section of a Road.
A, Foundation of rough pavement or concrete; B, Broken stones.

and consequently wear deep furrows there, by confining the wheels and horses to pretty much the same track. Fig. 1 shows a transverse section of a road of an approved form, the slope is 1 in 30, with a few feet in the center on a flat curve.

Different opinions are also held as to whether the bed upon which the road is to be formed should be flat or rounded; those who prefer it flat considering that there should be a greater depth of material at the center than at the sides, while others think that the depth should be uniform.

As respects the construction of the road itself, the first point to consider is the foundation. The majority of roads have no artificial foundation. In such cases, the surface on which the road-material is to be laid, is generally made as solid as possible by means of efficient drainage, and by rolling and beating wherever there are embankments formed. It is the question whether or not a road should have a foundation of rough pavement below the broken stone covering, which is the essential point of difference between the two great rival systems of Telford and Macadam. Telford considered it of great importance that there should be such a foundation. He made it of stones varying in depth from nine inches at the center to three inches at the sides of the road, these being set with their broadest edge downwards, and no stone being more than four inches broad upon the upper edge; upon these were placed a coating of broken stones not exceeding six inches in thickness. The Glasgow and Carlisle and the Holyhead roads are excellent examples of the enduring character of those made on Telford's plan.

In our biographical notice of Macadam (q. v.) will be found a reference to his method of road-making. Suffice it here to say that he preferred a yielding and soft foundation to one which was rigid and unyielding, so that even on boggy ground, if it were but firm enough to allow of a man walking over it, he considered an artificial bottoming quite unnecessary. His roads were formed entirely of angular pieces of stone, of such a size as to pass freely through a ring 2½ inches in diameter. This plan has now fewer advocates than Telford's, or than the one subsequently proposed by Mr. Thomas Hughes, where a concrete of gravel and lime is employed for the foundation of the road. But experience has shown that Macadam's plan of employing angular pieces of stone is superior to every other as a mere covering for roads, whether they have an artificial foundation or not. So popular at one time was the system of macadamizing, that expensively paved streets, such as that between Edinburgh and Leith, were torn up to be reformed on the new plan. Dublin has been instanced as an example of the failure of Macadam's plan for the streets of a populous city. There the macadamized streets are in winter constantly covered with mud, and in summer, profuse watering is required to keep them from being overwhelmed with dust. It is curious, however, that the French road-engineers have, in recent years, come to the conclusion, that a covering of broken stone alone is sufficient on the most frequented roads and under all but the very heaviest traffic.

With regard to the kind of stone suitable for covering roads, granite and the different kinds of greenstone and basalt, ordinarily called whinstones, are the only kinds admissible. Sandstone is too easily crushed, limestone is objectionable from its slight solubility in water. The stone employed should be tough as well as hard. Flint is hard enough, but it is brittle, and easily crushed to powder. The object is to get it to bind into a firm mass, and not to roll about, after it has been laid down for some time.

Little need be said about the drainage of roads, notwithstanding its great importance, because it will be apparent from what has been said, that it is in great part secured by the plan on which a road is made. What further drainage a road requires, can, in many situations, be effected by ditches on either side. Where this

is not possible, as in the case of portions situated in cuttings more or less deep, proper drains require to be constructed. In such circumstances, a drain is either made down the center, with branch-drains from the sides running into it; or drains are formed along the sides, with gratings at proper intervals to take in the surface-water. If the ground beneath the road is composed of clay or of any kind of wet soil, under-drainage must be resorted to; and of course, wherever there are footpaths, small drains require to be placed under them, if there is no other means of carrying off the water from the channel between them and the road.

ROANNE, a thriving town of France, in the department of Loire, and, after St. Etienne, the most important town in the department for industry and commerce, stands on the left bank of the Loire, which is here navigable, 52 miles by railway north-west of Lyon. Its streets are wide, and its houses handsome. The chief structures are the bridge over the Loire, the public library, and the college buildings. There are important manufactures of muslins, calicoes, and woollen and other fabrics. Ship-building is carried on at the several dockyards. R. is also a most important entrepôt for commerce between the north and south of France. Pop. (1876) 21,472. Around and within the town are to be found numerous traces of the ancient rule and civilization of the Romans.

ROANO'KE, a river of Virginia and North Carolina, U.S., formed by the union, at Clarkesville, Virginia, of the Dan and Staunton rivers, which rise in the Alleghanies, flows south-east through the north-eastern portion of North Carolina, and empties into Albemarle Sound. It is navigable for large vessels to Weldon, head of tide-water, 150 miles; its length is 260 miles. In 1861, Albemarle Island, at its mouth, and Plymouth, were taken by the federal gunboats.

ROARING, a disease of the air-passages of the horse, is characterized by a grating, roaring noise, most noticeable during inspiration, and when the animal is galloped in heavy ground. It usually depends upon wasting of some of the muscles of the larynx; is apt to result from frequent attacks of cold, from strangles, inflammation of the neck-vein, or from tight reining. It constitutes unsoundness, unfits the animal for the satisfactory performance of fast work, is apt gradually to become worse, when a sharper whistling noise is produced, and is seldom curable. In recent cases, a dose of physic should be given, a smart blister applied to the throat, or a seton inserted. As in broken-winded subjects, the breathing is much less distressed when the horse is fed and watered several hours before being required to exert himself. He should have a liberal supply of good oats, but only a limited allowance of hay, which should be given damped. In bad cases, tracheotomy may be performed, and a pipe inserted in the windpipe, with which we have known heavy draught-horses work regularly for years.

ROASTING. All the apparently numerous forms of cookery may be reduced to two, viz., Roasting and Boiling (q. v.). In this general sense, roasting may be held to include broiling, baking, and all other processes which consist essentially in the exposure of food to the action of heat without the presence of any fluid excepting its own natural juices. Chemistry and experience alike teach that the first application of heat in roasting should be powerful and rapid, so as to form an external wall, by hardening the skin, and coagulating the superficial albuminous juices, and thus retain the deep-seated juices as much as possible within the meat. This external crust is usually formed in about 15 minutes, after which the meat should be removed to a greater distance from the fire, and allowed to cook slowly. The evaporation of the internal juices may be further restrained by the free and early application of flour—a process known as dredging. The loss of weight in roasting is greater than that in boiling; but it is mainly due to the melting out of fat and the evaporation of water, while the nutritive matter remains in an easily digestible form in the interior. Rules for calculating the time a joint of given weight requires for roasting, are given in all the ordinary cookery-books. Unless the roasting is continued long enough, those parts which are nearest the center do not become hot enough to allow the albuminous matters to coagulate, and hence they appear red, juicy, and *underdone*, as it is commonly called. The exact nature of the chemical changes which occasion the peculiarly agreeable odor of roasted meat is still unknown.

ROB, the Spanish name of a conserve of fruits. It is derived from the Arabic *roob*, signifying the juice of fruit, boiled to a sufficiently thick consistency to keep, and is supposed to have been taken from its similarity to the saccharine pulp of the locust-pods, called *Al-garoba* by the Moors. The juices of strawberries, raspberries, gooseberries, currants, &c., are boiled with sugar until they form *robs*, and are in that state used for flavoring drinks, &c.

ROBBERY is larceny from the person, preceded by violence or the fear of violence. By the present statutory law of England and Ireland, 24 and 25 Vict. c. 96, whoever robs a person is guilty of felony, and liable to penal servitude, not exceeding fourteen years, and not less than three years; or to imprisonment not exceeding two years, with or without hard labor. If, on the trial for robbery, it appear to the jury that the party charged did not commit the crime of robbery, but committed an assault with intent to rob, the party shall not be acquitted, but shall be found guilty of the assault with intent to rob. The punishment of an assault with intent to rob is penal servitude for three years, or imprisonment not exceeding two years. To constitute simple robbery, there must be what is called asportation, or a seizure of the goods. Thus, where the thief, in pulling a purse out of a pocket, could not disentangle it from keys in the pocket, and so the purse never left the pocket, it was held not robbery; but where a thief detached a lady's earring, which became lost in the curls of her hair, it was held to be robbery. In the law of Scotland, robbery also means the violent or forcible taking away of property from the person, while stouthrieff means the same offence in or near a dwelling-house.

ROBERT OF GLOUCESTER, an old English (metrical) chronicler, of whom absolutely nothing is known, except that he was alive about the time of the great battle of Evesham (1265). Robert's work is a 'history' of English affairs from the arrival of the fabulous Brutus down to the end of Henry III.'s reign; and is valuable partly for its matter (though that is in the main taken from Geoffrey of Monmouth and William of Malmesbury), but more for the language, which is there seen in its transition from Anglo-Saxon to the English of Chaucer and Wycliffe. It is written in verse, contains more than 10,000 lines, and—if we may judge from the numerous copies that were made of it—was very popular in the middle ages. The principal extant manuscripts are the Bodleian, the Cottonian, and the Harleian. The Chronicle was printed by Hearne, in 2 vols., 1724, a reprint of which appeared in 1810.

ROBERT I. (of Scotland). See BRUCE.

ROBERT II., king of Scotland, 1371—1390, was born March 2, 1316, only two years after the battle of Bannockburn. His father was Walter Stewart, and his mother, Marjory, only daughter of Robert the Bruce. R. lost both his parents in infancy. During the disastrous reign of his uncle, David II., he was one of the most prominent of the patriotic nobles of Scotland, acting as regent, or joint-regent, during the minority and exile of his sovereign. He was present at the battles of Halidon Hill (q. v.) and Neville's Cross (see BRUCE, DAVID). On the death of David, he obtained the crown, and became the founder of the Stewart dynasty, in virtue of the law of succession adopted by the Council of Estates held at Ayr in 1315. Partly from disposition, and partly from the infirmities of age, R. proved a peaceable, though not exactly a pusillanimous ruler. Such wars as were waged with England, were not only conducted, but actually organized, by his powerful and intractable barons, particularly the Earls of Douglas, Mar, March, and Moray, who shaped the policy of the country very much according to their pleasure. The misery inflicted on both sides of the borders by the raids of these warlike chiefs, and the reprisals of the English wardens—the Percies and others—was frightful; famine and pestilence became chronic; but the most celebrated incidents of R.'s reign were the invasions of Scotland by an English military and naval force under the command of the Duke of Lancaster ('old John of Gaunt, time-honored Lancaster'), in 1384, and again by King Richard II. himself, in 1385, which wasted the land as far as Edinburgh and Fife; and the grand retaliatory expedition of the Scotch in 1388, when two armies invaded and devastated England: the larger, under the Earls of Fife and Strathearn, Archibald Douglas, surnamed the Grim, Lord of Galloway, and the Earls of Mar and Sutherland, penetrating by way of Carlisle; the smaller, under James Earl of Douglas (the 'doughty Douglas'), and the brothers Dunbar, Earls of Moray and March, by way of Northumberland. Both were completely successful. What gives a special interest to the movements of the smaller body, is the fact, that on its return home it fought and won, though at the expense of the life of its gallant leader, the brilliant battle of Otterburn, July 21, 1388. See CHEVY CHASE. R. died at his castle of Dundonald, in Ayrshire, April 19, 1390. According to Buchanan (not, however, a very accurate historian), he labored honestly to suppress the internal disorders of the country; but, like most of the Stewarts, he was profligate in his habits. His favorite mistress, Elizabeth Mure of Rowallan, became his second wife.

ROBERT III., king of Scotland, son of the preceding, was born about 1340. His baptismal name was John, but this name, for reasons not ascertained, was changed on his accession to the throne in 1390, by an act of the Scottish Estates or parliament. His imbecility as a ruler virtually placed the reins of government in the hands of his ambitious brother, Robert, Earl of Menteith and Fife, whom, in 1398, he created Duke of Albany—during whose regime the Scottish barons first began to exercise that anarchic and disloyal authority, which, in the reigns of the first

three Jameses, threatened to destroy the power of the sovereign altogether. The principal events in R.'s reign were the invasion of Scotland, in 1400, by Henry IV. of England, who, at the head of a large army, penetrated as far as Edinburgh, but did not inflict much injury on the country, more, however, from clemency than impotence; and the retaliatory expedition of the Scotch, in the following year, under Archibald Douglas, son of the grim Earl, which resulted in the terrible disaster at Homildon Hill (q. v.). R. had two sons, the eldest of whom was David, Duke of Rothesay, a youth not destitute of parts, but shockingly licentious. As long as his mother lived, he kept within bounds, comparatively speaking; but after her death, says Buchanan, 'he gave an unbridled license to his passions; laying aside fear and shame, he not only seduced married ladies and virgins of good family, but those whom he could not entice, he forced to his embraces.' Albany received orders from the king to act as his guardian, and after a short time, starved him to death in his castle of Falkland—for which he underwent a mock-trial by his own creatures, and was of course declared innocent. Sir Walter Scott has given the traditionary version of this tragedy in his romance, *The Fair Maid of Perth*. R. now became anxious for the safety of his younger son, James; and after consulting with Wardlaw, Archbishop of St. Andrews, he resolved to send him to France; but, while proceeding thither, the vessel in which he sailed was intercepted by an English cruiser, and James was taken prisoner in 1405. When his father received the melancholy news, he gave way to paroxysms of grief, and died at Rothesay in the following year.

ROBERTS, DAVID, R.A., a painter of great eminence, was born at Edinburgh on 24th October 1796, and began life there as apprentice to a house-painter. His talent for art becoming obvious, he was set to study at the Trustees' Academy; and in 1822 he went to London, where he found employment as a scene-painter at Drury Lane Theater. Clarkson Stanfield, since famous as a marine-painter, was then also working at Drury Lane, and between him and R. an affectionate intimacy ensued, which ceased only with life. In 1826, a picture of 'Rouen Cathedral,' exhibited by R. at the Royal Academy, drew attention by its marked ability. The year after, appeared his painting of 'St. Germains at Amiens.' Shortly after, he left England, and for seven years was engaged in sketching in Spain, Africa, and the East. As the result of his labors, there was given to the world in 1839 the splendid work, in 4 vols., entitled *Sketches in the Holy Land, Syria, Idumæa, Arabia, Egypt, and Nubia*. The book contains 246 subjects, lithographed by Louis Hague, and illustrated by a historical commentary furnished by Dr. Croly. It is the finest and most elaborate thing of the kind perhaps ever produced, and of itself it would have sufficed for a great reputation to the artist. Pending its appearance, he had resumed his contributions to the Academy, of which in 1839 he was elected an Associate; the full dignity of Academician being conferred on him two years after. From this time forward, he grew steadily in fame, and in 1854 he was selected by the Queen to paint for her the 'Inauguration of the Great Exhibition in 1851;' a task which he achieved with admirable success. In his chosen field of architecture, during all his later life, he was admittedly without a rival. In addition to his unremitting work for the Academy, he illustrated many books, and issued the admirable series of lithographs, 'Spanish Sketches,' which attained a great popularity. He died November 25, 1864.

ROBERTSON, FREDERICK WILLIAM, M.A., an English preacher, was the son of a Scotch gentleman, Captain Frederick Robertson of the Royal Artillery, and was born in London 3d February 1816, in the house of his grandfather, Colonel Robertson. At the age of nine, he was sent to the grammar-school of Beverley, in Yorkshire, where he remained for a few years, and then accompanied his parents to the continent, where he became a proficient in French. In 1832, he entered the rector's class at the Edinburgh Academy, and there competed, we are told, 'all but successfully,' for the highest classical honors of the institution with James Moncreiff (now Lord Justice-clerk for Scotland). Next year R. proceeded to the Edinburgh University, and while there, had for private tutor the Rev. Charles Terrot, subsequently Bishop of the Scottish Episcopal Church in the same city. He was originally designed for the bar, but the study of law did not prove interesting to him, and he would gladly have become a soldier, for he always felt (as he afterwards confessed) 'an unutterable admiration of heroic daring;' but certain difficulties intervened in the way of obtaining a commission, and R., in obedience to the wish of his father, entered Brasenose College, Oxford, to study for the church, in 1836. His life had all along been marked by its singular purity and depth of religious feeling; hence his new career inspired him with no regret, but rather with a high resolve to be worthy of his calling. His first appointment was to the curacy of St. Maurice and St. Mary Calendar, but his health broke down in the course of a year, and he was compelled to visit the continent.

On his return to England, he was for a time curate to the incumbent of Christ Church, Cheltenham, whence, in the beginning of 1847, he removed to St. Ebbes, Oxford, and was just beginning to attract the notice of the undergraduates at Oxford, when he was offered the incumbency of Trinity Chapel, Brighton. His 'career' in Brighton—though it is perhaps wrong to describe a life so pure, delicate, unselfish, devoted as his, by a term expressive of vulgar ambition—was brief but glorious. For six years he continued to preach sermons, the like of which, for blending of delicacy and strength of thought, poetic beauty, and homely lucidity of speech, had perhaps never been heard before in England. R. was unhappily (for his comfort) not very 'orthodox;' consequently, he was long misunderstood, and vilified by the 'professedly religious portion of society;' but so true, so beautiful was his daily life and conversation, that he almost outlived those pious calumnies, and his death (from consumption, August 15, 1853) threw the whole town into mourning. His sermons (of which four series have been published) have attained great popularity and a very large circulation. The first series was published in 1855 (11th edition, 1863). R.'s *Expository Lectures on St. Paul's Epistle to the Corinthians* appeared in 1859. His *Lectures and Addresses on Literary and Social Topics* contain passages of faultless beauty and refinement; but as they were delivered to mixed audiences, and never intended for publication, they do not perhaps exhibit that rigorous intellectual grasp of a subject, or that strong and searching criticism of which their author was so capable. A good biography, with letters, was published in 1865 by the Rev. Stopford A. Brooke (5th ed., 1868).

ROBERTSON, JOSEPH, the most accomplished Scottish antiquary of the present century, was born at Aberdeen on the 17th day of May 1810. He was educated at Udny, in his native county, at the grammar-school of Aberdeen, and afterwards at the Marischal College there. The law was chosen for him as his profession, but his heart was not in the task, and from an early age he devoted himself to literature. His chief attention then, as in his after life, was directed to researches connected with the history and antiquities of Scotland; and in 1833 he went to Edinburgh, the place of all others best adapted for the cultivation of his favorite studies. While there, he wrote, for Oliver and Boyd's Cabinet Cyclopædia, a volume on the *Circumnavigation of the Globe*, which was published in 1836. The work by which he became first generally known, *The Book of Bon-accord, or a Guide to the City of Aberdeen*, was published in 1839. It is justly styled by Mr. Charles Knight, in his *Life of Shakspere*, 'a most lively, instructive, and learned volume—a model of guide-books.' A continuation of this work was promised, but was never completed. In the following year his *Delicia Literariæ, a new volume of Table-talk*, was published. In 1839, he returned to the north to undertake the editorship of the *Aberdeen Constitutional* newspaper; and in the end of that year, in conjunction with Mr. John Stuart, he founded the Spalding Club, a society instituted for printing the historical, ecclesiastical, genealogical, topographical, and literary remains of the north-eastern counties of Scotland. This society, formed on the model of the Bannatyne and Maitland Clubs, has printed many valuable works on Scottish archæology, which otherwise would have been all but inaccessible. Its earliest publication was a *History of Scots Affairs from* 1637 *to* 1641, written by James Gordon, parson of Rothiemay, which was issued in three vols. in 1841, under the joint editorship of Mr. R. and Mr. Grub.

R. edited for the same Club a volume of *Collections for a History of the Shires of Aberdeen and Banff* (1843); three vols. of *Illustrations of the Topography and Antiquities of the Shires of Aberdeen and Banff* (1847, 1857, and 1862); and *Passages from the Diary of General Patrick Gordon of Auchleuchries* (1859). He also contributed to the fifth volume of the Miscellany of the Club, in 1852, a learned paper *On Scholastic Offices in the Scottish Church in the 12th and 13th Centuries*. In 1843, R. went to Glasgow to become editor of the *Glasgow Constitutional* newspaper. While in that city, he edited for the Maitland Club, in 1846, a volume containing the *Book of the Collegiate Church of St. Mary and St. Anne, Glasgow*, and the *Chartulary of the Black Friars of Glasgow;* and in 1847, the fourth volume of the Miscellany of the Club. In June 1849, he contributed to the *Quarterly Review* an article on Scottish Abbeys and Cathedrals, which has become a text-book for all who write on that subject. In the same year he once more took up his residence in the Scottish metropolis, on being appointed editor of the *Edinburgh Evening Courant*. He discharged his editorial duties at Aberdeen, Glasgow, and Edinburgh with faithfulness and ability; but he found a more congenial occupation, when, in 1853, he was appointed, through the Earl of Aberdeen, who knew and appreciated his merits, to the office which is now known as that of Curator of the Historical Department of the Register-house at Edinburgh. In 1863, he edited for the

Bannatyne Club the *Catalogues of the Jewels, Dresses, Furniture, Books, and Paintings of Mary Qu en of Scots.* This volume contains a Preface which forms a most valuable contribution to the history of Mary's reign, and supplies information on almost all the controversies connected with her life. With the sanction and zealous encouragement of Sir William Gibson-Craig, Lord Clerk-register of Scotland, he projected the publication of a series of works connected with the history of Scotland, similar to those which have appeared in England under the direction of the Master of the Rolls.

The first volume of the series, the Chronicles of the Picts and Scots, has been edited by Mr. Skene, and several others have since been published. R. assisted in other literary undertakings, and was a valuable contributor to this *Encyclopædia*. His articles are generally connected with his favorite studies; among them are those on ARCHÆOLOGY, BURGH, ST. COLUMBA, CRANNOGES, the CULDEES, DAVID I., the FAMILY OF DOUGLAS, IONA, MARY STEWART, and OSSIAN. The last and most important of R.'s works was his *Concilia Scotiæ*, printed in two vols., in 1866, for the Bannatyne Club. This work has done for the Scottish Church that which Archdeacon Wilkins did for the Church of England in his *Concilia Magnæ Britanniæ et Hiberniæ*. It contains the statutes of all the Scottish councils, whether provincial or diocesan, from the earliest period to the Reformation, printed carefully from the best authorities; and the Preface, which occupies the greater part of the first volume, is a learned and authentic history of the councils, and of everything bearing on the subject of them. The authorities are quoted with an accuracy and copiousness for which R. was remarkable, and which contrasts strongly with the carelessness in that respect which marks some popular historians of the present day. In April 1864, R. received the degree of LL.D. from the University of Edinburgh. He died on December 13, 1866, almost immediately after the publication of his *Concilia Scotiæ*. R.'s labors are not to be estimated merely by the works which appeared under his name, or which he is known to have written. There was hardly a work of any merit published during the last twenty years of his life, in connection with Scottish history and antiquities, to which he did not in some way or other give his assistance; and his assistance was given with a thorough heartiness which only those who have benefited by it can appreciate. No literary man of his time was more beloved by his friends and intimate associates. In the relations of private life, he was most exemplary.

ROBERTSON, WILLIAM, the historian, was born in the year 1721, in the county of Edinburgh, and in the parish of Borthwick, of which his father was minister. He went to school at Dalkeith, a few miles distant from his home; but in 1733, his father's appointment to a charge in Edinburgh gave him the opportunity of attending school and college there. He was licensed as a preacher in 1741, and in 1743 was ordained to the parish of Gladsmuir, where the battle of Prestonpans was to be fought two years afterwards. In 'the '45,' he showed his zeal for the government cause by joining a body of volunteers formed in Edinburgh; and when the majority of his comrades saw that it was useless for them to attempt to defend the town, he, with a few whom he had infected with his ardor, went to offer their services to Sir John Cope.

The latter, conscious that he had already too many elements of imperfect discipline in his army, had the prudence to decline this offer. R. afterwards became a leader in what was called 'the Moderate' side in the ecclesiastical courts; and in 1758 was promoted to one of the Edinburgh charges, where he had increased opportunities of influence. In 1759, he published his celebrated *History of Scotland*. He avowedly passed over the earlier, periods, speaking of them as 'dark and fabulous,' which no doubt they were in the hands of those who had treated them; but it may be regretted that R. did not bring his acuteness to bear on the materials for their elucidation. In 1762, he was made Principal of the university of Edinburgh. In 1769, he published the *History of the Reign of the Emperor Charles V.*, to which he prefixed a *View of the State of Society in Europe from the subversion of the Roman Empire to the beginning of the Sixteenth Century.* This is the most valuable of his works. The field has been often since gone over by authors who have discovered much new material, but all the use they have made of it has become a sort of tribute to the natural sagacity of Robertson. His *History of America* was published in 1777. These works are admirable for their elegant and vigorous style. R. died in 1793. He was a genial man, with a large circle of friends. He had great conversational powers, and was reputed to be fond of displaying them. Interesting notices of his early life will be found in the autobiography of his friend Dr. Carlyle, and a sketch of the closing years is given in Lord Cockburn's *Memorials of his Life and Times.*

ROBESPIERRE, MAXIMILIEN MARIE ISIDORE DE, was born 6th May 1758, at Arras, where his father was an unsuccessful advocate. Having distinguished himself at the college of his native place, he was sent through the influence of a canon of the cathedral of Arras, to complete his education in Paris, at the College of Louis le Grand, where, by a singular chance, he found himself a fellow-student with Fréron, and Camille Desmoulins. In his studies, he was noted for diligence, regularity, and intelligence; and on the completion of his course at college, he devoted himself to the study of jurisprudence. After some years thus passed, he returned to Arras, to follow the profession of his father. In this his success was decided; and previous to the commencement of his more public career, he had become a person of considerable local note. While sedulously attending to his professional duties, he cultivated literature, not wholly without distinction; and in 1783 became a member of the Academy of Arras. Of the verses which, at this time, he seems to have been fond of writing, some curious fragments are preserved. Having, it is said, in discharge of his duty as member of the criminal court, been obliged to condemn a culprit to death, he resigned his situation on a point of conscientious objection to the barbarity of capital punishment—an incident sufficiently piquant in its contrast with subsequent portions of his history. On the memorable convocation of the States-general in 1789, he had local influence sufficient to secure his election as one of the deputies of the *tiers-état*, in which capacity he immediately repaired to Versailles. In the Assembly he was for some time of little account; but gradually he made for himself a position, and nice observers noted in him a quality of fanatical earnestness and conviction, in virtue of which they surmised for him a great career. 'This man,' said Mirabeau in particular, 'will go far, for he believes every word he says.' (*Cet homme ira loin, car il croit tout ce qu'il dit.*) Though in the Constituent Assembly he spoke frequently, and—despite the disadvantages of a mean person, a harsh shrill voice, and an ungainly manner—always with increasing acceptance, it was outside as a popular demagogue and leader in the famous Jacobin Club that his chief activity was exerted; and in this field his influence speedily became immense.

After the death of Mirabeau, whose giant figure, whilst he lived, seemed to dwarf all meaner men, his importance became more and more recognized; and from this time forward till his death, his biography is in effect the history of the revolution. In May 1791, he proposed and carried the decree by which members of the Assembly were excluded from a place in the legislature which succeeded; a measure obviously disastrous, as deteriorating the quality of the Assembly, and more and more insuring its subjection to the Jacobins, of whom R. was now the idol. His early aversion to capital punishment has been spoken of; and it is curious enough to be noted, *en passant*, that now, on the 30th May, he delivered an oration against it in the Assembly, denouncing it as 'base assassination.' On the dissolution of the Constituent Assembly in October 1791, R., now famous, revisited his native town, where he was received with enthusiasm; an escort of the National Guard did honor to his entrance, and a general illumination of the place testified the admiration of the citizens for their deputy. After a stay of seven weeks, he returned to Paris, and resumed his activity as a leader of the Jacobin Club. In the *émeute* of 10th August following, by which the king was dethroned, he took no prominent part; and though his complicity is suspected in the September massacres which ensued, no very distinct share in the infamy has ever yet been proved against him. To the National Convention, which was now formed, he was returned at the head of the Paris deputies; and as recognized chief of the extreme party called the Mountain, he was one of the main agents in procuring the execution of the king, which took place in December 1792. In the following year occurred his final struggle with the Girondists, who had twice before attacked him with a view to compass his destruction, and the chief men among whom he now triumphantly sent to the scaffold. The period of 'the Terror' followed: Marie Antoinette and the infamous Duke of Orleans were the first victims; Pétion, Danton, and Camille Desmoulins were next immolated, on a suspicion of favoring a reactionary policy; and for months, under the so-called Committee of Public Safety, Paris became the scene of an indiscriminate *quasi*-judicial slaughter, in which some thousands of lives were sacrificed. With these enormous atrocities, the name of R., along with those of his friends, Couthon and St. Just, remains peculiarly associated.

In the midst of the horror, took place, on 8th June, 1794, that strange *Fête de l'Etre Suprême*,' in which, in the name of the Republic, the existence of a Deity was decreed—a day of triumph for R., who, conspicuous as the first man of France, presided at the solemn mummery. But the end was near; men were weary of 'the Terror,' and the general sense of insecurity it induced; R. had many enemies; in particular, the numerous friends of Danton were eager to avenge his death; a conspiracy was organized against 'the tyrant,' as he was now called, and after a scene of fierce tumult in the Convention, his arrest was accomplished. A rescue by the populace followed, but he lacked the courage and promptitude to turn the opportunity to account; whilst he

hesitated, his enemies acted, and in July, 1794, he closed his career on the scaffold to which he had sent so many others.

Though without great and heroic qualities, R. can scarcely have been the mean and contemptible creature he has not unfrequently been represented. The instant effect of his oratory we know; and even as read, his speeches command respect for the mental power they exhibit. The subtlest practical tact and judgment he must plainly have possessed; and though timid in his own person, he was dexterous to appropriate the results obtained by the boldness of others. In principle, he was severe and consistent; and the title of 'Incorruptible,' which he early acquired, seems throughout to have been thoroughly deserved. In private life, he was amiable; and though he waded to his public ends through blood, he had not the savage joy in the shedding of it which it has been common to attribute to him. He was callous, not actively cruel; and during the time of 'the Terror,' it is simply the truth, that he was rather reluctantly acquiescent, than active in the atrocities for which he has since been held above all others responsible. 'Death—always death!' he is said to have frequently exclaimed in private, 'and the scoundrels throw it all on me! What a memory shall I leave behind me, if this lasts! Life is a burden to me.' For a candid view of the character on this and its other sides, the more curious reader may be referred to the work on the subject by Mr. G. H. Lewes—*Life of Maximilien Robespierre, with Extracts from his Unpublished Correspondence* (London, Chapman and Hall, 1849). See also the Histories of Thiers, Mignet, Carlyle, Michelet, Louis Blanc, and Ernest Hamel's *Vie de Robespierre* (Par. 1865).

RO'BIN, besides being a familiar name of the Redbreast (q. v.) in Britain, and frequently given to the Bluebird (q. v.) in America, is also in America the usual name of a species of Thrush (q. v.) widely distributed from Mexico to lat. 60° N. It is nearly twice the size of the redbreast, olive gray, the top and sides of the head black, the chin and throat white with black streaks, the under parts chestnut brown. It remains during winter in sheltered places, even as far north as New England, but is generally a bird of passage. Many arrive in New England before the snow has disappeared. Large flocks are to be seen in the Southern States in winter, where great numbers are killed for the table, the markets being often glutted with them. In Massachusetts, the law forbids the killing of this bird at any season of the year. Its nest is often built near houses. Two broods are produced in the year. The robin is a lively bird, and a general favorite in the northern parts of the United States. It is often kept as a cage-bird, is very gentle and easily tamed, and has a pleasing song.

ROBIN GOODFELLOW, a name given in England to a domestic spirit or fairy, analogous in character to the *Nisse Goddreng* of Scandinavia, the *Knecht Ruprecht*, i. e., Robin, of Germany, and the *Brownie* of Scotland. Roguery and sportiveness were the characteristics of this spirit; and in the reign of Elizabeth, his existence was so generally credited, that he was 'famozed in every old wives chronicle for his mad merrye prankes.' It was from the popular belief in this spirit that Shakspeare's *Puck* was derived. From the early ballads concerning R., we learn that he was the offspring of a 'proper young wench by a hee-fairy,' who was no less a person than Oberon, king of Fairyland. In his youth, R. displayed such mischievous tricks that his mother found it necessary to promise him a whipping. He ran away from home, and engaged with a tailor, from whom he also eloped. When tired, he sat down, and fell asleep, and in his sleep he had a vision of fairies. On awaking, he found lying beside him a scroll, evidently left by his father, which, in verses written in letters of gold, informed him that he should have anything he wished for, and also the power of turning himself into various shapes; but he was to harm none but knaves and queans, and was to 'love those that honest be, and help them in necessity.'

As a specimen of his 'mad prankes,' R. went one day to a wedding as a fiddler, and was a welcome guest; but in the evening 'then hee beganne to play his merry trickes in this manner. First, hee put out the candles, and then being darke, hee strucke the men good boxes on the eares; they, thinking it had beene those that did sit next them, fell a-fighting one with the other, so that there was not one of them but had either a broken head or a bloody nose. At this, Robin laughed heartily. The women did not scape him, for the handsomest he kissed: the others he pinched, and made them scratch one the other, as if they had beene cats. Candles being lighted againe, they all were friends, and fell againe to dancing, and after to supper. Supper being ended, a great posset was brought forth. At this, Robin's teeth did water, for it looked so lovely that hee could not keepe from it. To attaine to his wish, he did turne himself into a beare: both men and women seeing a beare amongst them, ranne away, and left the whole posset to Robin. He quickly made an end of it, and went away without his money, for the sport hee had was better to him than any money whatsoever.'

Although R. was a sprite particularly fond of disconcerting and disturbing domestic peace, he was believed to be easily propitiated. If a bowl of milk, or curds and cream, were duly laid out for him, he would at midnight perform for the servants many household duties. If this were neglected, R. would revenge himself by pinching and otherwise annoying the inmates. The following passage in Shakspeare's *Midsummer Night's Dream* fully describes R.'s peculiarities:

> Either I mistake your shape and making quite,
> Or else you are that shrewd and knavish sprite
> Call'd Robin Goodfellow: are you not he
> That frights the maidens of the villagery;
> Skims milk, and sometimes labors in the quern,
> And bootless makes the breathless housewife churn;
> And sometime makes the drink to bear no barm;
> Misleads night-wanderers, laughing at their harm?
> Those that Hobgoblin call you, and sweet Puck,
> You do their work, and they shall have good-luck.

The *Mad Pranks and Merry Jests of Robin Goodfellow* have been reprinted from the edition of 1628, by the Percy Society, in 1841.

ROBI'NIA, a genus of trees and shrubs of the natural order *Leguminosæ*, suborder *Papilionaceæ*, having a 4-fid calyx, with the upper segment divided into two; stamens, nine united, and one free; the pod long and many-seeded. The species are widely diffused over the world. The most important is a North American tree, sometimes called the *Locust Tree* (q. v.), also known as the *False Acacia*, or *Thorn Acacia*, often simply designated *Acacia*. It was raised from seed in France by John Robin, about the year 1600, and gradually spread over the warmer parts of Europe and the south of Siberia. On account of its quick growth, its spines, and its property of submitting to be clipped into any form, it is very suitable for hedges. In the south of Europe, it succeeds well as a timber tree, but in more northern regions, it suffers from frost in severe winters; and in Britain it often suffers from frost, owing to the imperfect ripening of the wood in the summer. The wood is compact, hard, and takes a fine polish; for many purposes, it is scarcely inferior to oak, which it rivals in toughness and strength. It does not readily rot in water, and is used for shipbuilding. The tree is very ornamental, and of rapid growth. It is found wild in abundance from the Alleghanies to the Rocky Mountains. Its leaves are pinnate, with 9—13 thin and smooth leaflets. The flowers are fragrant and white, in large pendulous racemes. The roots throw up many suckers; and are very sweet, affording an extract resembling liquorice. An agreeable syrup is also made from the flowers.—*R. viscosa* is a smaller tree, but even more ornamental, a native of the south-western parts of the Alleghany Mountains. It has rose-colored scentless flowers. The young branches are viscid. —The ROSE ACACIA (*R. hispida*) is a native of the south-western ranges of the Alleghanies, and is a highly ornamental shrub, with hispid branches, and large rose-colored scentless flowers.—*R. Caragana* is a native of the south-east of Europe, and is planted for hedges at St. Petersburg, where it spreads like an indigenous plant.

ROBINS, BENJAMIN, a celebrated English mathematician and artillerist, was born at Bath in 1707, of parents who belonged to the Society of Friends, and who were in such poor circumstances as to be unable to give their son a good education. R., however, having obtained a little instruction in mathematics, prosecuted this branch of science with great zest, and having acquired a good elementary knowledge of it, he removed, by the advice of Dr. Pemberton, to London, where he set up for a teacher of mathematics. During his leisure hours, he improved himself in his favorite subject by reading the works of the ancient and modern geometers, and by the study of the Latin, Greek, and several modern languages. He also published several mathematical treatises, which gained for him considerable reputation. R. next commenced the series of experiments on the resisting force of the air to projectiles, which has gained him so much celebrity, varying his labors by the study of fortification; a science with which he obtained a practical acquaintance by visiting many of the most celebrated works of this class in Flanders. In 1734, he demolished in a treatise entitled *A Discourse concerning the Certainty of Sir I. Newton's Method of Fluxions*, the objections brought by the celebrated Berkeley, Bishop of Cloyne, against Newton's principle of ultimate ratios. His great and valuable work, the *New Principles of Gunnery*, upon the preparation of which he had spent an enormous amount of labor, appeared in 1742, and produced a complete revolution in the art of gunnery. Previous to R.'s time, it had never been attempted to estimate the velocity of balls otherwise than by the ordinary parabolic theory of Galileo (see PROJECTILES).

R. suggested two methods for obtaining this information—viz. (1), by finding experimentally the initial force of fired gunpowder confined to a certain space, and the law of the decrease of this force as the space increased, thence calculating the velocity which

would be imparted to a body of given weight; and (2) by the *Ballistic Pendulum*. The second method has been found in practice to be more preferable for accuracy. R., in the course of his experiments, also discovered and explained the curvilinear deflection of a ball from a vertical plane. Some of his opinions having been questioned in the *Philosophical Transactions*, R. ably replied to these objectors, and also wrote several dissertations on the experiments made by order of the Royal Society in 1746—1747, for which he received their annual gold medal. In consideration of his able defence of the policy of the then government, by means of pamphlets which he wrote and published from time to time, he received (1749) the post of 'Engineer-in-general to the East India Company;' but his first undertaking, the planning of the defences of Madras, was no sooner accomplished than he was seized with a fever, and though he recovered from it, his vital energy had been exhausted, and he died July 29, 1751. R. was considered as one of the most accurate mathematicians of his time. His mathematical works were collected after his death, and along with the details of his latest experiments in gunnery, were published by Dr. Wilson in 1761. It may also be mentioned that R. had some share (to what extent is now unknown) in the composition of Anson's *Voyage Round the World* (1740—1744).

ROBINSON, Rev. Edward, D.D., LL.D., philologist and biblical scholar, was born at Southington, Connecticut, April 10, 1794, graduated at Hamilton College, Clinton, in the state of New York, in 1816, where he was engaged as tutor, and in pursuing his studies until 1821, when he went to Andover, Massachusetts, to superintend the printing of an edition of the first six books of the *Iliad*, previous to which he had married, and become a widower. He studied Hebrew with Professor Stuart at Andover, to whom he became an assistant professor. In 1826, he began four years' travel and study in Europe, where he married Miss Therese A. L. von Jakob, daughter of a professor at Halle. Returning in 1830 to Andover, he was appointed Extraordinary Professor of Sacred Literature, and librarian, but resigned in 1833, removed to Boston, and in 1837 was appointed Professor of Biblical Literature in the Union Theological Seminary, city of New York. At this period, he made, in company with Rev. Eli Smith, an extensive survey of Palestine, of which he gave an account in his admirable work, entitled *Biblical Researches in Palestine and Adjacent Countries* (3 vols. 8vo, Halle, London, and Boston, 1841)—which will always remain a standard work on the subject. He entered upon the active duties of his professorship in 1840; and in 1852 made a second visit to Palestine, of which he published an account in 1856. His other works are a translation of Buttman's *Greek Grammar*, 1832 and 1850; *Greek and English Lexicon of the New Testament*, 1836 and 1850; *Harmony of the Four Gospels*, in Greek, 1845, and in English, 1846. He was also editor of the *Biblical Repository*, *Bibliotheca Sacra*, Calmet's *Bible Dictionary*, a translation of Gesenius's *Hebrew Lexicon*, &c., and was an active member of geographical, oriental, and ethnological societies. He died in 1864.

ROBINSON, Mrs. Therese Albertine Louise, wife of the preceding, and daughter of Professor von Jakob, known to the world of letters as 'Talvi,' a name composed of her initials, was born at Halle, Germany, January 26, 1797. In 1807, she accompanied her father to Russia, where he had an appointment as professor in the university of Kharhov. In 1810 they removed to St. Petersburg, where she learned modern languages and history. In 1816, they returned to Halle, and there she studied Latin, and wrote a volume of tales, published in 1825 under the title of *Psyche;* and under the signature of 'Ernest Berthold,' translations of Sir Walter Scott's *Black Dwarf* and *Old Mortality*, and also two volumes of Servian popular songs—*Volkslieder der Serben*. In 1828, she was married to Professor Robinson, and in 1830 accompanied him to America, where she studied the languages of the aborigines, translated Pickering's *Indian Tongues* into German, and contributed a *Historical View of the Languages and Literature of the Slavic Nations* to the *Biblical Repository*. In 1837, she accompanied her husband back to Germany, and published *An Essay on the Historical Characteristics of the Popular Songs of the German Nations, The Poems of Ossian not Genuine*, a *History of Captain John Smith*, in German, also *The Colonization of New England*, which was translated into English by the younger Hazlitt. Returning to New York, she wrote in English, *Heloise, or the Unrevealed Secret; Life's Discipline, a Tale of the Annals of Hungary; The Exiles;* and numerous contributions to German and American periodicals. She died at Hamburg in 1870.

ROBISON, John, a celebrated Scotch natural philosopher, was born at Boghall, in the parish of Baldernock, Stirlingshire, in 1739, and after a preliminary training at the grammar-school of Glasgow, entered the university of that city in November 1750, and took his degree in 1756. He was engaged to accompany Edward, Duke of York, to sea, as his instructor in mathematics and navigation; but this arrangement being abandoned, R. accompanied in a similar capacity the son of Admiral Knowles (1758—1762). He afterwards obtained the responsible office of taking charge of the Harrison (q. v.) chronometer in its trial trip across the Atlantic; and on his return (April 1763) from this expedition, for which he was never remunerated, he returned to Glasgow to commence the curriculum of divinity study. He happened, however, at this time to renew his acquaintance with James Watt and Dr. Black, and his former strong predilection for physical science underwent a vigorous revival, and was cultivated with such success that in 1766, when Black was transferred to the university of Edinburgh, R. succeeded him. In 1770, his old friend, Admiral Knowles, having been recommended by the British government to the czarina Catherine II. as the fittest person to reform the ship-building and naval administration of Russia, accepted the appointment of President of the Russian Board of Admiralty, and persuaded R. to accompany him as secretary. R. remained in Russia for several years, and rose high in the opinion of government, which conferred upon him various offices, both honorable and profitable. But the chair of Natural Philosophy in Edinburgh having become vacant in 1773, R. was unanimously elected, and despite the extremely tempting and flattering offers of the Russian government, he accepted the chair (1774). On leaving Russia a pension was settled on him, and he agreed to take charge of two or three of the young cadets, his former pupils.

To the performance of his professorial duties, R. brought talents and acquirements of a high order; his knowledge was extensive, and included the latest discoveries of both British and foreign philosophers; his language was precise and fluent; and his views of his subject ingenious and comprehensive. But, on the other hand, his diction was too rapid, and he unfortunately disapproved of experiments, and employed them as little as possible in illustrating the great principles of natural science. In 1783, R. joined with Principal Robertson and other eminent men in reviving the old literary and scientific society (which had been founded in 1739 under the direction of Mr. Maclaurin, and had been in a languishing state since 1756), which was now incorporated by royal charter, and became the Philosophical Society. The *Transactions* of this Society contain several works from R.'s pen, which are held in high esteem; and his contributions to the *Encyclopædia Britannica* were the means of elevating that work to the rank of a valuable and trustworthy book of reference. He published Black's *Lectures on Chemistry* (1803), and also a portion of a work of his own, entitled *Elements of Mechanical Philosophy*, which, together with some MSS. intended to form part of a second volume, &c., was re-published by Sir David Brewster in 4 vols. (1822), with notes. On January 28, 1805, he was seized with a severe recurrence of a former illness, brought on by a cold, and died two days afterwards.

ROB ROY, the popular name of Robert M'Gregor, a celebrated Scottish outlaw, whose singular adventures entitle him to be considered the Robin Hood of Scotland. He was born between the years 1657 and 1660, and was the second son of Donald M'Gregor of Glengyle, by a daughter of Campbell of Glenlyon. R. R., in consequence of the outlawry, in 1660, of the clan M'Gregor by the Scottish parliament, assumed the name of Campbell. In Gaelic, the name *Roy* signifies *red*, and was applied to him from his ruddy complexion and color of hair. R. R. received a fair education, and in his youth was distinguished for his skill in the use of the broadsword, in which the uncommon length of his arms was of much advantage. It was said that he could, without stooping, tie the garters of his Highland hose, which are placed two inches below the knee. Like many of the Highland proprietors of the period, R. R. dealt in grazing and rearing black-cattle for the English market. He took a tract of land for this purpose in Balquhidder; but his herds were so often stolen by banditti from Inverness, Ross, and Sutherland, that, to protect himself, he had to maintain a party of armed men, to which may be attributed the warlike habits he afterwards acquired, He also protected his neighbors' flocks, in return for which he levied a tax, which went under the name of 'black mail.' R. R. married a daughter of the laird of Glenfalloch, shortly after which he acquired the estates of Craig Royston and Inversnaid, near the head of Loch Lomond. In consequence of losses incurred in unsuccessful speculations in cattle, for which he had borrowed money from the Duke of Montrose, R. R. lost his estates, which were seized by the duke, on account of this debt. R. R. rendered desperate by his misfortunes, collected a band of about twenty followers, and made open war upon the duke, sweeping away the whole cattle of a district, and intercepting the rents of his tenants. That this could happen at so late a period, and in the immediate neighborhood of the garrisons of Stirling, Dumbarton, and Glasgow, appears almost incredible; but R. R. enjoyed the protection of the Duke of Argyle and the respect of the country people, who gave him timely information of the designs of his enemies.

Numberless stories are still current in the neighborhood of Loch Lomond and Loch Katrine of his hairbreadth escapes from

capture by the troops. At one time, a reward of £1000 was offered for his head, in consequence of which he was obliged to take shelter in a cave at the base of Ben Lomond, on the banks of the lake, which had in former times afforded a secure retreat to Robert the Bruce. Many instances have also been recorded of his kindness to the poor, whose wants he often supplied at the expense of the rich. R. R. was not the commonplace *cateran* that many people think him. He gave his sons a good education, and died peaceably in his bed about the year 1738. His funeral was attended by all the people of the district, with the exception of the partisans of his enemy, the Duke of Montrose. R. R.'s exploits have been immortalized by Sir Walter Scott in his celebrated novel of *Rob Roy*, written in 1817.

An interesting fact is, that in the list of subscribers to Keith's *History of the Affairs of Church and State in Scotland*, published in 1734, there occurs the name 'Robert Macgregor, *alias* Rob Roy.' See Macleay's *Rob Roy and the Clan Macgregor* (1881).

ROC or ROCK, a fabulous bird, represented as of immense size, and 'able to truss an elephant' in its talons. It is perhaps enough to refer to the *Arabian Nights' Entertainments*, as to the size and power of the Roc. A belief in its existence prevailed throughout the middle ages, and it is noticed in many works of that period. The fables concerning the R. may have originated in exaggerated stories of some of the great eagles, or of the Lammergeier.

RO'CAMBOLE (*Allium scorodoprasum*), a plant of the same genus with garlic, onion, leek, &c., and nearly allied to garlic, which it resembles in its habit, although larger in all its parts. The upper part of the stem is in general spirally twisted before flowering. The root forms rounder cloves than those of garlic, and of much milder flavor; the umbels are also bulbiferous. R. has long been cultivated in kitchen-gardens, although it has never become very common in them. It is a native of sandy soils in Denmark and other countries near the Baltic.

ROCCE'LLA. See ARCHIL.

ROCH or ROCK ALUM, a name formerly given to pure alum in mass; but it is now applied to a particular variety found at Civita Vecchia, in the Roman States. It is a kind of native alum, free from iron, but having a reddish color, derived from the soil in which it is found. It is also called Roman, and red alum. A factitious kind is now in general use, made of common alum reddened with Armenian bole.

RO'CHDALE, a thriving manufacturing town of Lancashire, a market-town and parliamentary and municipal borough, in the valley of the Roche, and built on both sides of that stream, 11 miles north-north-east of Manchester, and 200 miles north-west of London by railway. The parish church, placed on an eminence, and approached by a flight of steps, is a venerable edifice, dating from the 12th c., and built partly in late Norman, and partly in Perpendicular. The other public buildings comprise churches, chapels, and meeting-houses for the various dissenting sects. The new Town Hall, completed in 1867, is a fine building in domestic Gothic style. The public baths, opened in 1868, are the property of the corporation. Many improvements in the architectural and sanitary condition of the town have been made within recent years. With all the improvements, however, R. is beautiful only in site, and derives its importance wholly from its extensive and varied manufactures. The woollen manufacture, introduced here by a colony of Flemings in the reign of Edward III., is in a prosperous state, and is increasing in importance. Blankets, baizes, kerseys, and other woollen fabrics are the staple manufactures. Cotton goods also, especially calicoes, are largely manufactured. In the vicinity, coal is found, and flagstones, freestones, and slates are abundantly quarried. A good general trade is carried on; there are several hat-factories, cotton-mills, machine-shops, iron and brass foundries, &c. There are weekly markets for woollen goods and grain, and fortnightly fairs for cattle. The commerce of the town is facilitated by abundant means of communication. Pop. (1871) of municipal borough, 44,559; (1881) 68,865. R. returns one member to the House of Commons.

ROCHEFORT-SUR-MER, an important seaport and naval arsenal of France, in the dep. of Charente-Inférieure, stands on the right bank of the Charente, 5 miles from its mouth. It is surrounded by ramparts, and protected by forts at the mouth of the river; and is a modern, clean, well-built town. Few French towns can be compared with R. for the number and importance of its public works. The harbor, which is one of the three largest in France, is deep enough to float large vessels at low water. R. has fine wharfs, extensive magazines, dock-yards, rope-walks, cannon foundries, and other establishments designed for the manufacture and preservation of naval stores and marine apparatus of every kind, including extensive bread and biscuit stores. The most celebrated of its many institutions are the marine hospital, founded in 1787, and provided with 1240 beds for seamen, besides wards for invalided officers; the artillery and naval schools for every branch of the profession, and the general civil college. Its convict-prison, which had accommodation for 1000 prisoners, has been disused since 1852, and the convicts are now transported to Cayenne. In addition to the extensive trade arising from the special character of the place, R. is the center of the commerce of the department, and is largely engaged in colonial trade, in the manufacture of brandy, and in the building men-of-war and of merchant-ships, steamers, and coasting-vessels. Pop. (1876) 25,454.

ROCHEFOUCALD. See LAROCHEFOUCAULD.

ROCHELLE, LA, a fortified seaport of France, capital of the dep. of Charente-Inférieure, on an inlet of the Bay of Biscay, formed by the islands Ré and Oleron, 300 miles south-west of Paris by railway. Its little harbor, which consists of an outer tidal basin, and an inner wet dock, is surrounded by fine quays and commodious docks, close to which lie the principal streets and squares. Many of the latter are regular and well built, and present a handsome appearance from the number of houses which are adorned with porticoes and balconies. The public buildings most worthy of notice are the arsenal, the palace, the town-hall, the exchange, and the cathedral. Besides the fine promenade of the Place du Château, there are, outside the city walls, two extensive public gardens, known as La Promenade du Mail and the Champs de Mars. Ship-building is actively carried on, especially in connection with the Newfoundland fishing trade; and besides this branch of industry, and the manufacture of coal bricks and cotton yarns, R. has numerous glassworks, sugar-refineries, and distilleries for the preparation of brandy. Pop. (1876) 19,030.—R., which was known till the 12th c. under its Latin name of *Rupella*, or Little Rock, of which its present name is a mere translation, originated in a colony of serfs of Lower Poitou, who, fleeing from the persecution of their lord, settled on the rocky promontory between the ocean and the neighboring marshes, which had previously been occupied by fishermen only, but which rapidly increased in importance under the new settlers. On the marriage of Eleanor of Aquitaine with Henry II. of England, R., as a part of her dowry, came into the possession of the English kings, by whom it was retained till 1224, when it was taken by the troops of the French king, Louis VIII.; and although it was ceded to England at the treaty of Bretigny in 1360, in the subsequent wars it was retaken by France, under whose sway it has remained since 1372. As a stronghold of the Huguenot party, it underwent various attacks and sieges during the religious wars of the Henries, in the latter half of the 16th c.; and on its final and unconditional surrender to the royal troops in the time of Louis XIII., its old fortifications were destroyed, and new lines of defences subsequently erected by the great Vauban.

ROCHELLE SALT is the popular name of the tartrate of soda and potash ($NaO,KO,C_8H_4O_{10} + 8$ Aq), this salt having been discovered, in 1672, by a Rochelle apothecary named Seignette. It occurs, when pure, in colorless transparent prisms, generally eight-sided; and in taste it resembles common salt. It is prepared by neutralizing acid tartrate of potash (formerly known as bitartrate) with carbonate of soda. After a neutral solution has been obtained, it must be boiled and filtered, and the resulting fluid must be concentrated till a pellicle forms on the surface, when it must be set aside to crystallize.

This salt is a mild and efficient laxative, and is less disagreeable to the taste than most of the saline purgatives. From half an ounce to an ounce, dissolved in eight or ten parts of water, forms an average dose. A drachm of Rochelle Salt added to one of the ingredients of an effervescing draught (bicarbonate of soda or tartaric acid, for example), forms one of the varieties of what are called Seidlitz powders.

RO'CHESTER, an episcopal city, parliamentary and municipal borough, and river-port of Kent, stands between Chatham (q. v.) on the east, and Strood on the north-west, on the right bank of the Medway, 36 miles east-south-east of London, by the London, Chatham, and Dover Railway. Together with Chatham and Strood, it forms in effect one large town. The city is surrounded on two sides by the river; and its ancient castle and cathedral, the numerous martello towers along its shores, and the works connected with the Chatham lines of fortification, render its appearance highly striking. The bishopric of R. was founded in 604; but the early Saxon cathedral suffered from the ravages of the Danes, and was in a completely ruined condition at the time of the Norman Conquest. Gundulf, who was consecrated Bishop of R. in 1077, began to rebuild the cathedral and the priory connected with it; the dormitory, chapter-house, and refectory were added under the succeeding bishop; and the new cathedral was dedicated in 1130, in presence of the king and a great company of bishops. The cathedral, the nave and crypt of which are Norman, and the choir and transepts Early English, is 310 feet long, and the western transept is 123 feet, and the nave and choir 68 feet broad.

Of the ancient Norman Priory, only a small fragment remains.

The castle, crowning an eminence, and overlooking the cathedral, is a Norman keep, built in a wonderfully strong and solid style of masonry. R. imports coal and exports hops. In 1880, 4463 vessels, of 766,018 tons entered the port, and 4798, of 772,215 tons, cleared. R. returns two members to the House of Commons. Pop. (1871) 18,352; (1881) 21,590.

R., which is surmised to have existed prior to the Roman invasion, was called by the Romans *Durobrivæ*, and according to Bede, derives its present name (*Hrofs-ceaster*, Hrof's Castle) from that of Hrof, a Saxon chieftain.

ROCHESTER, a city of New York, U. S., is on the Genesee River, 7 miles south of its entrance into Lake Ontario, where it is crossed by the Erie Canal and the Central Railway, and is the terminus of the Genesee Valley Canal and Railway, 229 miles west-north-west of Albany. In the center of the city are the upper falls of the Genesee, a perpendicular cataract of 96 feet. Two other falls of 84 and 25 feet are a mile and a half below, the river running through a deep gorge in its limestone banks, from 100 to 220 feet high. The city is well-built, chiefly of bluish limestone, with broad shaded streets, and there are nearly as many houses as families. The falls give water-power to numerous large flour-mills and other manufactories. The canal crosses the river on a handsome aqueduct of seven arches. There are 57 churches, 26 public schools, 41 academies, a university, theological seminary athenæum, Protestant and Catholic hospitals, a reformatory and county offices, 5 banks and 4 savings banks with 10,000,000 dollars on deposit, 4 daily and 10 other papers. The rural cemetery of Mount Hope is one of the ornaments of the city. The suburbs are highly cultivated, having 4000 acres of fruit trees, and nurseries of 250 to 500 acres. The nursery trade of R. is not surpassed by that of any other place in the world. There is a good harbor at the mouth of the river, and a considerable commerce by the lake. R. was settled in 1810; in 1820, its population was 1502; in 1840, 20,191; in 1860, 48,243; in 1870, 62,386; in 1880, 89,363.

ROCHESTER, John Wilmot, second Earl of, has left a name notorious for wit and profligacy. He was born April 10, 1647, at Ditchley, Oxfordshire, his father being Henry, first earl, better known as the Lord Wilmot of Clarendon's *History*. He was entered of Wadham College, Oxford, when only 12 years of age; and at 14 was, with other persons of rank, made M.A. by Lord Clarendon in person. After traveling in France and Italy, he attached himself to the court, and rose high in favor with Charles II., who made him one of the gentlemen of the bedchamber, and comptroller of Woodstock Park. In 1665, he went to sea in the fleet commanded by the Earl of Sandwich, and behaved at Bergen with great intrepidity. His account of the attack is described in a letter to his mother given in Wordsworth's *Ecclesiastical Biography*. He had entered into a formal engagement with his friend Mr. Windham, 'not without the ceremonies of religion, that if either of them died, he should appear, and give the other notice of the future state, if there was any.' Windham was killed in the action, but did not afterwards disturb the repose of his friend. R. incurred the displeasure of the king, and was committed to the Tower, for the forcible abduction of a celebrated beauty and heiress, Miss Mallett, who was rescued by her friends, but whom he subsequently married before he was 20 years old. His wit and love of pleasure made him the favorite of a dissolute court. He once harangued the populace as a mountebank from a stage on Tower Hill, and is said to have occasionally persuaded the 'merry monarch' to disguise his rank, and accompany him in the pursuit of frolic and adventure. His genius and activity of mind led him to withdraw at times from scenes of gallantry and licentious merriment. He cultivated the Muses with success, and Anthony Wood speaks of him as the greatest scholar among the nobility of his day. As he grew older, he gave less of his time to study, and more to the company of vicious companions, and indulgence in wine. His constitution being undermined by excess and voluptuousness, he died at the early age of 34.

Bishop Burnet has left an interesting account of his death under the title of *Some Passages of the Life and Death of John Earl of Rochester*, from which it appears that he became a sincere convert to the truth of Christianity, and sincerely repented his immoral and dissolute courses. He wrote some love-songs, an elegant *Imitation of Horace on Lucilius*, a *Satire against Man*, in which he is much indebted to Boileau, and an *Essay on Nothing*, which is perhaps his best performance.

RO'CHET (Lat. *rochetus*, or *rochettus*), a portion of the church costume of bishops, abbots, prelates, canons of certain privileged chapters, and some other dignitaries. It is usually of lawn or lace, and is of the form of a surplice, but with close-fitting sleeves. In the Latin Church, its use is very ancient, although its form has varied at different times. In the first Prayer-book of Edward VI., which preserved a considerable part of the Roman episcopal costume, the rochet was ordered to be worn by bishops in the communion service. The rochet, however, must not be confounded, as is often done by writers on clerical costume, with the Dalmatic and Tunic, tight and close-fitting vestments of colored silk worn by bishops under the *Planeta* (q. v.).

ROCK. Though popularly restricted to masses of indurated matter, this term is extended by geologists to all substances which make up the crust of the earth, whether they be loose and friable like soil and sand, or compact and indurated like limestone and granite. The rocks of the earth's crust will be found described under the heads Aqueous and Igneous Rocks, to which the reader is referred.

ROCK, a kind of sweetmeat, made of sugar, sometimes mixed with almonds and various flavoring materals. The sugar is first boiled and then poured out upon a cold marble slab, and worked up into a rough mass.—The term is also frequently applied to another form of sweetmeat, in which the sugar, whilst hot and soft, is pulled repeatedly over a smooth iron hook, until it becomes white and porous. This is also flavored with peppermint or other essences.

ROCK, Cock of the (*Rupicola aurantia*), a bird of the order *Insessores;* tribe *Dentirostres;* family *Pipridæ* (Manakins, &c.), regarded by many as a sub-family of *Ampelidæ*. The *Pipridæ*, or Manakins, are a pretty large group of birds, many of them of very curious and beautiful plumage, most of them inhabitants of America, and only of the tropical parts of it. They have the bill broad at the base, the nostrils at the side nearly hidden by feathers; the wings rather short, but pointed; the tail very short and even; the legs (*tarsi*) long and slender. In the genus *Rupicola*, the bill is strong; and the species sometimes called *Rock-manakins* are comparatively large birds, having a double vertical crest on



Cock of the Rock (*Rupicola aurantia*).

the head, with the feathers disposed in a fan-like manner. The Cock of the R. is a native of Guiana and of other north-eastern parts of South America. It is remarkable for its bright orange-colored plumage—the quill-feathers of the wings, however, being black, and the tail tipped with yellow—its large crest overhanging the bill, and its wary habits. It is a solitary bird, inhabiting rocky places, retiring into a hiding-place during the day, and coming forth to feed at sunrise and sunset. The tips of the crest-feathers are tinged with brown and yellow. The wing-coverts and upper tail-coverts are loose flowing plumes, giving a resemblance to gallinaceous birds. The size is about that of a common pigeon.—The Peruvian Cock of the R. (*R. Peruviana*) is less brilliant in plumage than the Guiana species.

RO'CKALL stands on a sandbank in the North Atlantic Ocean; this bank is nearly 100 miles in length, and 40 in breadth. The rock itself is situate in 57° 35′ N. lat., 13° 40′ W. long., about 300 miles west of North Uist, in the Outer Hebrides, and is of a rounded form, rising about 18 or 20 feet above the sea. It is frequented by large flocks of sea-birds, and the place was found some years ago to be surrounded by considerable shoals of the larger kinds of fish, chiefly *Gadidæ* and *Pluronectidæ*. A company was formed in 1861 to carry on a fishery at the place; but the supply not proving so great as was anticipated, and the distance from the markets being very considerable, the speculation proved to be very unprofitable. There are still a few fish about R., but they are caught by private fishermen.

ROCK BUTTER, a mineral substance, consisting of Alum (q. v.), mixed with alumina and oxide of iron, of a pasty consistency, and appearing as an exudation oozing out of rocks which contain alum. It is always greasy to the touch, but is often hard enough to exhibit a straight foliated fracture. It is very easily broken. It occurs in most of the places where alum is procured.

ROCK CRYSTAL, a popular and partly also a scientific name for the finest and purest Quartz (q. v.) seldom applied, however, to small crystals which are mere six-sided pyramids, but more generally to those in which the six-sided prism is well developed. The name is sometimes limited to colorless and perfectly transparent quartz, but is also more rarely extended to that which is violet or amethystine (*Amethyst*, q. v.), red (*Bohemian Ruby* or *Silesian Ruby*), wine-yellow (*Citrin* or *Gold Topaz*), brown or smoky (*Smoke Quartz, Cairngorm Stone*), &c. The beauty of specimens of R. C. is sometimes very great. The crystals are sometimes slender, crossing and penetrating each other in exquisite groups. They sometimes enclose other substances, which are beautifully seen through the transparent R. C., as slender hair-like or needle-like crystals of hornblende, asbestos, oxide of iron, rutile or oxide of titanium, oxide of manganese, &c., and such specimens are known by various fanciful names, as *Thetis's Hair-stone, Venus's Hair-stone, Venus's Pencils, Cupid's Net, Cupid's Arrows*, &c.; and sometimes the enclosed substances are small spangles of iron-glance, or crystals of iron pyrites, or native silver in fern-like leaves, or spangles of gold.

Very large crystals of perfectly pure R. C. are sometimes found. One found in the Alps, and which was among the treasures carried from Italy by the French in 1797, is 3 feet in diameter, and weighs 8 cwt. R. C. was prized by the ancients, and was used by them, as it still is, for vases, cups, seals, &c. An important modern use of it is for lenses of spectacles, &c., its hardness rendering it much less liable to be scratched than glass. Lenses of R. C. are often called *Pebble* lenses.

RO'CKET, a name given to a number of plants of the natural order *Cruciferæ*, and belonging to the genera *Brassica, Sisymbrium, Erysimum, Barbarea, Hesperis*, &c.—GARDEN R. (*Brassica Eruca*, or *Eruca sativa*) is an annual plant, a native of Austria, with stem two feet high, upright and branching; the leaves smooth, succulent, cut and toothed. When in flower, it has a strong, peculiar, and disagreeable smell; but when it is very young, this smell is almost imperceptible, and the leaves are used as a salad, for which it is frequently sown on the continent of Europe, and was formerly cultivated also in Britain.—The name GARDEN R. is also given to *Hesperis matronalis*, also called Dame's Violet (q. v.), a favorite ornament of our flower-borders.—The YELLOW R. of our flower-borders is a double-flowered variety of *Barbarea vulgaris* (see CREST).—The WILD R. (*Sisymbrium officinale*, or *Erysimum officinale*) is common in Britain, and is sometimes sown and used as a spring pot-herb.

ROCKET is a firearm capable of taking effect at a long range. The rocket consists of a light tubular case of pasteboard, or thin metal, charged to the muzzle with a composition consisting of saltpetre 68 parts, sulphur 12 parts, charcoal, or mealed powder, 32 parts. This composition is rammed hard into the case, the center being left void. To the rocket is attached a long stick, which serves (like the tail of a kite) to straighten its course. See PYROTECHNY. When lighted at the end the stream of gases propels the mass on the principle explained under BARKER'S MILL. As a mere firework, rockets are made of a few ounces in weight: as intended to throw light upon a town or a hostile work, they average from ¼ lb. to 2 lb. These light rockets were improved by Sir William Congreve, who so contrived them, that, when over the necessary point, the rocket discharged a number of light balls, which burned in the air for several minutes with great brilliancy, while others at the same point released small parachutes, which sustained a bright light for a still longer time. But Sir William Congreve did more: he converted the rocket into a terrible weapon of war, with ranges which no ordnance of that day could attain. Discarding the small sizes, he made 12-lb., 18-lb., and 32-lb. rockets, which he charged with canister-shot, bullets, and other missiles.

The stick for a 32-lb. rocket is 18 feet in length, and the maximum range 3500 yards. The range can be also increased by discharging the rocket from a cannon, with a time-fuse to ignite it at the cannon's utmost range, when the rocket commences its own course. As missiles, these rockets are found to annoy most seriously the defenders in any fortified work, and, in a bombardment, they speedily set houses and buildings on fire. In the field, also, the plunging, ricochetting motion of the rocket greatly disturbs both cavalry and infantry. The Congreve rockets were first tried on actual service, and with fatal effect, at the attack on Copenhagen in 1807. One great advantage in a rocket is, that it has no recoil against the stand from which it is fired; the largest rocket may therefore be discharged without danger from the smallest boat; consequently, in naval attacks on maritime fortresses, a flotilla of rocket-boats is a very common auxiliary. For the use of rockets in shipwrecks, see LIFE MORTARS AND ROCKETS.

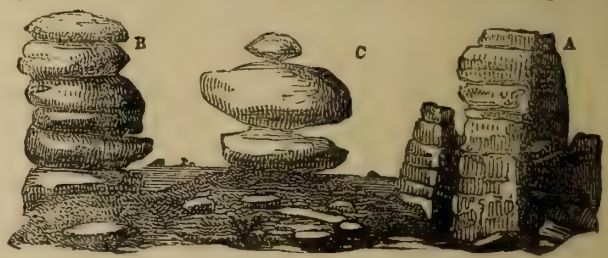
ROCK-FISH. See WRASSE.

RO'CKFORD, a city of Illinois, U.S., on the Rock River, 92 m. W.-N.-W. of Chicago, on the Chicago and Galena Railway. It is the center of a rich country, with county buildings, 6 banks, 5 newspapers, 16 churches, and factories supplied with water-power by the river. Pop. in 1880, 13,136.

ROCKING-STONES, or LOGGANS, are large masses of rock so finely poised as to move backwards and forwards with the slightest impulse. They occur in nearly every country. Some of them appear to be natural, others artificial; the latter seem to have been formed by cutting away a mass of rock round the center-point of its base. The former are chiefly granitic rocks, in which felspar and porphyry are abundantly present; and these ingredients becoming rapidly decomposed, and the dust and sand washed away by rains, what was formerly a solid rock soon assumes the appearance of a group of irregularly-shaped pillars, having a rhomboidal horizontal section, and separated into portions by horizontal and vertical fissures. As decay proceeds, the edges of the blocks forming the pillar are first attacked and disappear, as is also the case with greenstone and basalt, and the pillar now becomes a pile of two or more spheroidal rocks, resting one upon the other (see fig., where A, B, and C exhibit three successive stages in the process of decomposition, as observed by De Luc in the mountains of Silesia).

Should a mass of rock be so situated as to preserve its equilibrium in spite of the gradual diminution of its base or point of support, a rocking-stone or loggan is the result. For an exposition of the principle regulating the stability of equilibrium of rocking-stones, see STABILITY. Various explanations have been given of the uses of these singular objects. They are supposed to have been used in very early times for purposes of divination, the number of vibrations determining the oracle; hence it came to be believed that sanctity was acquired by walking round them.

Some rocking-stones occur near to remains of ancient fortifications, which seems to bear out a statement in one of the poems of



Rocking Stone.

Ossian, that the bards walked round the stone singing, and made it move as an oracle of the fate of battle. In Greece, rocking-stones occur as funeral monuments, and are generally found on conspicuous places near the sea. Rocking-stones are numerous in Yorkshire, Derbyshire, Cornwall, and Wales. One near Land's End, in Cornwall, has been computed to weigh no less than 90 tons. Near Warton Crag, Lancashire, are no less than seven of these stones. In Scotland, they occur in the parishes of Kirkmichael, Dron, and Abernethy, Perthshire, and in the parish of Kells, Kircudbrightshire. In Ireland, they are found in many places; one situated at a place called Islandmagee, on Brown's Bay, is popularly believed to acquire a rocking tremulous motion at the approach of sinners and malefactors.

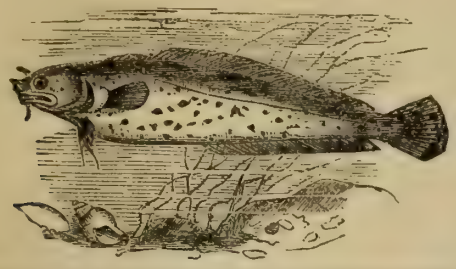
ROCK ISLAND, a city of Illinois, at the foot of the upper rapids on the Mississippi, opposite Davenport, Iowa, 3 miles above the mouth of Rock River, 181 miles west-by-south of Chicago. The Mississippi is here crossed by a railway bridge, and the island from which the town is named has been selected as the site of a national armory. A dam across a portion of the river gives water-power for many manufactories. Pop. (1880), 11,660.

RO'CKLAND LAKE, a beautiful sheet of water in Rockland County, New York, U.S., 30 miles north of New York City, 1 mile from the Hudson, and 160 feet above its surface. It is celebrated for furnishing 200,000 tons of pure ice, annually harvested by about 1000 men, for the supply of New York, and for export.

ROCKLAND, a town in Maine, U.S., on the west side of Penobscot Bay, 40 miles south-east of Augusta. It has a broad and deep harbor, and 80 lime-kilns, making 1,200,000 casks of lime yearly, chiefly shipped to Boston and New York. Its commerce employs 18 ships, 40 barks and brigs, and 150 schooners. It has 3 banks, 2 newspapers, 8 churches, &c. Pop. in 1860, 7316; in 1870, 7074.

RO'CKLING (*Motella*), a genus of fishes of the Cod and Haddock family (*Gadidæ*), having an elongated body, compressed towards the tail; the first dorsal fin very slightly elevated, and very delicate; the second dorsal and the anal fins long, continued almost to the tail fin. Several species are found on the British coasts, and are distinguished among other things by the number of their barbules, three, four, or five. The largest of them is

never more than 19 or 20 inches long; the smallest, the MACKAREL MIDGE (*M. glauca*), only about an inch and a quarter. None of the species is much regarded by fishermen, one reason being, that decomposition takes place very rapidly after they are



Three-bearded Rockling or Sea Loach (*Motella tricirrata*).

taken out of the water, although, when quite fresh, they are not bad for the table.

ROCK-OIL. See NAPHTHA.

ROCK RIVER rises in the south-eastern portion of Wisconsin, U.S., and runs south-west into Illinois, thence south-west, and empties itself into the Mississippi 3 miles below Rock Island. Its course of 200 miles is through one of the most beautiful and fertile regions in the world, known as the 'Rock River Country.' Its frequent falls give abundant water-power, and it is crossed by 12 lines of railway.

ROCK-ROSE. See CISTUS.

ROCK-SALT is common salt (chloride of sodium) occurring as a mineral and in a solid form. It is always mixed with various impurities. It is found massive or crystallized, its crystals generally cubes, its masses very often either granular or fibrous. It is white, gray, or, owing to the presence of impurities, more rarely red, violet, blue, or striped. For its chemical and other qualities, see SALT It is a very extensively-diffused mineral, and in some places forms great rock and even mountain masses. A hill of rock-salt near Montserrat, in Spain, is 500 feet high. The island of Ormuz, in the Persian Gulf, is formed of rock-salt. The Indus, in the upper part of its course, forces its way through hills of rock-salt, rising in cliffs 100 feet above the river. In many parts of the world, rock-salt is found in beds under the soil or other rocks. Those of Cheshire in England are particularly celebrated, as at present yielding almost all the salt used in Britain, great part of which is pumped from them in the form of brine. Part is also obtained by mining, as at Northwich. The mines of Wieliczka, in Poland, are of great extent. The workings are at depths varying from 200 to 740 feet, and the salt at the deepest working is the purest. Some of the chambers in the mines are said to be 300 feet high. Blasting by gun-powder is often necessary in the mining operations. The mines give employment to 1200 or 1400 workmen; and they have been wrought for centuries. Vast quantities of rock-salt occur in many parts of Asia, Africa, and America. In Caramania and Arabia, rock-salt is sometimes used for building houses, the dryness of the climate rendering its solubility unimportant.—The salt which crystallizes on the margins and bottoms of salt lakes may be regarded as a variety of rock-salt. Concerning the salt of the ocean, the salt found in many desert regions as an efflorescence on the ground or on rocks, the salt with which sandstone and other rocks are impregnated, &c., see SALT.

ROCK-SOAP, a mineral consisting of silica, alumina, peroxide of iron, and water, the silica nearly one-half, the alumina and the water sometimes nearly each one-fourth of the whole. It is earthy, easily broken, black or nearly so, very soft, and easily cut with a knife, is greasy to the touch, and adheres strongly to the tongue. It is valued by painters for crayons. It is found in a number of places on the continent of Europe, and occurs in trap rocks in the Isle of Skye. It is only found massive.

ROCK-WORK, an ornamental structure often introduced into gardens, for the cultivation of plants such as grow on or amongst rocks. It is made of rough blocks of stone rudely piled together, with earth, &c. Simple as it seems, it is very difficult of construction; and too often, after much expense, it has a paltry and ridiculous appearance.

ROCKY MOUNTAINS, that portion of the great ranges of mountains in the central and western portions of North America which lies in the United States and British possessions, a continuation of the Cordilleras of Mexico, between the Pacific Ocean and 105° W. long., and reaching from Mexico to the Arctic Ocean. In the United States, the R. M. extend over a breadth of 1000 miles, and cover an area of 980,000 square miles. From lat. 32° to 40° N., the ranges bear nearly north and south; between lat. 40° and 45° N., their course is north-west; then, after a more northerly bend, they keep a course nearly parallel to that of the Pacific, with many detached ranges and peaks, one of which, Mount Elias, lat. 61° N., long. 141° W., is 17,800 feet high, and marks the boundary-line of longitude between Alaska and the British possessions. Mount Shasta, in the coast-range in North California, is 14,000 feet high; Fremont's Peak, near the western boundary of Wyoming, and the sources of the Yellowstone and Colorado Rivers, is 13,570 feet. In British Columbia, Mount Brown, lat. 53°, is 16,000 feet; and Mount Hooker, 15,700 feet. The passes have elevations of 6000 to 7000 feet, and a vast territory is from 4000 to 5000 feet above the level of the sea.

The central range of the R. M. forms the ridge which divides the rivers that fall into the Pacific from those that fall into the Arctic Ocean, Hudson's Bay, and the Gulf of Mexico, and whose head-waters are often interlocked; but between the eastern and western ranges lie the territory of Utah and the state of Nevada, in which are large rivers having no other outlets than lakes, generally salt, as Great Salt Lake in Utah, and Humboldt's Lake, the outlet of Humboldt's River, in Nevada. The tops of the higher ranges are covered with perpetual snow, and their lower regions abound with artemesias, odoriferous plants, and sunflowers. The rocks are metamorphic gneiss, granites, porphyries, mica and talcose slates, and gold-bearing quartz, with deposits of mercury, silver, carboniferous limestone, coal, and petroleum. Anthracite has been found near the gold mines of Santa Fe, and copper in New Mexico.

ROCO'CO, a name given to the very debased style of architecture and decoration which succeeded the first revival of Italian architecture. It is ornamental design run mad, without principle



Rococo Ornament.

or taste. This style prevailed in Germany and Belgium during last century, and in France during the time of Henry IV. The fig. is an example from an altar in the church of St. James's, Antwerp.

ROCROI, a small town of France, in the dep. of Ardennes, 15 miles north-west of Mézières, is a fortress of the fourth class, and is situated in a fine extensive plain, bounded on all sides by the forest of Ardennes. Pop. (1876) 1052. It is memorable for the victory gained by the Great Condé (then Duke of Enghien) over the Spaniards, May 19, 1643. The Spanish army was composed of veteran bands of Walloons, Spaniards, and Italians; and their general, Don Francisco de Mellos, the governor of the Low Countries, was a commander worthy of his army. The French (22,000) were also good troops; but their general, Condé, was a young and inexperienced officer. At first, the battle was unfavorable to the French, but at last the Spaniards were thrown into irretrievable rout. The Count of Fuentes, the commander of the redoubtable infantry, and 10,000 of his men were among the slain; and 5000 men, with all the cannon, many standards, and the baton of the Count de Mellos, were captured. But far beyond all material losses, the renown of invincibility, first acquired by the Spanish infantry on the field of Pavia (1525), and confirmed at St. Quentin, Gravelines, and Prague, was destroyed.

ROD, called also a *pole*, or *linear perch*, a measure of length of 5½ yards, or 16½ feet. The square rod, called generally a *rood*, is employed in estimating masonry, and contains 16½ × 16½, or 272¼ square feet.

RODE'NTIA (Lat. Gnawers), or RODENTS, in the system of Cuvier, an order of mammalia, almost exactly corresponding with the *Glires* of Linnæus. The order is a truly natural one, and is therefore universally recognized by naturalists. The R. are small quadrupeds; the largest of them—the Capybara—not being equal in size to a hog, whilst to this order belong the smallest of mammalia. They are very numerous, and widely distributed over the globe, particularly abundant in South America, and rarest in Australia. They are all remarkably characterized

by their front teeth, variously regarded as incisors and canines—the true incisors or canines being absent—which are large and of peculiar structure, two in each jaw, and separated by a considerable vacant interval from the molars.

The front teeth have a plate of hard enamel in front, which wears more slowly than the substance of the rest of the tooth, so that being employed on hard substances, they acquire a chisel-like form, and unlike the teeth of mammals in general, they are always growing from a fresh pulp at the base, so that compensation is made for the wearing away at the tips; but when a tooth is accidentally destroyed, the opposite tooth continuing to grow, sometimes acquires a monstrous shape and size, from which cause rats and other rodents have been known to die, the enormous tooth preventing the eating of food, or even recurving and piercing the skull. The ordinary food of most rodents consists of vegetable substances, and generally of a pretty hard kind, and their front teeth are adapted for comminuting it by gnawing, and



Skull of the Beaver, showing the Dentition.

are also used for gnawing wood, the shells of nuts, &c., in order to obtain access to food. The molar teeth have flat crowns, having ridges of enamel, which make them more or less tuberculous; and these are in the line of the jaw, whilst the only horizontal motion of which the lower jaw is capable is forwards and backwards, thus making the ridges of the molar teeth powerful instruments for the reduction of hard substances; the jaws also being in general very strong. In the rodents which eat only vegetable food, the molar teeth have rounded tubercles; whilst in the omnivorous kind—as rats—the tubercles become sharp points. The stomach is simple; the intestines are very long; the cæcum is often large, sometimes larger than the stomach itself. The brain is not large, and is nearly smooth, and without convolutions; the rodents are not generally distinguished for sagacity, although some of them—as the beaver—exhibit remarkable instincts. Most of them may be easily tamed, but few of them seem capable of learning anything, and in general they merely acquire a familiarity with man. Of this the rabbit exhibits a very perfect example, although the rat seems to display a far higher intelligence. The eyes are directed laterally.

The rodents very generally have the hinder limbs larger than the fore, and their motion is partly a kind of leaping. In some, this is as completely the case as in kangaroos. Some, as squirrels, have an admirable power of climbing trees; and a few, as beavers and water-voles, are aquatic. Most, if not all, have the habit of sitting on their haunches, and holding their food to their mouth by their fore-paws; using both paws together, however, as the fore-feet have not at all the character of a hand. The thumb is never opposable to the other toes; sometimes it is rudimentary or wanting. The bones of the fore-leg are generally separate, but have not so much freedom of motion as in the *Carnivora*. The toes are terminated by claws. The presence or absence of clavicles (collar-bones) divides the order into two sections, to the first of which, having clavicles, belong squirrels, mice, rats, voles, the beaver, &c.; and to the second, without clavicles, belong porcupines, cavies, chinchillas, hares, rabbits, &c. The rodents are very numerous, about 400 species being known.

RODERIC, the last king of the Visigoths in Spain, whose tragic downfall, coincident with that of the Visigothic monarchy, has inspired poets and romancers (including historians) to throw round him a halo of glory. The Spanish and Arab historians contradict each other in almost every particular of R.'s life—the latter, on the whole, being apparently the more trustworthy. According to them, R. was of humble birth, but rose, through his talent and bravery, to the command of the cavalry. A conspiracy having been formed against Witizia, the reigning monarch, by the clergy and the nobles of Roman blood, R. was elevated to the throne in 709, and by his energy and talent soon quelled all opposition. The sons of Witiza, however, joined with some malcontent Visigothic nobles—among whom was Count Julian—and agreed to summon to their assistance, the Arab chief, Muza ibn Nozeir, who had just finished the conquest of Mauritania. The Spanish writers, on the other hand, assert that the country groaned under the tyrannical government of R., that his licentious behavior had disgusted many of his nobles, and that the people were ripe for a revolution when the Moslem invasion took place. Both are agreed as to the time and mode of the invasion; but the Arab historians brand Count Julian with the most atrocious treachery, as not only voluntarily surrendering Ceuta, the key of the country, but actually guiding the 13,000 Berbers and Arabs under Tarik into Spain.

A landing was effected at Algesiras, 28th April 711; and in spite of vigorous opposition from the governor of Andalusia, Tarik marched on, routing R.'s chosen cavalry, which had been sent to oppose him. R., who had been employed in another quarter, now hastened at the head of an army, which is variously estimated at from 50,000 to 100,000 men, to oppose the daring invaders, who by this time had been so reinforced from Africa and by rebels that their numbers amounted to 25,000. The two armies met on the banks of the Guadalete, near Xeres de la Frontera, and on July 17 the battle commenced. R. directed the center of his army in person, appointing the sons of Witiza to command the wings, and the battle raged furiously for three days; a single combat then took place between R. and Tarik—a kind of statement extremely frequent in Eastern histories—in which the former was slain, and his head cut off, to be embalmed, and sent to Muza. The Christians, enraged at the loss of their chief, fought furiously during six days longer, but all in vain, for victory now declared itself decisively in favor of the Moslems, to whom the sons of Witiza had deserted soon after the commencement of the contest, and the rout of R.'s army was complete. The most ancient Spanish chroniclers agree in asserting that R. either died on the field or sunk in the Guadalete, whilst attempting to save himself by swimming his horse across; and the various stories of his escape and subsequent adventures are of much later date. This decisive victory laid all Central and Southern Spain at the feet of the Arabs. R. has been made the hero of an epic poem by Southey.

RODEZ, a small town of France, capital of the dep. of Aveyron, stands on the crest and slope of a hill, on the north bank of the Aveyron. Its streets are steep, narrow, winding, and dirty; but the promenades around the town are pleasant. The cathedral, with a clock-tower of great height, is a Gothic structure of the 15th century. A variety of woollen cloths are manufactured, and cheese of a highly esteemed quality is made. Pop. (1876) 12,881.

RODIYAS, a degraded race in Ceylon, who are expelled from society, and live in a condition more abject than that of the Pariahs of India. By some they are thought to be a branch of the Veddahs (q. v.). Under British rule, which does not recognize caste, the R. have improved socially, and are no longer disqualified for labor. For many interesting particulars respecting this unfortunate race, see *Ceylon*, by Sir. J. E. Tennent, vol. ii. p. 191.

RODNEY, George Brydges Rodney, Lord, English admiral, born February 13, 1718, was second son of Captain Rodney of the Royal Marines. He was taken from Harrow School at the early age of twelve, and sent to sea. He became lieutenant in 1739; post-captain, 1742; and commander of the Newfoundland station in 1748, with the rank of commodore. In 1752, he returned home, and was elected M.P. for Saltash. He afterwards commanded the *Fougueux*, the *Prince George*, and the *Dublin* men-of-war. In 1759, after 28 years' active service, he was made rear-admiral; and in July he bombarded Havre for two or three days, destroying the town and fortifications so effectually, that it has never recovered its former importance as an arsenal for ships-of-war. In 1761, he took Martinique, Grenada, and Santa Lucia. In 1762, he became vice-admiral, and in 1764 wes made a baronet. In 1779, Spain joined France in the war against England, and their united fleets appeared in the Channel in overwhelming force. The siege of Gibraltar was undertaken by the Spaniards; and R., who was sent out with 22 sail of the line and 8 frigates to the West Indian station, was ordered to relieve Gibraltar *en route*. After capturing seven Spanish ships of war, he fell in, January 16, 1780, with Admiral Langara, off Cape St. Vincent, 'that promontory which has witnessed more of our battles and triumphs than any other headland in the world.' Of the Spanish fleet, five were captured, and two destroyed. Having accomplished the relief of Gibraltar and Minorca, he quitted the Mediterranean, and crossed the Atlantic to the station of his command. On the 17th April he defeated, near Martinique, the French fleet under the Count de Guichen. Being ill-supported by his captains on this occasion, he complained to the Admiralty.

The naval administration of the day was, however, so corrupt and rotten, that the Admiralty suppressed the criminatory passages of his dispatches, and only one of the accused was brought to trial, the others being allowed to escape from the difficulty of finding a sufficient number of non-delinquent officers to try them. R. took Eustatia from the Dutch, with 250 ships and other booty, estimated at three millions sterling. Demerara and Essequibo next surrendered. On the 12th April 1782, R., in conjunction with Hood and Drake, encountered the French fleet under De Grasse off Dominicia, April 12, 1782. Each fleet consisted of upwards of 30 ships of the line. The battle was more obstinately contested than

any engagement that ever took place between the two nations, being kept up without intermission for nearly 12 hours. De Grasse was totally defeated, and R. lost seven ships of the line and two frigates. Owing to the French vessels being crowded with troops, they are said to have lost 3000 killed and 6000 wounded; while the English loss did not exceed 600. On board the *Ville de Paris* were 36 chests of money, to pay the soldiers; and the whole train of artillery was on board the other captured ships. Count de Grasse was himself taken prisoner. His flag-ship the *Ville de Paris*, of 112 guns, was the only first-rate man-of-war that up to that date, had ever been taken and carried into port; and De Grasse, when he landed at Portsmouth, was stated to be the first commander-in-chief of a French fleet or army who had been prisoner in England since the capture of Marshal Tallard in Queen Anne's wars. In this action, R. successfully executed the nautical manœuvre of breaking the French line, and placing the enemy between two fires, which had fallen into disuse since the Commonwealth. R.'s victory saved Jamaica, ruined the naval power of France and Spain, and gave the finishing blow to the war. The news arrived in England just after an order had been despatched for the recall of R., whose politics differed from those of the new ministry. He was now elevated to the peerage as Baron Rodney, and received a pension of £2000 per annum for himself and his successors. He lived in retirement for the rest of his life. He died May 21, 1792.

RODOSTO, a town of Turkey, stands on the north shore of the Sea of Marmora, 77 miles west of Constantinople. It contains many mosques, and sends large quantities of fruits and vegetables to the capital of the empire. Pop. 18,000.

RODRIGUEZ, a rugged and hilly island, 330 miles E. by N. of Mauritius, of which it is a dependency, being one of the Mascarene group. The soil is fertile: turtles abound. The island is interesting to naturalists as having been the habitat of the now extinct bird, the Solitaire (q. v.) Area, about 60 sq. miles. Pop. 1500.

ROE (*Cervus capreolus*, or *Capreolus dorcas*), a species of Deer (q. v.), inhabiting Europe and some parts of Asia, chiefly in hilly or mountainous regions, either covered with forests or with scattered bushes and heath. It is seldom found in the higher and more naked mountain tracts, the haunt of the stag or red deer. It was once plentiful in Wales and in the hilly parts of England, as well as in the south of Scotland, but is scarcely



Roebuck (*Cervus capreolus*).

now to be seen in any part of Britain south of Perthshire. It is not long since it was pretty common in some of the wilder parts of the north of England. The R. is about 2 feet 3 inches in height at the shoulder. Its weight is about 50 or 60 pounds. Its color is a shining tawny-brown in summer, more dull and grizzled in winter, the lower parts and part around the tail white. There is considerable variety in the shade of color. The hair is longer than in many deer. The tail is very short, concealed among the hair.

The horns, which are peculiar to the male (the *Roebuck*), are 8 or 9 inches long, erect, round, very rough, longitudinally furrowed; having in mature animals, two tines or branches, which, as well as the tip of the horn, are sharp-pointed, so that the horns of the R. become very dangerous weapons when used for offence. The ears are large. The habits of the R. somewhat approach to those of the goat, or even of the chamois. It keeps its footing on rocks with great security, bounds very actively, and takes great leaps. Its usual pace, when not very hard pressed, is, however, a kind of canter. It is not gregarious, not more than a buck and doe with one or two fawns being usually seen together. Contrary to what is usual among deer, the male and female R. remain attached during life. The voice of the R. resembling that of a sheep, but shorter and more barking, is often heard through the night, in regions where it is plentiful. The browsing of the R. is very injurious to young woods, a circumstance which has led to its extirpation in places where it would otherwise have been cherished. It feeds much on the tender shoots of trees and bushes as well as on herbage. The venison is superior to that of the stag, but not equal to that of the fallow-deer. The horns are used for handles of carving-knives, &c. The R. is never very thoroughly tamed, and when partially so, is apt to become mischievous, and the male dangerous.—Another species of R. (*Cervus* or *Capreolus pygargus*), rather larger than the common R., is found in Tartary.

ROEBUCK, John Arthur, English politician, was born at Madras in 1801, but passed his youth in Canada. At the age of 23, he came to England, and was called to the bar at the Inner Temple in 1831. He challenged the suffrages of the electors of Bath as a Radical reformer in 1832, and represented that city until 1837. He was again elected in 1841, and held his seat until the general election (1847). In May 1849, he was returned for Sheffield, which he represented till 1868; and for which he was again returned in 1874. In 1835, when the executive government of Canada and the House of Assembly of Lower Canada were at variance, the latter body appointed R. their paid agent in England—a position which involved him in a serious quarrel with the press.

He was next the central figure of a parliamentary 'scene,' on the occasion of a too plentiful crop of election petitions and election compromises subsequent upon a general election. He made out such a case that, in defiance alike of Whigs and Tories, he obtained a committee to inquire into election compromises. His next great appearance was at the meeting of Parliament in January 1855, when he gave notice of a motion for inquiring into the condition of the army before Sebastopol. To the undisguised joy of the nation, R. carried his motion by an immense majority, and the administration of the Earl of Aberdeen was shattered to pieces. The Sebastopol Committee sat, and the inquiry exercised great influence in the subsequent reconstruction of the War Department, and the reorganization of our military, commissariat, and medical systems. In 1855, he became a candidate for the chairmanship of the Metropolitan Board of Works, with a salary of £1500 per annum, but was only third on the poll. On the annexation of Savoy and Nice in 1860, R. indulged in the sharpest invective against the Emperor Napoleon. He became a director of the Galway Steam-packet Company, and offended his constituents by defending a contract which they regarded as savoring of a political job. He went to Vienna to obtain some commercial concessions for a company with which he was connected, and returned with strong pro-Austrian sympathies, volunteering a defence of Austrian rule in Venetia, which jarred upon public feeling. During the civil war in America, he displayed a strong leaning towards the cause of the Confederates. In the debate on the war between Germany and Denmark, R. declared (1864) that the English fleet ought to have been sent to defend Denmark. He warmly supported the Earl of Beaconsfield's policy during the Eastern crisis in 1877–78, and in 1878 was made a member of the Privy Council. R. was fearless and unmeasured in attack, not too charitable in his judgments, fond of personalities, but regarded as an honest and true-hearted Englishman. He is the author of a work on the *Colonies of England*, the *History of the Whig Ministry of* 1830, and wrote much for the Reviews. He died 30th November 1879.

ROERMOND (Fr. Ruremonde, called also by old writers Godswaard [i. e., God's Island] op de Maas), an old but lively town in the Netherlands, province of Limburg, at the junction of the Roer and the Maas. A suburb called St. Jacob is connected with R. by a beautiful stone bridge over the Roer. The cathedral is one of the handsomest churches in the Netherlands. Pop. (1875) 9609, about 350 being Protestants, 100 Jews, the remainder Roman Catholics. Principal industries are weaving woollen cloths, cottons, making paper, pipes, wax and tallow candles, cotton-spinning, calico-printing, refining salt, &c. R. is said by some authorities to have been the birthplace of the celebrated Mercator, others claiming the honor for Rupelmonde in East Flanders. It has often endured the horrors of being besieged and taken.

ROE-STONE, a name locally given to those limestones which are formed of small globules like the roe of fishes. It has been translated into the scientific term *oolite*, and this is applied to that period in the earth's geological history in which the limestones with this structure chiefly occur.

ROGA'TION-DAYS (Lat. *Feriæ Rogationum*), the Monday, Tuesday, and Wednesday before Ascension-day, so called because on these days the Litanies (q. v.) are appointed to be sung or recited by the clergy and people in public procession. The practice of public supplications on occasion of public danger or calamity is traceable very early in Christian use; but the fixing of the days before Ascension for the purpose is ascribed to Mamercus, Bishop of Vienne, in the middle of the 5th c., who, on occasion of a threathened earthquake or other public peril in his city, ordered a public procession and prayer, for the purpose of averting the Divine anger. The usage being in harmony with the spirit of the

times, became general and permanent, and the form of prayer employed is that known as the *Litany of the Saints*. In England, after the Reformation, the recitation of the Litanies upon these days was discontinued; but a memorial of the old practice long survived in the so-called Perambulation of Parishes (q. v.).

ROGER I., Count of Sicily and Calabria, and the founder of the Norman dynasty in these countries, was the youngest of the twelve valiant sons of Tancred de Hauteville, and was born in Normandy about 1031. Hearing of the wondrous success of his brothers (see GUISCARD), who had some time before departed to follow their fortunes, and had by this time gained possession of the greater part of Southern Italy, R. set out in 1058 to join them. On his arrival, he was deputed by his brother Robert to conquer Calabria, an achievement which was speedily executed. In 1060 he set out on an expedition against Sicily, then ruled by a number of Saracen chiefs; but he confined himself in this and the following expedition to predatory attacks on Messina and its neighborhood. He then took and fortified Messina, making it the base of his future operations, and being joined by Robert, the two, at the head of their small band, performed a variety of almost miraculous exploits. They were gradually joined by the Christian inhabitants, especially when their success had given the latter room to hope for freedom from their Moslem masters; and in 1072, Palermo, the capital and chief stronghold of the Saracens, was yielded to the invaders. R. was then invested by his brother with the crown of Sicily, under the title of Count; but it was not till 19 years afterwards that he succeeded in thoroughly supplanting the Saracens, owing to the repeated reinforcements they received from Africa. R. had previously divided the country into fiefs, which he now distributed among his chief barons, whose relations to their subjects were regulated by him with justice and moderation. He had, in 1062, received from Robert his fair share of Calabria, to which, on the death of the latter, he added (1085) a number of towns, wrested from Roger and Bohemond, Robert's two sons. He was now the chief of the Hauteville family; and the fame of his exploits, and the greatness of his power, made his alliance be courted by the first princes of Europe. It was at this time he took the title of 'Grand Count,' to distinguish him from his vassals; and in 1098, he received from Pope Urban II., in recompense for his fidelity to the holy see, the privileges of refusing at his pleasure papal legates admission to his territory, and of appointing bishops. The last acts of his life were the building and endowing of churches and monasteries, among others the cathedral of Messina (1097). He died at Mileto in Calabria, 11th July 1101.

ROGER II., king of Sicily, second son of the preceeding, was born in 1097, four years before the death of his father. His elder brother Simon having died in 1102, he became the heir to the Sicilian throne; and during his minority, the government was administered by his mother, a princess of Montferrat. When R. had taken the supreme authority into his own hands, his first care was to extend his estates. He compelled his cousin William to yield up the portions of Calabria and of the town of Palermo which Robert Guiscard had withheld from his father; and after the death of William (1127), he took possession of Apulia itself, obtaining his investiture in these new possessions (which were fiefs of the holy see) in the following year from Honorius II., who added to them that of the duchy of Naples. Ambitious of the title of king, he supported the faction of Pope Anacletus, his wife's brother, and received from him the title of king of Sicily, with rights of suzerainty over the duchies of Naples and Capua—the former being a Lombardo-Italian, and the latter a Norman principality. In return, R. established Anacletus on the pontifical throne in 1130; but the dispossessed pope, Innocent II., and the exiled princes of Capua and Naples, applied to the Emperor Lothar, who stripped R. of many of his acquisitions—the latter, however, recovering them almost the moment the German army had retired. At last, his bitter enemy, Innocent II., fell into his hands in 1139, and was compelled to withdraw the excommunications he had pronounced against R., and to consent to his retaining the territories he had acquired (excepting Naples), obtaining by these means not only his liberty, but the firm attachment of R. to the holy see, and his own recognition as lawful pope. In 1141, he received from Pope Lucius II. the right of using the staff, ring, tunic, mitre, and other symbols of ecclesiastical dignity and power.

In 1146, he revenged himself on the Greek emperor, who had been of the league with the pope and the emperor against him, by capturing Corfu, and pillaging Cephalonia, Negropont, Corinth, and Athens, returning to Sicily with an immense booty, including a number of workers in silk, by whom the silk-manufacture was first introduced into Sicily. He followed up these successes by the taking of Tripoli and other places on the African coast, and afterwards attacking the Zeirides—leaving, at his death, an African dependency which stretched from Morocco to Kairwan. He died at Palermo 26th February 1154. R. was, like his father, prudent and resolute, skilful both in the cabinet and on the field; but he had neither the fine deportment nor the generous soul of the first Roger. His mind was capable of great scope and untiring energy, so that the real interests of his states were never overlooked, and the orderly system of taxation and government was a pattern to the rest of Europe. He cared nothing for the religion of his subjects—they might be heathens if they chose; but obedience to himself and respect to the laws were rigorously demanded and enforced. His fleet was supreme on the seas, and his court surpassed in magnificence that of every other prince in Europe. He spent many of his later years in rearing religious edifices on a scale of extreme magnificence, of some of which remains still exist.

ROGERS, HENRY, educated at Highbury for the Independent ministry, became professor of English Literature in University College, London; resigned that post on his appointment to a theological professorship near Birmingham, and was appointed principal of the Lancashire Independent College in 1858. *The Eclipse of Faith* is his best known book. *Reason and Faith* was published in 1866; *The Superhuman Origin of the Bible inferred from Itself*, in 1874. R. died 20th Aug. 1877.

ROGERS, SAMUEL, an English poet, was born in London on the 30th July 1763. His father was a banker and member of a dissenting body. After having been carefully educated, R. was placed in his father's bank. His taste for literature and the company of literary men awoke at an early period, and he, accompanied by a friend, went one day to call on Dr. Johnson, who was then living at Bolt Court, but his courage failed him when his hand was on the knocker. In 1786, he published his first book, entitled *An Ode to Superstition, and some other Poems*. In 1792, he published his *Pleasures of Memory*—the work on which his fame most securely rests. For a considerable period after this, he was silent. Meanwhile, he had retired from business, and in the possession of ample wealth, in his house in St. James's Place, he employed himself with his Muse, his cook, the company of the literary celebrities of his time, and the collecting of pictures and articles of virtù. Then, and during the whole period of his subsequent life, his breakfasts were more famous than his poems. Critics might find fault with the one, but not with the other.

In 1812, he published *Columbus*, a not very striking poetical fragment. In 1814, *Jacqueline* appeared in the same volume with Lord Byron's *Lara*. In 1819, he issued *Human Life;* and in 1822, *Italy*. An edition of the last work, illustrated by the best artists, at the cost, it is said, of £10,000, appeared in 1836. After this date, he published nothing—his time being mainly devoted to taste, dining, epigram, and anecdote. Although aged, he was a greater gadder about than any man of his years in London. He rode or strolled in the parks, he haunted picture galleries, he was a constant attender at the opera. He was by far the oldest English poet. An accident in the street at last confined him to his room; and on 18th Dec. 1855, he died, aged 93. He read Goldsmith's *Traveller* when it was published, and he might have read Tennyson's *Maud*. He published his first book before Burns's first volume appeared at Kilmarnock. Since his death R.'s *Table Talk* has been published.

RO'GUE-MONEY is, in Scotland, an ancient assessment which the freeholders of every county at any of the head courts directed annually to be made in such sums as they judged necessary for defraying the expense of apprehending offenders, subsisting them in jail, and prosecuting them. The functions of the freeholder in the matter were transferred to the Commissioners of Supply by 2 and 3 Will. IV. c. 65, s. 44. The tax was first appointed by a statute of 11 Geo. II. c. 28. The raising and application of the tax are not uniform in the various counties.

ROHILCU'ND, an extensive region in the N.W. Provinces of India, lying west of Oude, and named after the Rohillas, an Afghan tribe which migrated hither in the 18th century. As an administrative *division* (area, 11,805 sq. miles; pop. in 1872, 5,436,314) it comprises the districts of Bijnur, Moradabad, Bareilly, Budaon, Shahjehaupur and Terai, and the protected state of Rampur.

ROHTU'K, a town of British India, the capital of the district of the same name, in the division of Hissar, Punjab, 42 miles north-west from Delhi. A canal or water-course, 45 miles long, constructed by order of the British government in 1825, supplies R. and the neighboring country with water from the great Ferozeshah Canal. Pop. (1868) 14,153.

RO'LAND, the hero of one of the most ancient and popular epics of early French or Frankish literature, was, according to tradition, the favorite nephew and captain of the Emperor Charlemagne. All that history tells us of him is simply this: In 778, when Charlemagne was busily engaged at Paderborn in organizing the government of the recently-subjugated pagan Saxons, and superintending their collective baptism and formal admission into

the Christian church, he was visited by a Saracen chief, who, being unwilling to recognize the supremacy of the Calif of Cordova, offered to put the Frankish sovereign in possession of several towns south of the Pyrenees which were under his rule. Charlemagne, accepting the offer, marched with a numerous army through the territory of Gascony, whose duke, Loup, he constrained to do him homage, and took Pampelona and Saragossa. Finding, however, that his Saracen ally gave him but little aid, he turned back to return to France; and it was during this retreat, while the Christian army was slowly threading its way through the narrow valley of Roncevaux or Roncesvalles (q. v.), that R., commander of the Marches of Bretagne, who commanded the rear-guard, was suddenly attacked by a large body of Vascons, lying in ambush in the surrounding woods, and slain while fighting gallantly. Beyond these meagre details, all that we read of R. is traditional. The oldest version of the *Song of Roland*, forming part of the *Chansons de Geste*, which treat of the achievements of Charlemagne and his paladins, belongs to the 11th c., although it is probable that the original compositions are not much later than the period to which they refer. Throughout the middle ages, the *Song of Roland* was the most popular of the many heroic poems current, and William of Normandy, when on his way to conquer England, had it sung at the head of his troops to encourage them on their march; while at the present day, the traditionary memory of the heroic paladin is still held in honor by the hardy mountaineers of the Pyrenees, amongst whose dangerous defiles the scene of his exploits and death is laid.

According to the poem, Charlemagne had been six years in Spain, when, resolving to return to France, he, by the advice of R., sent his captain, Ganelon, on an embassy to the pagan king, Marsilius of Saragossa, to receive the homage which he had pledged himself to perform. The mission was a dangerous one, as all other ambassadors to the king had been slain, and Ganelon, wishing to revenge himself on R., proved a traitor, and betrayed to Marsilius the route which the Christian army were to take. The consequence was, that after Charlemagne had safely crossed the mountains with the main part of his forces, R., who commanded a rear-guard of 20,000 men, was surprised within the narrow valley of Roncesvalles, by a terrible army of all the pagan nations of the world. R., who possessed an enchanted horn, which could have been heard far beyond the mountains, might have recalled his uncle, but despising such pusillanimity, he fought on till 100,000 Saracens lay slain around him and the 50 warriors who alone remained alive to aid him. Another army of 50,000 men of Carthage, Ethiopia, and Candia now pours down upon him. At length he blows his horn, which is heard by Charlemagne, who, however, does not return, as Ganelon persuades him once, twice, and thrice that R. is only hunting the deer; and not until the veins of R.'s neck have burst with the violence of the blast, does the emperor retrace his steps. In the meanwhile, R. has dragged his dying limbs to the foot of Mount Cisaire, above Roncesvalles, where, after having sung his death-song, and thrown his trusty and enchanted sword Durandal into a poisoned stream, where it still remains, he dies exhausted from his many wounds. Charlemagne, who arrives too late to save him, avenges his death in a series of marvelous battles and bloody victories.—The 83d impression of Léon Gautier's edition of the *Chanson de R.* appeared in 1881. See Bartsch, *Das Rolandslied* (1874).

ROLAND DE LA PLATIÈRE, Jean Marie, a French minister of the revolutionary period, was born at Mizy, near Villefranche (Beaujolais), 18th February 1734. His first independent appointment was that of inspector-ordinary at Amiens. In 1775, at the house of a friend in Amiens named Sophie Cannet, he met Marie Jeanne Phlipon, a young woman of brilliant genius and fascinating beauty, and after a courtship of four years, they were married, 4th February 1780. When the Revolution broke out in 1789, R., as well as his wife, became a decided partisan of the movement. In 1791, he was sent to Paris, by the municipality of Lyon, to represent to the Constituent Assembly the deplorable condition of the Lyonnese weavers. After the dissolution of the Constituent Assembly, he founded at Lyon, the *Club Central*, the members of which, marked by their attachment to constitutional liberty, received the name of *Rolandins*. Towards the close of 1791, he fixed himself at Paris, and soon became one of the heads of the Girondist or moderate section of the Republicans. In March 1792, he was appointed Minister of the Interior, a situation which he held till January 1793, when he resigned it, despairing of seeing moderate counsels adopted. After placing his accounts in the hands of the Assembly, he asked permission to withdraw from Paris, but it was refused, and an illegal attempt was made to arrest him, which failed. Immediately after, he fled, and concealed himself in Rouen. When news reached him of the execution of his wife, he committed suicide at a small village in the environs of Rouen, 15th November 1793. R. wrote and published several memoirs and disquisitions on branches of industry, besides 6 vols. of *Letters* addressed to his wife before their marriage, from Switzerland, Italy, Sicily, and Malta.

ROLAND, Madame (*née* Marie Jeanne Phlipon), wife of the preceding, was the daughter of Pierre Gratien Phlipon, an engraver, and was born at Paris, 17th March 1754. The precocity of her intelligence was remarkable. At the age of four, she had quite a passion for reading; at seven, she learned by heart a treatise on heraldry; at eight, she used to carry Plutarch with her to Church, while the *Jerusalem Delivered* of Tasso, and the *Telemaque* of Fenelon fired her childish imagination. At the same time, an ardent piety began to develop itself, and when only eleven, she entered the *Maison des Dames de la Congrégation*, in the Faubourg Saint-Marcel. Here she formed a close friendship with two young girls from Amiens, Henriette and Sophie Cannet, particularly with the latter, which was fruitful in consequences. On her return to her father's house after the lapse of two years, 'a change came o'er the spirit of her dream.' She no longer cared for the so-called 'religious' writers—the defenders of the Bible and the Church. Her faith was slowly changing from the dogmatic creed of Bossuet to the 'naturalism' of the Encyclopédists and 'Philosophes.' In ethics, now as ever, her preference for the Stoical system was marked. Shortly after the death of her mother in 1773, she read for the first time *La Nouvelle Heloïse*, which seemed to her (as it has to many another young impassioned soul) a veritable revelation. Greatly distressed by the imprudent conduct of her father, she again withdrew, at the age of 25, to the *Maison des Dames de la Congrégation*, and once more attempted an 'austere' life; but M. Roland (q. v.), who had already known her for five years, now came forward, and rescued her from a career which must ultimately have proved equally unsatisfactory to her reason and conscience, by offering her his hand. She was 25, and he 45. There was certainly something unpoetical in the disparity of their years, but then, Mademoiselle Phlipon knew that 'ideal' matches were made only in heaven, and so she accepted calmly the inspector of manufactures. Their marriage was celebrated 4th February 1780.

It is unnecessary to follow the remainder of her career, which was of course identical with her husband's until his flight from Paris 31st May 1793. The same night, she was herself arrested, and imprisoned in the Abbaye. A more dauntless and intrepid spirit never entered its walls! Released on the 24th of June, she was instantly rearrested by the very commissaries who had set her at liberty, without the shadow of a tangible accusation, and confined in Saint-Pelagie. Madame R. spent the period of her imprisonment in study, in the composition of her political *Mémoires*. Summoned before the Revolutionary Tribunal in the beginning of November, she was condemned, and on the 9th was guillotined, amid the shoutings of an insensate mob. It is said that while standing on the scaffold, she asked for a pen and paper that she might 'write down the strange thoughts that were passing through her head.' Only a genuine child of the French Republic could have been so ostentatiously speculative at such a moment. Still more celebrated is her apostrophe to the statue of Liberty, at the foot of which the scaffold was erected: 'O Liberty, what crimes are committed in thy name!' or, according to another version: 'Liberty, how they have played with thy name!'—See *La Correspondance de Madame Roland avec les Demoiselles Cannet* (2 vols., Paris, 1841); *Lettres Autographes de Madame Roland, adressées à Bancal des Issarts* (Paris, 1835).

ROLL, a round moulding much used in Gothic architecture. It is also modified by the introduction of a fillet, and is then called the roll-and-fillet moulding.

ROLL OF ARMS, a heraldic record of arms, either verbally blazoned or illuminated, or both, on a long strip of vellum, rolled up, instead of being folded into leaves. Rolls of arms are the most important and most authentic materials for the history of early heraldry. In England, they go back to the reign of Henry III., the oldest being a copy of a roll of that reign, containing a list of the arms borne by the sovereign, the princes of the blood, and the principal barons and knights between 1216 and 1272, verbally blazoned without drawings. The original has been lost, but the copy, which, having been made by Glover, Somerset herald, in 1586, is called 'Glover's Roll,' is in the English College of Arms. This roll exhibits heraldry as at that early period already consolidated into a system. In the British Museum (Harl. Coll., 6589) is a copy of another roll of the middle of the 13th c., containing 700 coats tricked, that is, drawn in pen and ink. The *Roll of Caerlaverock* is a heraldic poem in Norman-French, reciting the names and arms of the knights present at the siege of Caerlaverock in 1300. It has been published with notes by Sir N. H. Nicolas. Copies exist of rolls of the knights who were with Edward I. at the battle of Falkirk.

ROLLER (*Coracias*), a genus of birds very generally referred to the Crow family (*Corvidæ*), but by many naturalists to the Bee-eater family (*Meropidæ*), with which they regard the habits and colors of the species as indicating a closer alliance. The bill is moderately large, compressed towards the point, straight, the upper mandible curved downwards at the point, the sides

bristled at the base, the gape wide; the legs short and strong; the wings long. The colors are in general very brilliant. Mr. Swainson says of the BLUE-BODIED R. (*C. cyanogaster*) of Western Africa, that 'no effort of art can possibly do justice to those inimitably rich lines of ultramarine, beryl color, and changeable fawn, with which it is ornamented; for there are no tints hitherto discovered, either mineral or vegetable, which will



Roller (*Coracias garrula*).

enable the painter to produce their successful imitation.' The species are pretty numerous, all natives of the Old World, and mostly of the warmer parts of it. One only is found in Europe, the COMMON R. (*C. garrula*), a bird nearly equal in size to a jay; with head, neck, and wing-coverts greenish-blue, other shades of blue strongly marked in the wings.

This bird is abundant in the north of Africa, and in some parts of Asia; it is partially migratory, and is rare in Britain. It tosses its food, which consists of insects or parts of plants, into the air before eating it, swallowing it when it falls in a proper direction for entering the throat. The name R. is derived from its habit of tumbling in the air like a tumbler-pigeon. It is an inhabitant of woods. It is a very shy bird, and the sportsman always finds it difficult to approach. In the countries where it is abundant, as in some islands of the Mediterranean, it is in high esteem for the table.

ROLLER, an agricultural implement which has been long in use, consisting of a cylinder of wood, stone, or iron, placed in a frame, so as to revolve like a wheel, and drawn over the land by a horse. The weight of the roller is greater or less according to the purpose for which it is intended: the breaking of stiff clay clods, the consolidating of very light soils after frost, the hardening of the surface of the ground to check evaporation, the levelling of an uneven surface before harvest operations, &c. For these and such purposes, the roller is in constant use. The introduction of hollow cylinders of iron, instead of solid ones of wood or stone, is an improvement of no remote date, and was the first change on the old simple implement, which was afterwards further modified by dividing the cylinder into two parts, to give greater facility in turning, and to diminish its injurious action in scraping the soil before it while turning; and this process of division being carried further, with other modifications, giving each part or wheel a more independent action, and breaking up the uniformity of surface by giving a raised wedge-like edge to the circumference of each wheel, the result is a *clod-crusher*.

ROLLER, used as part of the inking apparatus in letter-press printing, is of modern invention. In the old process of applying the ink to the surface of types, stuffed leather balls were made use of, which were not only difficult to keep in proper order, but were inapplicable to cylinder-printing. The first improvement on the stuffed balls consisted in covering them with a soft and elastic composition, such as was employed in the Staffordshire potteries. Catching at this idea, the inventors of cylinder printing-machines made rollers by coating longitudinal and rounded pieces of wood with the composition, by means of casting in a mould. This invention came generally into use between 1814 and 1818, everywhere superseding balls, and rendering printing machinery practicable.

The method of making inking-rollers is very simple. A roller may be of any length, to suit work of different kinds; for hand-presses it is usually about 30 inches long, but longer for machines, according to their dimensions. The thickness is about three inches, of which the composition on the wood is probably three-quarters of an inch all round. The wooden center being fixed upright in an iron mould, the composition is poured in when in a hot liquid state, and then left to cool. When cold, the mould which is in halves, finely-jointed and held together, is opened, and the roller taken out: by a little trimming, it is ready for use. The composition consists of a due proportion of fine glue and treacle or molasses, boiled together and thoroughly blended—the result being a substance resembling soft india-rubber. The proportions of the two ingredients depend on the state of the atmosphere. In summer, one pound of glue to one pound of treacle may form a suitable mixture; but in winter, it may be requisite to give three pounds of treacle to one pound of glue, in order to insure the proper elasticity. Rollers in time, shrivel and waste by use, and the composition may then be remelted, along with some small addition of new materials. In all cases, the rollers require to be kept very clean, and suspended in a rack when not in use. The manufacture and supply of rollers for printers constitute a distinct business in London; but elsewhere, as far as we know, every printing establishment of any consequence possesses means of fabricating rollers for itself.

ROLLIN, CHARLES, a French historian, who formerly enjoyed, if he did not merit, an extensive popularity, was the son of a cutler, and was born in Paris, January 30, 1661. He studied at the Collége du Plessis, where, in 1683, he became assistant to the Professor of Rhetoric, and four years later obtained the chair for himself. In 1688, he was called to the chair of Eloquence at the Collége Royal de France, and for some ten years he discharged the duties of his office with remarkable zeal and success. In 1694, he was chosen rector of the university of Paris, a dignity which he held for two years, and signalized his brief tenure of office by many useful reforms, both in regard to discipline and study, and by his warm defence of the privileges of the university. His efforts to revive the study of Greek, then falling back into neglect, were particularly creditable to him, and altogether his career as rector constitutes perhaps his best claim to the regard of posterity, and has certainly left a more permanent impression than his writings, for its influence is perceptible even to the present day. In 1699, he was appointed coadjutor to the principal of the College of Beauvais; but was removed from this situation in 1712, through the machinations of the Jesuits, for R. was a strenuous Jansenist. For the next three years he devoted himself exclusively to learned study, the fruit of which was his edition of Quintilian (Paris, 2 vols. 1715). In 1720, he was re-elected rector of the university and in 1726 published his *Traité des Etudes*, which M. Villemain has pronounced 'a monument of good sense and taste,' and which is justly regarded as his best literary performance, for his *Histoire Ancienne* (Paris, 12 vols. 1730—1738), though long prodigiously popular, and translated into several languages (the English among others), is feeble in its philosophy, jejune in its criticism, and often inaccurate in its narrative. Nevertheless, to multitudes, both in this country and in France, it has formed the introduction to the study of ancient history. Frederick the Great, then the Prince-royal, of Prussia, among other princely notabilities, wrote to compliment the author, and opened up a correspondence with him. In 1738, R. published his *Histoire Romaine* (Paris, 9 vols,), a much inferior work, now almost forgotten. He died September 14, 1741.

ROLLING-MILL, one of the most important of modern inventions for the working of metals. It was first introduced practically by MR. Corb in 1784, and since then has gradually become more and more useful, as its capabilities have been developed. Under the article IRON (q. v.), there is a figure of the iron rolling-mill, by means of which bars of iron are rolled or drawn out, and it will be at once seen that the same machine will do for other metals; moreover, the rolls may be engraved so as to impress a pattern on the bar as it passes through; this is done by the brass-workers to a great extent; and tubes of brass, copper, tin, &c., are also operated on in a similar way, a mandrel or rod of iron being fitted inside the tube, to sustain the pressure of the rollers.

ROLLS, MASTER OF. See MASTER OF THE ROLLS.

ROLLS OF COURT, in Scotch Law, mean the lists of causes depending in the Court of Session.

ROMAGNA. See PAPAL STATES.

ROMAINE, REV. WILLIAM, an English divine of the last century, noted for the ardor with which he preached 'evangelical' and Calvinistic doctrines in an age of religious apathy, was the son of a corn-dealer in Hartlepool, and was born there, September 25, 1714. His father was a French Protestant refugee. Young R. was educated at the grammar-school of Houghton. He was ordained a priest in 1738, and immediately obtained a curacy near Epsom. In 1739, he published a sermon preached before the university of Oxford, in which he attempted to show, in opposition to the view maintained by Warburton in his *Divine Legation of Moses*, that the doctrine of a future state is 'expressly mentioned,' and even 'insisted on,' in the Pentateuch. This led to a controversy with Warburton. In 1747, he published the first volume of a new edition of Calasio's *Hebrew Concordance and Lexicon*, the fruit of seven years' labor.

The only thing in connection with R.'s edition that now calls for notice is the fact, that he took extraordinary liberties with the original, omitting, for example, the author's account of the word which is usually rendered 'God,' and substituting his own in the body of the work! In 1748, he was chosen lecturer of St. Botolph's, in London, and in the following year, lecturer of St. Dunstan's-in-the-West. Two years later, he was appointed assistant morning-preacher at St. George's; but was afterwards

deprived of the situation by the rector, Dr. Trebeck, who was jealous of his popularity, and averse to the 'plainness' of his preaching. His 'evangelicalism' grew with his years; and at length, in 1757, in a sermon on the *Lord our Righteousness*, it became so offensive to the torpid dons of Oxford that the university pulpit was in future closed against him. Some years before this, R. had been appointed to the professorship of astronomy in Gresham College, for which he was not fit, and which he did not retain. His intellect was anything but scientific in its character, as will readily be understood when we state that he allowed his 'zeal' for Hutchinsonian speculations to lead him into opposition to the Newtonian philosophy. In 1756, he became curate and morning-preacher at St. Olave's, Southwark, a situation which he exchanged in the course of a year for a preachership at St. Bartholomew the Great, near West Smithfield. In 1766, he was chosen by the parishioners rector of St. Andrew, Wardrobe, and St. Anne, Blackfriars, an office which he held till his death, July 26, 1795. Besides what has been already mentioned, R. published *Twelve Sermons upon Solomon's Song* (1759); *Twelve Discourses upon the Law and the Gospel* (1760); *The Life of Faith* (1763); *The Scripture Doctrine of the Sacrament of the Lord's Supper* (1765); *The Walk of Faith* (1771); *An Essay on Psalmody* (1775); *The Triumph of Faith* (1795). His works were republished in a collected form, in 8 vols., in 1796, by the Hon. and Rev. W. B. Cadogan, who prefaced them with a life of their author.

ROMAN ALUM. See ROCH ALUM.

ROMAN ARCHITECTURE. Of the early architecture of Rome and the other Latin cities, comparatively little is known. With the conquest of Carthage, Greece, and Egypt, the Romans became acquainted with the arts of those countries, and began to endeavor to use them for the embellishment of the imperial city. Besides, Rome under the empire was the capital of the world, and attracted artists from every country. The result was that the architecture of Rome became a mixed style. It was all imported, and partook of the character of the importers. The great interest of Roman architecture is, that it is a mixture and amalgamation of all ancient styles, and the starting-point for all modern styles. It is thus the connecting link between ancient and modern art; the whole history of Roman architecture being that of a transition, slow but steady, from the external architecture of the Greeks to the internal architecture of the Christians. Rome borrowed from Greece the oblong peristylar temple, with its horizontal construction and decoration, and the various 'orders.' See COLUMN, GRECIAN ARCHITECTURE. From the Tuscans, probably, were derived the circular form of temple and the circular arch, which became leading features in the development of the future Roman style.

The *Orders* imported from Greece were the Doric, Ionic, and Corinthian (q. v.). These were all used in Rome, but with some modifications; the Doric, for example, being never used as in Greece, but without fluting, and with the capital and entablature altered, and a base added, so as to make the style more similar to

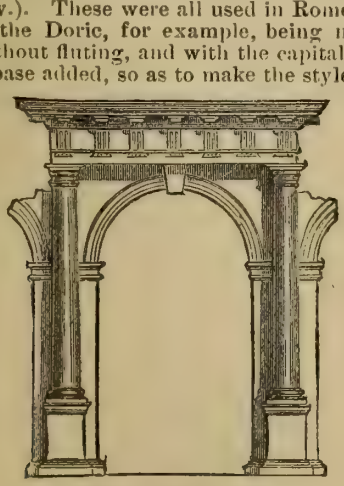


Fig. 1.—Doric Arcade.

the others, with which it was often associated. The Ionic had the volutes turned out angularwise, so as to present a similar face in each direction. The favorite 'order' of the Romans, however, was the Corinthian. It was invented in Greece, but more fully developed in Rome, where it suited the desire which existed for richness and luxuriance in architecture. Many fine examples of this style exist in Rome (as the Pantheon, Jupiter Stator, &c.), and in the provinces (as the Maison Quarrée at Nimes, Baalbec, &c.), the capitals, wherever found, being designed in endless variety.

The composite order was an invention of the Romans, and is sometimes called *the Roman order*. It is a combination of the Ionic and Corinthian. All these orders were used by the Romans, but in a manner peculiar to themselves; they combined with the Greek orders the arch. They placed the columns (fig. 1) at wide intervals, and set them on pedestals, to give them and the entablature a proper proportion; whilst behind the columns they placed square piers, and from them threw arches which supported the wall. This was the favorite Roman style, and may be seen in all their important works (amphitheaters, arches, baths, &c.). They piled one order above another, marking each story with the entablature. As the style proceeded, vaulting and arching became more common, especially in internal construction, but the horizontal ornamentation was never entirely abandoned. Arches of this construction were thrown from pillar to pillar behind the entablature, and gradually the pier was omitted, and the arch openly thrown from pillar to pillar, the architrave bent round it, and the cornice continued horizontally above.

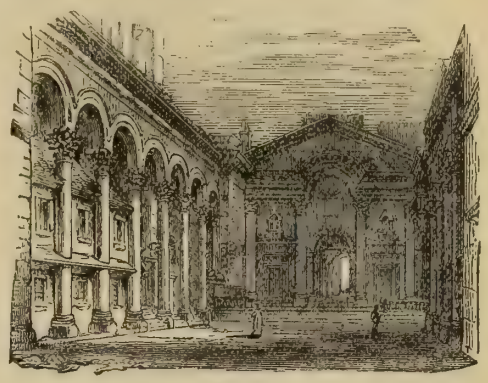


Fig. 2.—Courtyard at Spalatro.
(From Sir Gardner Wilkinson's *Dalmatia*.)

The buildings executed by the Romans are very varied in their character, but the same style was used for temples, baths, amphitheaters, triumphal arches, tombs, &c. The earliest temples of which remains now exist are those of Jupiter Stator in the Forum, Jupiter Tonans, and Mars Ultor, all of the Augustan epoch, and each with only three columns left. These are supposed to have been nearly peripteral, and it is worthy of notice that the cells are all large, and one of them has an apse.

One of the most interesting temples of Rome is the Pantheon. The portico is of the age of Augustus, but the rotunda is probably considerably later. The dome of the interior is a splendid example of the progress of Roman architecture in developing the use of the arch, and transferring the decoration from the exterior to the interior. The former is in this case totally sacrificed to the latter; but the interior has not yet been surpassed for boldness of construction or simplicity and sublimity of effect. Other examples of circular temples, on a small scale, are found at Tivoli and in Rome, both dedicated to Vesta.

The greatest works of the Romans, however, were not their temples. The Basilicas (q. v.), Amphitheaters (q. v.) and Baths (q. v.) are far more numerous and more stupendous as works of



Fig. 3.—Transverse Section of Basilica of Maxentius.
(From Fergusson's *Hand-book of Architecture*.)

art, and all show how well the Romans had succeeded in producing an internal architecture, which at a later period became so useful as a model for Christian buildings. The Basilica of Trajan is a type of the Christian wooden-roofed churches; while that of Maxentius (fig. 3), with its great intersecting vaults, its vaulted aisles, and buttresses, contains the germs of the greatest Christian cathedrals. The Roman Amphitheaters (q. v.) have never been surpassed for size and grandeur, or for suitability to their purpose. And of the Baths (q. v.), sufficient remains still exist, although much decayed, from the perishable nature of the brick and stucco employed in their construction, to prove that the scarcely credible descriptions of contemporaries were surpassed by the magnificence of the buildings themselves.

Among the other varied public works of the Romans are their Aqueducts (q. v.) and bridges, Triumphal Arches (q. v.), pillars of victory, and tombs. Of the tombs of the Romans, the earliest and best specimen is that of Cæcilia Metella, (wife of Crassus), on the Appian Way (fig. 4). It consists (like most Roman tombs) of a round drum placed on a square basement, and was probably



Fig. 4.—Tomb of Cæcilia Metella.
(From Fergusson's *Hand-book*.)

surmounted by a conical roof. The tomb of Augustus was similar, on a very large scale, and the sloping roof was broken into terraces planted with trees. That of Adrian (now the castle of St. Angelo in Rome) is another enormous example. The tombs were generally arranged along the ways leading to the gates of cities.

The later tombs of Rome are well worthy of study, as they contain many specimens of the transition towards the Christian style. They are generally vaulted, frequently with domes, as, for instance, the tombs of St. Helena and Sta. Costanza. Mr. Fergusson also places the so-called 'Temple of Minerva Medica' (fig. 5) amongst the tombs. It is a beautifully arranged building

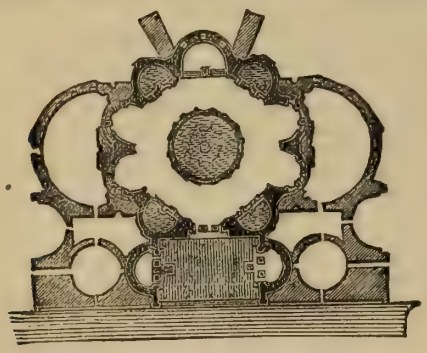


Fig. 5.—Plan of the Temple of Minerva Medica at Rome.

with ten sides, all containing deep niches (except the side with the door), surmounted by a clear-story, with ten well-proportioned windows. The vault is polygonal inside and outside; and the pendentives, ribs, buttresses, &c., which played so important a part in the Christian architecture both of the East and West, are distinctly used in its construction.

Of the domestic architecture of the Romans, we have many wonderfully preserved specimens in Herculaneum and Pompeii, showing both the arrangements and decorations of the dwellings of all classes. Of the great palaces and villas, however, none remain except the palace of Diocletian, at Spalatro, in Dalmatia. It is an important building, as it shows many steps in the progress of the style.

ROMAN CATHOLIC CHURCH, the community of Christians throughout the world who recognize the spiritual supremacy of the Pope or Bishop of Rome, and are united together by the profession of the same faith, and the participation of the same sacraments. The subject will be most conveniently treated by considering under separate heads the history of this great Christian community; its doctrinal and disciplinary system; and finally, its organization and constitutional forms, especially as affected by the decrees of the late council of the Vatican, and by other doctrinal constitutions of recent years.

Although a few other points of doctrinal difference separate the Roman Church from the Greek, Russian, and oriental communions, yet the most palpable ground of division lies in the claim of supremacy in spiritual jurisdiction on the part of the Roman bishop. The history of the Roman Church, therefore, in relation to the ancient oriental churches, is, in fact, the history of this claim to supremacy. In the minds of Roman Catholics, the claim of supremacy on the part of the Bishop of Rome rests on the belief, that Christ conferred on Peter a 'primacy of jurisdiction;' that Peter fixed his see and died at Rome (a position which some Protestant historians have called in question altogether); and thus, that the bishops of Rome, as successors of Peter, have succeeded to his prerogatives of supremacy. In this light, Catholic historians read the facts of the early history of the church—and they trace to this acknowledgment of the superiority of that see, the numerous references to Rome on matters of doctrine or discipline; the appeals from other churches, even those of Alexandria, Antioch, and Constantinople; the depositions or nominations of bishops, examination and condemnation of heresies, of which the first five centuries, especially the 4th and 5th, present examples, but in which Protestant historians only recognize the natural result of the political and social superiority of Rome as the capital of the Roman empire.

The letters of Pope Leo the Great show beyond question that the bishops of Rome, in the commencement of the 5th c., claimed to speak and act with supreme authority; and the first direct challenge to this claim was made by the patriarch of Constantinople, Acacius, and led to a schism of many years, which, however, terminated in the humiliation of the younger see. In all the controversies upon the Incarnation—the Arian, the Nestorian, the Eutychian, the Monothelite—not only was the orthodoxy of Rome never impeached, but she even supplied at every crisis a rallying point for the orthodox of every church. It was so, again, in the Iconoclast controversy; and although Constantinople, in the time of Gregory the Great and again of Nicholas I., renewed the struggle for supremacy or even equality, the superior position of Rome continued to be recognized. The separation of the Greek Church and her dependencies, under the patriarch Michael Cerularius in the year 1054, was but a narrowing of the territorial jurisdiction of Rome; and within that portion of the church which remained faithful, it even enhanced the dignity of Rome, and widened her prerogatives. The abandonment of Italy by the emperors to its fate under the invasion of the barbarians, led to the establishment of the temporal sovereignty of the popes; and the social disorganization of Europe combined with the spiritual authority of the Roman bishop to bring about the general recognition of his authority throughout the kingdoms of Europe as an arbiter in the temporal relations of sovereigns with their subjects, and of sovereigns towards each other. This extraordinary temporal authority was at once the consequence and the support of his acknowledged spiritual power; and even Protestants have recognized the Roman Church of the medieval period as absorbing in itself almost the whole of European Christendom, and as the only public (even though they believe it degenerate and corrupt) representative of the church in the West. The temporary withdrawal of the papal residence from Rome to Avignon, brought with it a notable diminution, at least, of the temporal power of the popes, which was still further weakened by the long western schism, by the conflicts of the rival pontiffs, and the scandals which arose therefrom. The modern political institutions which then began to break upon the world, so modified the public relations of church and state, as by degrees to undo the condition of society in which the temporal power of the popes had its foundation. The great revolution of the 16th c. completed the process.

Nor was the revolution with which the popes thus found themselves face to face without its influence in the external history of the Roman Church. The defections consequent on the Reformation, and at first numerous and formidable, received a check. The great Council of Trent did more to systematize, to define, and to present in popular form the doctrinal belief of Rome, than had been accomplished by the united efforts of the schoolmen of the three centuries which preceded the Reformation; while the decrees of reformation which it enacted, and still more the schemes of local and individual reform which it originated, and to which it gave the impulse as well as the example, tended to bring about an active internal reform. The latter half of the 16th c. was a period of new life in the Roman Church. The celebration of local synods, the establishment of episcopal seminaries, the organization of schools, and other provision for religious instruction —above all, the foundation of active religious orders of both sexes —had the effect of arresting the progress of Protestantism, which in many countries had been at first rapid and decisive; and Lord Macaulay has traced out with curious minuteness the line which marks in the several kingdoms the origin and the progress of this religious reaction.

From the end of the 16th c., therefore, the position of the R. C. Church, especially in her external relations, may be regarded as settled. The local distribution of the rival churches in the world has hardly been altered, except by migration, since that time. But in her relations to the state, the Roman Church has since passed through a long and critical struggle, which is detailed under the heads GALLICAN CHURCH, FEBRONIANISM, INNOCENT

XI. The new theories to which the French Revolution gave currency have still further modified these relations; but in most of the European kingdoms they were readjusted after 1815, either by concordat or by some similar mutual agreement. Many conflicting claims on either side, however, still exist; but in the conflict with the state the policy of the R. C. Church has generally been to record her protest against any violation of her right, and, this protest having been made, to submit under protest, unless in what are considered the essentials of faith or of discipline. Where the encroachments of the state are considered to violate the essentials of faith or discipline, the resistance must result in definitive separation, as in the case of England under Henry VIII. and his successors, in Poland under the Czar, and in Prussia in the now pending conflict.

The details of the doctrinal system of the R. C. Church will be best collected and explained from her latest authentic creed, that commonly called 'the creed of Pius V.,' drawn up as a summary of the authoritative teaching of that ecclesiastical body till the time at which it was written, and published together with certain later doctrinal pronouncements. It is only necessary to premise that, while in the view of Catholics (see RULE OF FAITH) all doctrine must be based on the Word of God, written or unwritten, the church is the only authoritative judge of that rule of faith. The tribunals which are held to represent this teaching, as well as the subjects to which the privilege extends, and the limits within which it is held to be exercised infallibly, have all been explained under the head INFALLIBILITY (q. v.). But Catholics hold, that while the church has authority, when doubts or difficulties arise, to propound in such terms as leave no room for doubt new definitions of faith, nevertheless these new definitions must not be regarded as additions to the accepted faith of the church, or indeed to the original deposit of divine teaching, but only as expositions of former articles, or at most as developments of what already existed in the germ, and has but been evolved by controversy, or brought into practical action by the progress of time, and by the change of the external relations of the church.

The creed of Pius V. is as follows:

'I, N. N., with a firm faith believe and profess all and every one of those things which are contained in that creed which the holy Roman Church maketh use of. To wit: I believe in one God, the Father Almighty, Maker of heaven and earth, of all things visible and invisible, and in one Lord Jesus Christ, the only begotten Son of God, born of the Father before all ages; God of God; Light of Light; true God of the true God; begotten, not made; consubstantial with the Father, by whom all things were made. Who for us men, and for our salvation, came down from heaven, and was incarnate by the Holy Ghost of the Virgin Mary, and was made man. He was crucified also for us under Pontius Pilate, suffered, and was buried. And the third day he rose again according to the Scriptures: he ascended into heaven, sitteth at the right hand of the Father, and shall come again with glory to judge the living and the dead; of whose kingdom there shall be no end. I believe in the Holy Ghost, the Lord and life-giver, who proceedeth from the Father and the Son; who, together with the Father and the Son, is adored and glorified; who spake by the prophets. And in one holy, Catholic, and Apostolic Church. I confess one baptism for the remission of sins; and I look for the resurrection of the dead, and the life of the world to come. Amen.

'I most steadfastly admit and embrace the apostolical and ecclesiastical traditions, and all other observances and constitutions of the same church.

'I also admit the holy Scriptures, according to that sense which our holy mother the Church hath held and doth hold; to whom it belongeth to judge of the true sense and interpretation of the Scriptures; neither will I ever take and interpret them otherwise than according to the unanimous consent of the Fathers.

'I also profess that there are truly and properly seven sacraments of the new law, instituted by Jesus Christ, our Lord, and necessary for the salvation of mankind, though not all for every one: to wit—Baptism, Confirmation, the Eucharist, Penance, Extreme Unction, Order, and Matrimony; and that they confer grace; and that of these, Baptism, Confirmation, and Order cannot be repeated without sacrilege. I also receive and admit the received and approved ceremonies of the Catholic Church, used in the solemn administration or the aforesaid sacraments.

'I embrace and receive all and every one of the things which have been defined and declared in the holy Council of Trent concerning original sin and justification.

'I profess, likewise, that in the Mass there is offered to God, a true, proper, and propitiatory sacrifice for the living and the dead; and that in the most holy sacrament of the Eucharist there is truly, really, and substantially the Body and Blood, together with the soul and divinity of our Lord Jesus Christ; and that there is made a conversion of the whole substance of the bread into the Body, and of the whole substance of the wine into the Blood; which conversion the Catholic Church calleth Transubstantiation. I also confess that under either kind alone Christ is received whole and entire, and a true sacrament.

'I constantly hold that there is a Purgatory, and that the souls therein detained are helped by the suffrages of the faithful.

'Likewise, that the saints reigning together with Christ are to be honored and invocated, and that they offer prayers to God for us, and that their relics are to be had in veneration.

'I most firmly assert that the Images of Christ, of the Mother of God, ever Virgin, and also of other saints, ought to be had and retained, and that due honor and veneration are to be given them.

'I also affirm that the power of indulgences was left by Christ in the church, and that the use of them is most wholesome to Christian people.

'I acknowledge the holy Catholic, Apostolic, Roman Church for the mother and mistress of all churches; and I promise true obedience to the Bishop of Rome, successor of St. Peter, Prince of the Apostles, and Vicar of Jesus Christ.

'I likewise undoubtingly receive and profess all other things delivered, defined, and declared, particularly by the holy Council of Trent; and I condemn, reject, and anathematize all things contrary thereto, and all heresies which the church hath condemned, rejected, and anathematized.

'I, N. N., do at this present freely profess, and sincerely hold this true Catholic faith, out of which no one can be saved; and I promise most constantly to retain and confess the same entire and inviolate, by God's assistance, to the end of my life.'

In addition to these articles, the R. C. Church has, since the compilation of the creed of Pius V., defined certain further doctrines in the controversy on grace, which arose from the teaching of Jansenius (q. v.); still more recently that of the Immaculate Conception of the Blessed Virgin Mary (q. v.); and a still more comprehensive body of articles in the memorable *Syllabus* issued by Pope Pius IX., and in the decrees of the Vatican Council, celebrated under the presidency of the same pontiff.

The doctrinal decisions of this latter council are divided into two sections, the first 'on the Catholic Faith,' the second 'on the Church of Christ.' Each section contains a 'scheme of doctrine,' in which the heads of belief, and the grounds on which they rest, are explained; and to each is appended a body of 'canons,' in which the several points are summarized, stated in precise theological language, and defined as articles of Catholic belief. In the scheme 'upon the Church of Christ' are contained, in 'an additional chapter,' the celebrated declarations regarding the infallibility of the Pope. See *Omnium Concilii Vaticani Documentorum Collectio* (8vo, Paderborniæ, 1873).

The details of the discipline of the R. C. Church would be out of place here. But it may be observed that the R. C. Church leans towards asceticism, as regards the practice of fasting, with less rigor than the Greek and oriental communions; while, on the contrary, as to the celibacy of the Clergy (q. v.), her law is much more stringent; all the clergy of the R. C. Church in the greater orders, including sub-deacons, being so strictly bound to celibacy, that a marriage contracted after ordination is invalid by the church law. See ORDERS. In all that regards the general discipline of the whole church, only the pope or a general council is considered to have power to legislate; national or provincial synods for the discipline of a kingdom or province, and bishops for that of their own dioceses.

The constitution of the R. C. Church has been in great part explained in the article HIERARCHY. It may be necessary to add that, under the generic name Roman Catholics are comprised all those Christians who acknowledge the supremacy of the Roman pontiff, even though they be not of the Roman or Latin RITE (q. v.). Not a few individuals and churches of other rites are included under this designation, Greeks, Slavonians, Ruthenians, Syrians (including Maronites), Copts, and Armenians; and these communities are permitted to retain their own national liturgy and language, and for the most part their established discipline and usages. The most remarkable examples of the diversity of discipline thus introduced under the common rule of the Roman pontiff are the retention in the East of the use of the cup for the laity, and the permission of the marriage of the clergy.

As regards its organization for the purposes of ecclesiastical government, the normal territorial distribution of the R. C. Church of the several rites in the various countries where it exists is into provinces, which are subject to archbishops, and are subdivided into bishoprics, each governed by its own bishop. The total number of archbishops of the several rites in communion with Rome in 1880 was 173, of whom 9 bore the title of patriarch. The number of bishops was 710. But in certain parts of the world, where the population and government are Protestant or unbelieving, the spiritual affairs of the Catholic Church are directed, not by bishops with local titles, but by bishops IN PARTIBUS INFIDELIUM (q. v.), who are styled vicars of the pope,

or vicars apostolic. The full number of archbishops and bishops in 1880, including those *retired* and those with sees *in partibus infidelium*, was 1146.

The statistics of the R. C. Church, as contained in the *Orbe Cattolico*, published at Rome, give us the total number of Catholics of all nations as 185,000,000. This number nearly corresponds with the total of Roman Catholics as given in the article on Religion (q. v.). In order to avoid unnecessary repetition, we refer to that article for the details of the distribution of Roman Catholics in the several countries; and for the number of those subjects of the pope who follow a rite different from that of Rome, see GREEK CHURCH, RUSSIAN CHURCH, SYRIA, MARONITES.

ROMAN CATHOLIC EMANCIPATION OR RELIEF ACTS. After the Reformation, both in England and in Scotland, R. Catholics were subjected to many penal regulations and restrictions. As late as 1780, the law of England—which, however, was not always rigidly enforced—made it felony in a foreign R. Catholic priest, and high treason in one who was a native of the kingdom to teach the doctrines or perform divine service according to the rites of his church. R. Catholics were debarred from acquiring land by purchase. Persons educated abroad in the R. Catholic faith were declared incapable of succeeding to real property, and their estates were forfeited to the next Protestant heir. A son or other nearest relation being a Protestant, was empowered to take possession of the estate of his R. Catholic father or other kinsman during his life. A R. Catholic was disqualified from undertaking the guardianship even of R. Catholic children. R. Catholics were excluded from the legal profession, and it was presumed that a Protestant lawyer who married a R. Catholic had adopted the faith of his wife. It was a capital offence for a R. Catholic priest to celebrate a marriage between a Protestant and R. Catholic. Such was the state of the law, not only in England but in Ireland, where the large majority of the population adhered to the old faith.

In Scotland, also, R. Catholics were prohibited from purchasing or taking by succession landed property. The inexpediency and irrationality of imposing fetters of this description on persons not suspected of disloyalty, and from whom danger was no longer apprehended, began about 1778 to occupy the attention of liberal-minded statesmen; and in 1780, Sir George Saville introduced a bill for the repeal of some of the most severe disqualifications in the case of such R. Catholics as would submit to a proposed test. This test included an oath of allegiance to the sovereign, and abjuration of the Pretender, a declaration of disbelief in the several doctrines, that it is lawful to put individuals to death on pretence of their being heretics; that no faith is to be kept with heretics; that princes excommunicated may be deposed or put to death; and that the pope is entitled to any temporal jurisdiction within the realm. The bill, from the operation of which Scotland was exempted, eventually passed into law. An attempt which had been made at the same time to obtain a like measure of relief for the R. Catholics of Scotland, was defeated by an outburst of religious fanaticism. The populace of Edinburgh, stirred up by a body called 'The Committee for the Protestant Interest,' attacked and set fire to the R. Catholic churches, and the houses of the clergy and of such persons as were suspected to be favorable to R. Catholic relief. The frenzy spread to England, where a 'Protestant Association' had been formed to oppose the resolutions of the legislature. See GORDON, LORD GEORGE. In 1791, a bill was passed affording further relief to such R. Catholics as would sign a protest against the temporal power of the pope, and his authority to release from civil obligations; and in the following year, by the statute 33 Geo. III. c. 44, the most highly penal of the restrictions bearing on the Scottish R. Catholics were removed without opposition, a form of oath and declaration being prescribed, on taking which they could freely purchase or inherit landed property.

Endeavors were made at the same time by the Irish parliament to get rid of the more important disqualifications, and place Ireland on an equality in point of religious freedom with England. In 1780, Grattan carried his resolution that the king and parliament of Ireland could alone make laws that would bind the Irish, and separation from England was urged as the alternative with repeal of the disqualifying statutes. The agitation culminated in the Irish rebellion of 1798; the union of 1800 followed, which was partly carried by means of pledges, not redeemed, regarding the removal of the disabilities in question. Meantime, in England, R. Catholics continued subject to many minor disabilities, which the above-mentioned acts failed to remove. They were excluded from sitting and voting in parliament, and from enjoying numerous offices, franchises, and civil rights, by the requirement of signing the declaration against transubstantiation, the invocation of saints, and the sacrifice of the mass. In the early part of this century, many measures were proposed for the removal of these disqualifications, and in 1813 and succeeding years, one bill for this end after another was thrown out. Meanwhile, the agitation on the subject among the R. Catholics themselves greatly increased, and in 1824 it assumed an organized shape by the formation of the 'R. Catholic Association' in Ireland, with its systematic collections for the 'Catholic rent.' The Duke of Wellington, who, for a long time, felt great repugnance to admit the R. Catholic claims, was at last brought to the conviction, that the security of the empire would be imperilled by further resisting them, and in 1829 a measure was introduced by the duke's ministry for Catholic emancipation. An act having been first passed for the suppression of the R. Catholic Association—which had already voted its own dissolution—the celebrated R. Catholic Relief Bill was introduced by Mr. Peel in the House of Commons on the 5th of March, and after passing both Houses, received the royal assent on the 13th April. By this act (10 Geo. IV. c. 7), an oath is substituted for the oaths of allegiance, supremacy, and abjuration, on taking which R. Catholics may sit or vote in either House of Parliament, and be admitted to most other offices from which they were before excluded. They, however, continue to be excluded from the offices of Guardian and Justice or Regent of the United Kingdom, Lord Chancellor, Lord Keeper, or Lord Commissioner of the Great Seal of Great Britain or Ireland and Lord High Commissioner to the General Assembly of the Church of Scotland. As members of corporations, they cannot vote in the disposal of church property or patronage. Ecclesiastics or other members of the R. Catholic persuasion, either wearing the habit of their order, or officiating in any place which is not their usual place of worship, or a private house, forfeit £50. Jesuits, and members of orders bound by monastic or religious vows, must register themselves with the clerk of the peace of their county, under a penalty of £50 for every month that they remain in the kingdom unregistered. Jesuits not natural-born subjects, who have come into the country since the passing of the act, are liable to be banished. Persons admitting others to such societies within the United Kingdom, are liable to fine and imprisonment, and those who have been so admitted are liable to be banished.

Restrictions which existed on R. Catholic bequests were removed by 2 and 3 Will. IV. c. 115, as regards Great Britain, and by 7 and 8 Vict. c. 60, with relation to Ireland. Acts 7 and 8 Vict. c. 102, and 9 and 10 Vict. c. 59, abolished a few minor R. Catholic disabilities. For the statutory prohibition against the assumption of ecclesiastical titles in respect of places in the United Kingdom, see ECCLESIASTICAL TITLES ASSUMPTION ACT.

ROMAN CEMENT. See CEMENTS.

ROMAN RELIGION, ANCIENT, a conglomeration of the most widely-different theological or rather mythological elements, introduced by the various strata of immigrations that flowed into the different parts of Italy at different pre-historic times. It was chiefly under Greek influence that it assumed that most characteristic and systematic form, under which it was known during the classical times of Rome, and as which it generally represents itself to our minds. Numa Pompilius (q. v.), that mythic successor of Romulus, is by the primitive legend mentioned as the founder of the Roman religion, or rather ceremonial law. He is probably the type of the period when the religious notions of the Sabines were first joined to the primitive elements of legendary belief of the early settlers. Among the vast number of the different and obscure component elements, the Pelasgian, Sabellian, Oscan, Gallic, &c., out of which grew the recognized state religion, we can, with a comparative amount of clearness, distinguish chiefly three—the Etruscan, the Sabine, and the Latin. The religion of the Etruscans—as distinct from the Pelasgians (q. v.)—has been characterized in our article on that nation. Of the gods of the Latins, many are closely related to those of the Greeks (see GREEK RELIGION), a circumstance easily accounted for by their common eastern origin (see ROME, HISTORY OF); others, however, seem indigenous. Their principal deities are Tellus (q. v.) (the earth) Saturn (q. v.) (god of seeds), and his wife Ops (goddess of earth and plenty), who are somewhat akin to Kronos and Rhea; Jupiter (q. v.), with Juno (q. v.), givers of light. Deities more peculiar to the Latins are Janus (q. v.), and Diana (q. v.). Faunus and Fauna are prophesying wood-deities, and were allied to Lupercus, in whose honor the Lupercalia (q. v.) were celebrated; Picus and Pilumnus, who preside in some way over agriculture and the fruits of the field; Vesta (q. v.); Fortuna (q. v.); Ferentina, the goddess of leagues.

A certain number of agrarian deities (Anna Perenna, Venus, &c.) make up, with those mentioned, the bulk of 'native' Latin numina. Of chiefly Sabine deities, we name Feronia, the Ferentina of the Latins, a goddess of the soil, who was worshiped with gifts of flowers and fruits; and the two war-gods, Mars and Quirinus—the former a deity at first worshiped under the symbol of shield and spear, and of high importance for colonizations to whom every animal and every human being born in a certain year was sacred; the former being doomed to be sacrificed, and

the latter at the age of twenty to emigrate, and to found new settlements: Quirinus, a deity of strife, closely connected with the myth of Romulus. Sabine deities were also Sol, the sun, Luna, the moon, &c.

Having thus traced some of the principal gods and goddesses (of the greater part of whom fuller information will be found in special articles in the course of this work) to the respective nationality that first introduced them into Italy, we shall now take a brief glance at the Roman Pantheon as it appeared when it had embodied systematically these acclimatized primeval idealizations. For it was as characteristic of the Roman gods to appear in sets, as it was for the more personal gods of the Hellenes to appear singly. The Romans, as it were, made them fall rationally into rank and file, each with a distinct mission of its own, and thus filled with them, as with authorities over special departments, the whole visible and invisible world—above, below, and around. The first rank of all is taken by the three Capitoline deities, the personifications of highest power, highest womanliness, and highest wisdom—Jupiter (q. v.); Juno (q. v.), the Queen of Heaven, and the tutelary deity of women; and Minerva (q. v.). The stars also had three foremost representatives—Sol, the sun, Luna, the moon, and Tellus, the earth.

The supreme deities of the Infernal Regions were Orcus, Dis (Dives, Consus?), and his wife, the Queen of the Empire of the Shadows, Libitina. The element of the water was presided over by Neptune (q. v.); that of the fire by Vulcan (q. v.), the god of the smithies, and Vesta, the goddess of the domestic hearth and its pure flame. Agriculture and rearing cattle were sacred to the ancient Latin king Saturnus, whose wife, Ops—the riches therefrom accruing—had, like Demeter, her seat in the soil. Ceres, Liber, and Libera, the three Greek deities of agricultural pursuits, were superadded about 500 B.C. Pales, the special protector of the flocks, and his festival (the Palilia) were celebrated on the foundation-day of Rome. Mars himself was the supreme deity of the Romans next to Jupiter. Deities of Oracles are Faunus, a deified king, who gave his obscure decisions either in dreams or in strange voices, and his female relative—wife, daughter, or sister—Fauna (Bona Dea), who attends only to the female sex; and the Camenæ, prophesying nymphs, of whose number was Egeria, Numa Pompilius's inspirer. The Apollo worship was but of late growth in Rome. The Parcæ represented the unchangeable fate of the individual. Fortuna was, on the contrary, the uncertain chance of destiny, the 'luck' to be invoked at all important junctures. Salus, Pax, Concordia, Libertas, Felicitas, Pietas, Virtus, Honos, Spes, and a host of other abstract notions, explain themselves. Venus first became important when identified with Aphrodite; in the same way as Amor, Cupido, and Voluptas were Greek importations, brought into prominence by the poets chiefly. Life, death, and life after death are made concrete, by the Genii, the Lares, Manes, and Penates. See LARES.

Like the Greeks, the early Romans had no 'mediators,' but addressed their prayers and supplications directly to the individual god. The priesthood, we find, in the classical period, had arisen originally from the 'kindlers (*flamines*) of Mars,' or those who presented burnt-offerings to the early Italian war-god Mars, and the twelve dancers (*Salii*) who in March performed war-dances in his honor. To these came the 'Field Brethren,' the 'Wolf-repellers,' &c.; and thus by degrees an endless and most powerful hierarchy came to be built up. By the side of it, but not identical with it, were certain sacred colleges, who kept the sacred traditions alive, and who were the supreme authority on religious observances. These were the colleges of Pontifices (q. v.), or Bridge-builders, of Augurs (see AUGURIES and AUSPICES), the keepers of the Sibylline Books (see SIBYL); the twenty Fetiales or state heralds, the supreme—advising, not executing—authorities on international law; the Vestal virgins, on whom devolved the guardianship of the Palladium and of the sacred fire; the Salii (see above), and others. Priests, in the stricter sense of the word, in the service of special deities, were the Flamens (q. v.); while the Dea Dia, the goddess of fields (Tellus, Ceres, Ops, Flora), had the special brotherhood of the twelve Arvalian brothers, with their numerous followers. The state sacrifice, before the expulsion of the mythical kings supposed to have been offered up by these, was offered by a special *Rex Sacrorum* or *Rex Sacrificulus*.

The mode of worship was analogous to that of the Greeks. Votive offerings, prayers, vows, sacrifices, libations, purifications, banquets, lays, songs, dances, and games made up the sum of their divine service. The sacred places were either *fana*, *delubra* —mere hallowed spots on hills and in groves—or *templa*, *ædes*, special buildings dedicated to a special deity. The latter contained two altars—the *ara*, for libations and oblations; and the *altare*, for burnt-offerings chiefly. Frugality, as it pervaded, in the classical period, the domestic life, so it also prevented all extravagance of offerings to the deity, and all excess of rejoicing before it. Sober and dull, as the Roman religion undoubtedly was—for it never once expanded into the joyful extravagances of fancy with which the Greek religion was fraught throughout—it at the same time kept free from the abominations that are the natural offspring of that unbounded sway of fancy. Human sacrifices, as far as they are to be met with, grew out of the idea of substitution, and were chiefly enthusiastic voluntary acts of men who threw themselves into the breach; or they carried out decrees of civil tribunals, who had convicted the 'victim' of a deadly offence. In their dealings with the gods, the Romans were pure merchants, carrying out their promises with strict literalness, and thus often fraudulently, against the patent inner meaning of their promise; but the gods were not to them the all-pervading essences, but rather creditors, strict and powerful, yet unable to exact more than was agreed upon outwardly.

A code of moral and ethical rules, furthering and preserving civil order, and the pious relations within the state and family, were the palpable results of this religion, which, in its barrenness of metaphysical notions, did next to nothing for the furtherance of art.

And here we must enter somewhat more fully into that peculiar phenomenon of the utter dissimilarity in the characters of the Greek and Roman religion, at which we have hinted already—a dissimilarity all the more surprising, as the self-same symbolical and allegorical views of nature, filtered through however different channels, form the foundation of both. Both also—especially in their later stages—offer a general analogy not only of deities and spirits, but even of holy places and their mode of worship. But the fact is, that they each took the originally common stock of notions and conceptions, clad more or less in mythical garb, and utterly transformed it, superadding to it from time to time according to their own distinct nationality. It is here, however, that their characteristic traits come out in as forcible a contrast as they do in every other relation of life, in their art and culture, in their states and families. While to the Hellenes the individual was the chief end of all things, and the state existed for the citizen, and the ideal was the *Kalokagathia*, the beautiful, good, the Romans imposed, as the highest duty, submission to authority—the son to the father, the citizen to the ruler, and all to the gods. To them, only that which was useful appeared good. Idleness was not to be tolerated in a community where every single member only existed as far as it contributed to the greatness and aggrandizement of the commonwealth. Hence, with them, a rational thoughtfulness, and a grand and awful austerity in their relations to men and gods; while the Greeks treated both with joyful serenity. The Greek invested his gods with human attributes, and then surrounded them with a halo of highest splendor and most glorious divine beauty; but he constantly modelled and remodelled them, until they reached the acme of beautiful perfection, as would the painter and the sculptor with their work. The Roman, on the other hand, cared nothing for the outward form of his idealized notions—the notions themselves, mere fundamental ideas, were his sole object of veneration.

The Greeks made everything concrete, corporeal, and individual; the Romans abstract and general. The Greeks could only worship allegories; the Romans, abstractions. Hence, also, their utter discarding of many of the myths common to the whole Indo-Germanic stock, the unmarried and childless state of their gods, who, moreover, wanted no food, and did not wander about among men, as did the Indian and the Hellenic. As in the late Midrash, which has partly found its way into Christianity, there is a heavenly Jerusalem right over the earthly Jerusalem, in which all things below were reproduced in an exact but most ideal and divine manner. Thus, the Roman Pantheon was the precise counterpart of the Roman world as it existed in reality. Every man, and thing, and event, and act had a corresponding tutelary deity, that came and went with the special individual, phenomenon, or event, and eternal gods were those only that represented certain great unchanging laws of nature. The angels of the legendary lore of later Judaism and early Christianity, that protect special nations, were with the Romans the gods of these nations, and entered, as their special numina, the divine commonwealth of the Romans simultaneously with the admission of these nations into their own pale or freedom.

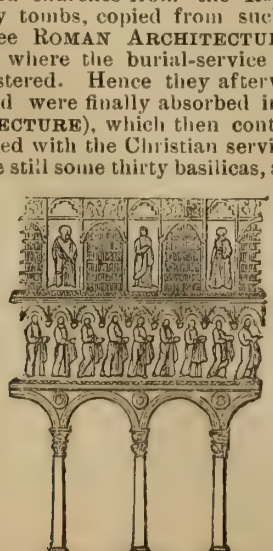
As long as the grand old Roman simplicity of manners, the frugality of domestic life, the indefatigable pursuit of agriculture, trade, and commerce, lasted—and all of these were well characterized by the deep reverence paid to gods (albeit not in the highest scale of divine order), who presided over the house, the field, the forest, mercantile enterprise, and the like, Vesta, the Penates, the Silvani, the Lares or Lases, Hercules or Herculus (a native Italian deity, the god of the enclosed homestead [compare Jupiter *herceus*] apparently distinct from the Greek Heracles) as the god of property and gain, whose altar, as god of faith (*Deus fidius*), was as frequently to be met with as those of the goddess of chance (Fors, Fortuna), and the god of traffic (Mercury)—so long did Roman religion, properly so called, retain its firm hold over the people's minds, and its influence cannot well be overrated. But when the antique austerity, the olden spirit of grand independence, the

unceasing hard work that steeled body and soul, had given way to the lazy luxurious ease of later times—then Roman religion ceased to exist in reality, and over its ruins rose a mad jumble of unbelief, Hellenism, sectarianism, and oriental creeds.

The ancient *religio*, the binding faith, which had excited the admiration and astonishment of the Greeks, had waned, and in proportion with the unbelief rose the pomp, and stateliness, and luxury of public worship. To the hierarchy of augurs, oracle-keepers, and pontifices were superadded special banquet-masters for the divine banquets. The priests more and more freed themselves from taxes and other public burdens, and the custom of perpetual endowments for religious objects crept in, as their influence waxed stronger and stronger. 'Pious services' became as much an item of domestic expenditure as the cook's and nurse's wages. Penny collections for the 'mother of God' were gathered on certain fixed days by the sound of fife and drum played by priests in oriental garb, headed by a eunuch, from house to house, and the whole substance of Roman faith was transformed into an unwieldy mass of dark, grovelling mysticism and shameless profligacy, presided over by wretched gangs of uneducated and unprincipled priests. How this state of things favored the gradual introduction of Judaism and Christianity into the dying days of imperial Rome, has been briefly sketched in GNOSTICS (q. v.). Constantine the Great abolished the last outward trace of Roman religion by proclaiming Christianity as the state religion.—For the greater part of the gods and goddesses mentioned, see special articles. See also GREEK RELIGION, ETRURIA, PELASGIANS, &c. For a fuller account of the whole subject, the reader is referred to Mommsen's *History of Rome* (Eng. transl. Lond. 1864).

ROMANE'SQUE ARCHITECTURE, the debased style which succeeded Roman architecture, from about the time of Constantine (350 A.D.) to that of Charlemagne (800 A.D.). It is impossible to fix the date of the style definitely, because Roman Architecture (q. v.) was itself a transitional style, and the one fades gradually into the other. When Constantine proclaimed Christianity the religion of the empire, he gave the Christians freedom of action. They could worship in public, and consequently desired buildings for their service; hence the impetus which gave architecture a new start. As explained under APSE and BASILICA, the Christians adopted the Roman hall of justice for their church or place of assembly, and erected many noble basilicas in Rome, Ravenna, and all over the empire. These consisted of three or five aisled halls—the aisles separated by rows of columns. In Rome, the columns, entablatures, and other ornaments were frequently taken from the ruins of ancient buildings which abounded there. The new style is therefore closely allied to the ancient one in the imperial city; but in Ravenna, Jerusalem, Provence, and the remoter districts, where few ancient remains exist, a simpler and ruder copy of the ancient work is found. There is always, however, a certain resemblance to the old forms which distinguishes the Romanesque from the round-arched Gothic which succeeded it. The piers along the aisles are always single columns, generally with caps intended to be Corinthian, and wide arches; the aisles are wide, with open wooden roof; and there are remnants of entablatures, mouldings, &c., which recall the ancient Roman work. The early Christians also derived their round churches from the Romans. They were probably originally tombs, copied from such buildings as the Minerva Medica (see ROMAN ARCHITECTURE), and were the most sacred places, where the burial-service was said, and the sacraments administered. Hence they afterwards became Baptisteries (q. v.), and were finally absorbed into the church (see RHENISH ARCHITECTURE), which then contained within itself everything connected with the Christian service.

In Rome there are still some thirty basilicas, and the Romanesque



Romanesque Interior.

style may be said never to have died out there. As we recede from the center, we find its influence gradually weaken, and succumb to the Northern Gothic style. Thus, in Lombardy and Provence, it was superseded by the Lombard (q. v.) and Romance styles in the 11th and 12th centuries; while in Byzantium and the East, it gave way to the Byzantian style about the time of Justinian. Amongst the finest examples remaining are St. Paul's (see BASILICA) and Sta. Maria Maggiore at Rome, and at Ravenna, St. Apollinare; the interior decoration of which last (see fig.) is very beautiful. The mosaics of the apse, the painted walls, and the inlaid pavements of the Romanesque churches, are amongst their finest features. In color, they always excel.

In Tuscany, there is a late form of Romanesque, of which the cathedrals at Pisa and Lucca, San Miniato at Florence, and many churches in those cities, are examples. They are intermediate specimens, built during the 11th c., when the cities became prosperous, and have a certain amount of Gothic feeling; but although beautiful in colored decoration, they have not the simple grandeur of the early basilicas; and although more decorated externally than these, they have not the bold and purpose-like appearance of Gothic elevations.

ROMA'NIC LANGUAGES, a general name for those modern languages that are the immediate descendants of the language of ancient Rome. In those parts of the empire in which the Roman dominion and civil institutions had been most completely established, the native languages were speedily and completely supplanted by that of the conquerors—the Latin. This was the case in Italy itself, in the Spanish peninsula, in Gaul or France, including parts of Switzerland, and in Dacia (see under MOLDAVIA). When the Roman Empire was broken up by the irruptions of the northern nations (in the 5th and 6th centuries), the intruding tribes stood to the Romanized inhabitants in the relation of a ruling caste to a subject population. The dominant Germans continued for several centuries to use their native tongue among themselves; but from the first they seem to have acknowledged the supremacy of the Latin for civil and ecclesiastical purposes, and at last the language of the rulers was merged in that of their subjects; not, however, without leaving decided traces of the struggle—traces chiefly visible in the intrusion of numerous German words, and in the mutilation of the grammatical forms or inflections of the ancient Latin, and the substitution therefor of prepositions and auxiliary verbs. It is also to be borne in mind that the language which underwent this change was not the classical Latin of literature, but a popular Roman language (*Lingua Romana rustica*) which had been used by the side of the classical, and differed from it—not to the extent of being radically and grammatically another tongue, as some writers unwarrantably conclude—but chiefly by slovenly pronunciation, the neglect or misuse of grammatical forms, and the use of 'low' and unusual words and idioms. As distinguished from the old *lingua Latina*, the language of the church, the school, and the law, this newly-formed language of ordinary intercouse, in its various dialects, was known as the *Lingua Romana;* and from this name, probably through the adverb Romanicé, came the term Romance (Prov. and O. Fr. *romans*, Sp. *romance*, It. *romanzo*), applied both to the language and to the popular poetry written in it, more especially to the dialect and productions of the troubadours in the south of France.

According to the theory of Raynouard (q. v.), the new language that sprang out of the corruption of the Latin was at first essentially the same over all the countries in which Latin had been spoken, and is preserved to us in a pure state in the Provençal, or language of the troubadours; and it was from this as a common ground, and not from the original Latin, that the several Neo-Latin tongues diverged into the different forms which they now present. This theory is not accepted by more recent inquirers; its groundlessness has been demonstrated by Sir G. Cornewall Lewis in his elaborate *Essay on the Origin and Formation of the Romance Languages* (2d ed. Lond. 1862). It is beyond doubt that the several daughters of the mother Latin had their characteristic differences from the very first, as, indeed, was inevitable. The original Latin spoken in the several provinces of the Roman empire must have had very different degrees of purity, and the corruptions in one region must have differed from those in another according to the nature of the superseded tongues. To these differences in the fundamental Latin must be added those of the superadded German element, consisting chiefly in the variety of dialects spoken by the invading nations and the different proportions of the conquering population to the conquered. French, e. g., as was to be expected, is richer in German words than any other member of the family, having 450 not found in the others. Italian is next to French in this respect. There are about 900 in the Romanic languages altogether, of which about 300 are common to them all. A great many of these words are terms relating to warfare.

The varieties of speech originating in the way now described (which first received the general name of Romanic* languages in

**Romanic* seems preferable to *Romance*, the term employed by many English writers, both as being more in analogy with *Italic*, *Arabic*, &c., and as avoiding the association with a particular kind of literature, and the special Neo-Latin tongue in which that literature was originally written—viz., the Provençal.

recent times from German scholars—*Romanische Sprachen*) are divided by Diez into six jurisdictions :

1. The Italian, preserving, as was to be expected, the traits of the mother Latin in more recognizable form than any of the sister tongues. It presents a variety of strongly marked dialects.

2. The Walachian (see under MOLDAVIA).

3. The Spanish, which is characterized by copiousness and etymological obscurity, arising from the establishment of so many different nations on the soil. For one element of difference, it contains a large number of Arabic words—as many as 500 terms have been enumerated. Of the various dialects, the Castilian is considered the standard.

4. The Portuguese, including both the language of Portugal and of Galicia; it is nearly akin to the Spanish, but differs too much in some points of grammar to be reckoned a mere dialect.

5. Provençal, the language of the south of France, extending on the one side into Spain over Catalonia, Valencia, and the Balearic Isles; and on the other over Savoy and part of Switzerland, about the Lake of Geneva. The line of division between the Provençal and the northern idiom which has now become the literary language of the whole of France, is usually drawn through Dauphiné, Lyonnais, Auvergne, Limousin, Perigord, and Saintonge. From the use of the affirmative *oc* (= yes), the Provençal was known as the Langue d'oc, as the northern French was called the Langue d'oil, from *oïl*, modern French *oui* (see LANGUEDOC).* The Provençal was at an early period a cultivated language, with a regular system of grammar, and in the 12th and 13th centuries, produced a rich poetical literature (see TROUBADOURS).

6. French, extending over the northern half of France, and parts of Belgium and Switzerland. Diez conceives that at first northern French may have been little different from Provençal, but, beginning with the 9th c., it has been more and more distinguished by the greater wearing away of the original grammatical forms. See FRENCH LANGUAGE AND LITERATURE.

The language of the canton of the Grisons (q. v.), anciently *Rhætia*, though sufficiently distinct from Italian and French, is not considered by Diez to have attained sufficient fixity or independence to deserve being ranked along with the others as a seventh Romanic tongue. It is called by the Germans Curwälsch, by the people themselves Rumonsh. There are two chief dialects, the Oberland, about the sources of the Rhine, and that spoken in the Engadine (q. v.), called the Ladin.

The chief authorities on this subject are the two great works of Diez (q. v.), the Grammar and the Dictionary of the Romanic Languages. The Dictionary and the Introduction to the Grammar have been translated into English.

ROMANOFF, THE HOUSE OF, of which the present imperial family of Russia is the chief representative, is said to have derived its origin from a Lithuanian prince of the 4th c.; but however this may be, it is certain that the family did not make its appearance in Russia till the 14th c., when Andrew Kobyla emigrated from Prussia to Moscow in 1341, and entered the service of the then grand-duke, Simeon the Fierce. Andrew's descendants became bojars early in the 15th c., their territories lying in the government of Vladimir, and district of Jurief-Polskoi. The bojar *Roman Jurievitch*, the fifth in direct descent from Andrew, died in 1543, leaving a son and daughter; the latter of whom became czarina by her marriage with Ivan the Terrible; while the former, *Nikita Romanovitch Jurief*, by his nuptials with the Princess of Susdal (a direct descendant from a brother of St. Alexander Nevskoi), was also allied to the royal race of Rurik.

Nikita was one of the regency during the minority of Feodor I.; and his eldest son Feodor, under the name of *Philarete*, was elevated to the rank of archimandrite and metropolitan of Rostof during the reign of the false Dmitri. The Romanoffs supported that party who tendered the Russian crown to the Polish prince, and Philarete had gone with that view to Poland, when a sudden outburst of national sentiment put a stop to these negotiations, and the unlucky envoy was in consequence thrown into prison by the enraged Poles. The national party now proceeded to the election of a native sovereign, who should be as closely allied as possible by blood to the race of Rurik; and after much hesitation and many rejections, they chose MIKAIL FEODOROVITCH ROMANOFF, the son of the imprisoned metropolitan, and the representative through his grandmother of the royal house of Rurik, 21st February 1613. This selection, which had been made by the higher nobility and the clergy, was rapturously applauded by the people; and though the new czar was not quite seventeen years of age, the general desire of all classes to conform to his ordinances rendered the cares of government comparatively light. He was succeeded by his eldest son, *Alexei Mikailovitch* (1648—1676), an able prince, who carried on war with varied success against the Swedes and Poles, and acquired a great reputation as a legislator. Alexei was twice married, and left by his first wife two sons, Feodor and Ivan, and many daughters, and by his second wife, one son, Peter. His eldest son, *Feodor* (1676—1682), was a prince of much talent and foresight, and labored with success to reduce the power of the aristocracy; but being of a very weak constitution, he died at the age of twenty-five without posterity, leaving the throne by his will to his half-brother, Peter, as his full brother, Ivan, was an imbecile. However, it was not till seven years after this that *Peter* (see PETER THE GREAT) succeeded in obtaining possession of the throne. It is worthy of remark, that hitherto all the czars in the House of R. had mounted the throne before attaining twenty years of age. Peter (see PETER THE GREAT) was twice married; by his first marriage, he had a son, Alexis (q. v.), who died during his father's lifetime, leaving one son, Peter, afterwards Peter II.; and by his second marriage with *Catharine I.* (q. v.) 1725—1727) he had two daughters, Anne and Elizabeth.

Catharine I. left the throne to her step-grandson, *Peter II.* (1727—1730), the last of the male line of R.; and on his death without heirs, the succession reverted to the female line. Ivan, Peter the Great's half-brother, had also left daughters, and their claims to the crown being preferable, one of them, *Anna Ivanovna* (1730—1740), was placed upon the throne, and was succeeded by her grand-nephew, *Ivan IV.* (1740—1741); but then a revolution drove Ivan's family from the throne, of which the cadet female line in the person of *Elizabeth* (1741—1761), the daughter of Peter the Great and Catharine, obtained possession. Failing heirs of Elizabeth, her nephew, Peter, the son of her elder sister, Anna Petrovna, who had married the Duke of Holstein-Gottorp (a cadet of the family of Oldenburg), and died in 1728, was the heir-presumptive; and accordingly, on her death in 1761, he mounted the throne as *Peter III.* (1761—1762), founded a new dynasty, that of ROMANOFF-OLDENBURG; but his brief tenure of power was put an end to by his assassination, at the instigation of his wife, the princess Sophia-Augusta of Anhalt-Zerbst, who, as Catharine II. (1762—1796), wielded the sceptre of this mighty empire for the long period of thirty-four years. She was succeeded by *Paul I.* (q. v.) (1796—1801), her only son by Peter III.; and Paul, after a brief reign, was also assassinated, leaving several sons, the eldest of whom was *Alexander I.* (1801—1825); but as he left no issue, the crown at his death devolved by right upon his next brother, Constantine. Constantine had, however, in compliance with the wish of his elder brother, previously relinquished his claims to the supreme power, and the third brother, *Nicholas I.* (1825—1855), in consequence ascended the throne. Nicholas left at his death four sons and several daughters, and his eldest son, *Alexander II.* (1855) was the late czar.

ROMANS, a town of France, in the dep. of Drome, stands on the right bank of the Isère, 14 miles north-east of Valence. A bridge, founded in the 9th c., connects R. with the small town of Peage on the left bank of the river. R. owes its origin to an important abbey, founded in the 9th c. by Saint Bernard, Archbishop of Vienne, and by a nobleman named Romain, who gave his name to the town. Silk and woollen fabrics are largely manufactured, and a very active general trade is carried on. Pop. (1872) 9893; (1876) 11,024.

ROMANS, EPISTLE TO THE, in a doctrinal point of view, the most profound and elaborate composition of St. Paul. That it proceeded from the pen of the great apostle of the Gentiles, has never been seriously doubted by any competent scholar. Much discussion has taken place regarding the *composition* of the church at Rome, and—connected therewith—the design or object of the epistle. Were the members of the church Jewish or Gentile Christians? The general opinion of commentators is, that the church was a mixed congregation, the majority of members being probably of pure Gentile descent, and the minority, Jewish Christians, who perhaps formed the original nucleus of the church. Dr. Jowett, in his *Epistles of St. Paul to the Romans, Galatians, and Thessalonians*, suggests that the phenomena of the text—for example, the frequent appeals to the authority of the 'law' addressed to Gentiles—may be best explained on the hypothesis that the apostle is speaking to a Gentile congregation which had passed through a phase of Jewish proselytism. The great value of the Epistle to the Romans consists in this, that it exhibits what may be called the *rationale* of Christianity.

The immediate object of the apostle was probably nothing more than to prevent an outbreak in the church at Rome of those violent antipathies of religious sentiment which had shown themselves elsewhere (for instance, at Corinth), and had produced such disastrous consequences; but with a view to the more complete accomplishment of this object, he takes a broad *ethical* view of human nature, and finds all men—Jews and Gentiles alike—to be estranged from God, and in need of pardon and reconciliation. He does not underrate the advantages which his Jewish countrymen possessed—nay, he extols them; but he points out at the same time that the 'oracles' or 'law' could not make the Jews holy :

* Instead of the etymologies of *oc* and *oil* given in the article referred to, Diez derives *oc* from Lat. *hoc*, this (equivalent to Eng. *so*, Ital. and Fr. *si*, which are only other forms of the Pronoun [q. v.] *su* or *ta*); in the north, *oc* was first shortened into *o*, and then compounded with *il* (Lat. *hoc illud*).

they could only condemn them for being unholy. The Gentiles were declared guilty not less decisively by their own consciences —the law was plainly enough 'written in their hearts.' Hence Paul's grand argument, that if men are to stand as 'righteous' in the sight of God, it cannot be by their 'works,' but in virtue of a divine justification graciously vouchsafed to them, and received into their hearts by an act of faith. This leads him to unfold the purpose and significance of Christ's work, to dilate on the 'freeness' of God's grace towards 'sinners.' He concludes by predicting the conversion of his 'kinsmen according to the flesh,' exhorting the Gentiles to humility, charity, mutual forbearance, and the practice of all the Christian virtues. The Epistle is believed to have been written from Corinth during Paul's third missionary journey, about 58 A.D. The commentaries upon it, or upon special chapters, are innumerable; and almost all the great doctrinal controversies that have agitated Christendom owe their origin to it.

ROMA'NTIC SCHOOL, the name first assumed in Germany, about the beginning of the present century, by a number of young poets and critics, A. W. and Fr. Schlegel, Novalis, Ludwig Tieck, Wackenroder, &c., who wished to indicate by the designation that they sought the essence of art and poetry in the wonderful and fantastic—elements that pre-eminently characterized the Romance literature of the middle ages. Their efforts were directed to the overthrow of the artificial rhetoric and unimaginative pedantry of the French school of poetry, even then influential, and to the restoration of a belief in the mystery and wonder that envelop the existence of man—a belief that had been rudely assailed and mocked by the prevailing materialism in all departments of thought. Thus, their purpose was twofold—it was in part æsthetic, and in part religious. As poetical reformers, the Romantic School in Germany unquestionably exercised a most beneficial influence; but as religionists—though their aim was intrinsically high and noble—they more or less consciously subserved the designs of a reactionary government, and so came to be hated and distrusted by the liberal politicians and thinkers of Germany.—See Eichendorff's *Ueber die ethische und religiöse Bedeutung der neuern Romantischen Poesie* (Leip. 1847); H. Heine's *Zur Geschichte der neuern schönen Literatur in Deutschland* (Hamb. 1833); Hettner's *Die Romantische Schule* (1850); R. Haym's *Die Romantische Schule* (1870); and the Danish work of Brandes (1873). —Between twenty and thirty years later, a similar school arose in France, and had a long struggle for supremacy with the older Classic School. It was victorious, but not wise, and, except in a few instances—such as Lamartine and Victor Hugo—it has rushed into excesses of caprice both literary and moral, which have stamped it with a revolutionary rather than a reformatory character.—See Huber's *Die Romantische Posie in Frankreich* (1832); Tennet's *Prosodie de l'Ecole Moderne* (1844); Gautier's *Histoire du Romantisme* (Par. 1874).

ROME. The design of this article is to furnish the reader with a brief outline of the ETHNOLOGY and HISTORY of ancient Italy, in so far as these are not already discussed or described under particular heads, to which reference will be made. As the Roman state gradually conquered and incorporated with itself the other states and territories of the Italian peninsula, and as these (in general) figure separately in history only during the process of this subjugation, it will be most convenient to consider them here.*

Ethnology.—In the earliest times we find in Italy *five* distinct races; three of which (IAPYGIANS, ETRUSCANS, and ITALIANS) may, in a restricted sense, be termed 'native,' inasmuch as we do not meet with them elsewhere; and two, GREEKS and GAULS, 'foreign;' inasmuch as their chief settlements were not in Italy, but in Greece and Gallia. But ethnologically, this distinction is arbitrary. There is no reason for believing that the first three races were indigenous, and the last two, immigrant; the analysis of their languages, or of such fragments of their languages as survive, leads strongly to the conclusion that all were alike immigrant, and that in this respect the only difference between them is one of *time*.—1. *The Iapygians.*—This race, monuments of which in a peculiar language (as yet undeciphered), have been found in the south-east corner of Italy—the Messapian or Calabrian peninsula—is in all probability the oldest.—2. *Etruscans.*—The origin of this mysterious people is certainly one of the most interesting, if also one of the most insoluble problems in history. It is not, however, necessary to say anything about them here, as their history, character, and civilization are handled at length in the article ETRURIA.—3. *Italians.*—At what period the earliest immigrations into Italy of the so-called 'Italian' races—the Latins and Umbro-Sabellians, took place, it is wholly impossible to tell; but it was undoubtedly long before the Etruscans had settled in Etruria. They were by far the most important of the various races that inhabited the peninsula; in fact, the entire historical significance of Italy depends upon them; and therefore it is fortunate that their ethnological origin and affinities are capable of the most certain demonstration. An investigation of their language, subdivided indeed into numerous dialects, often widely differing but fundamentally the same, has resulted in the discovery that they belong to the great Aryan or Indo-Germanic family (see ARYAN RACE and ARYAN LANGUAGES), and are in particular closely allied to the Hellenes. We are therefore warranted in affirming that at some very remote period a race migrated from the East, embracing the ancestors of both Greeks and Italians. By what route they proceeded, or at what point they diverged, we can only conjecture, for the problem is not yet solved whether the Hellenes reached Greece by way of Asia Minor or from the regions of the Danube; but, at any rate, Mommsen's statement that 'the Italians, like the Indians, immigrated into their peninsula from the north,' may be regarded as certain.

There is ground for believing that the Latins were the first members of the Italian family to enter Italy, and that, having crossed the Apennines, they spread themselves to the south along the western coast, driving the Iapygians before them, and finally cooping them up in the Calabrian peninsula—the heel of the boot. But this conquest belongs to prehistoric ages, and the original Latins of Campania, Lucania, Bruttium, perhaps even Sicily (i.e., the races spoken of in classic legend, as the Itali, from whom the peninsula received its name, the Margets, Ausones, Siculi, &c.), were themselves in the course of time so thoroughly Hellenized by the influence of the rich and powerful Greek colonies planted on their coast (see MAGNA GRÆCIA), or so overwhelmed by the successive invasions of Samnite hordes, that nearly every trace of a primitive Latin nationality had disappeared, and only here and there a solitary linguistic or legendary relic survives to indicate faintly the path which conjecture should pursue. It was only in Latium Proper, where no Greek colonies were founded, and where the fortune of war was in its favor, that the Latin branch of the Italian race firmly rooted itself. There, however, it did flourish, and petty as the district might seem—not more in all than 700 square miles—it was incomparably the most important in the peninsula, for within its limits rose those seven hills on which a city was to be built that was destined to subdue and govern the world. The other branch of the 'Italian' stock—the Umbro-Sabellian, must have entered Italy at a later period than the Latin. Its advance along the central mountain-ridge—the Apennines—from north to south can still be traced; and its last phases—i. e., the contest of Campania and the other southern districts of the peninsula by the Samnite highlanders—belong to purely historical times. The oldest members of this branch are probably the Sabines (q. v.), who seem to have fixed themselves in the mountainous region to the north-east of Rome, and are regarded as the progenitors of that multitude of tribes which we find occupying the central portion of Italy—the Picentes, Peligni, Marsi, Æqui, Vestini, Marrucini, Frentani, Samnites—perhaps also the Volsci and Hernici.

4. *Gauls.*—To a period considerably later and comparatively historical, belong the settlement of the Gauls in the north, and of the Greeks in the south of Italy. The former a branch of the Celtic race, itself now ascertained to be also a member of the great Aryan family (see CELTIC NATIONS), and therefore allied, however distantly, to the other Italian races, had, for ages before history begins, fixed themselves in the region now known as France. Finding further progress westward barred by the waves of the Atlantic, and being of a restless and excitable disposition, they turned their steps east and south-east, broke over the Alps (according to the legend in Livy, by the Little St. Bernard) some time during the 3d c. after the founding of Rome, and poured down into the plains of the Po. The first Gallic tribe that made its appearance on the soil of the peninsula is said to have been the Insubres, whose capital was Mediolanum (Milan); then followed the Cenomani, whose headquarters were Brixia (Brescia) and Verona, and afterwards numerous kindred hordes, among the latest and most powerful of whom were the Boii (q. v.) and Senones, who forced their way across the Po, and effected a lodgment in the modern Romagna, occupying (besides an inland district) the coast of the Adriatic as far south as Ancona. Hence, in ancient times, the whole of northern Italy was for a long period known as Gallia Cisalpina (Gaul on *this*, i. e., the Italian side of the Alps), to distinguish it from Gaul Proper, which was called Gallia Transalpina. Gallia Cisalpina was again subdivided into two parts by the river Padus (Po); the northern being named Gallia Transpadana, and the southern (the country of the Boii and the Senones), Gallia Cispadana. Various other tribes or peoples are found in the north of Italy, such as the Ligurians (along the Gulf of Genoa) and the Veneti (in modern Venetia), regarding whose origin—in the absence of all linguistic and other memorials—we are utterly in the dark. 5. *Greeks.*—The other people which we have distinguished as 'foreign,' was the Greek. There is, however, this distinction to be observed, that the Greeks were not (like the Gauls) barbarians; they did not swoop down upon the southern shores of Italy (like the Norse pirates on

* The map of Ancient Italy will elucidate the geographical references of the present article.

the coasts of England and France) to plunder and devastate; nor did they force their way into the interior and dispossess the native inhabitants; they merely colonized the coasts, built cities, and carried on commerce. Through them it is probable the Romans acquired their earliest notions of the Greek literature, philosophy, and cultus. For further information concerning them, we refer the reader to the article MAGNA GRÆCIA, and to such of their cities as have received separate treatment.

Primitive Social Condition of the Latins.—With this brief introductory sketch of the various races that inhabited Italy in historical or pre-historical times, we may now revert to the Latins, with whom we have at present more particularly to do. What was the extent of their civilization, or how far their social organization had proceeded when they finally settled in the 'broad plain' (*Latium*, connected probably with *latus*, broad; *latus*, a side; Gr. *platus;* Eng. *flat*) that stretches westward from the Alban Hills to the sea, may be conjectured, but cannot be positively ascertained. We know, indeed, that long before they had set foot in Italy, before even they had branched off from their Hellenic brethren, they had ceased to be *mere* nomades, or wandering shepherds. The evidence of this fact lies in their language. Not only do the names of the oldest Latin nations, as the *siculi*, ('the sickle-bearers' or 'reapers'), and the *osci*, or *opsci* ('field laborers'), clearly prove the antiquity of Italian husbandry; but the oldest agricultural terms are actually common to both Latins and Greeks (e. g., Lat. *ager*, Gr. *agros;* Lat. *aro*, *aratrum*, Gr. *aroo*, *arotron;* Lat. *ligo* (a hoe), Gr. *lachaino;* Lat. *hortus*, Gr. *chortos;* Lat. *milium*, Gr. *meline;* Lat. *rapa*, Gr. *raphanis;* Lat. *malva*, Gr. *malache;* Lat. *vinum*, Gr. *oînos*). Moreover, the form of the plough was the same among both peoples, as also their mode of cutting and preparing the grain; many of the usages of social life; the oldest methods of measuring the land; and the style of their national dress—the Latin *tunica*, corresponding exactly with the Greek *chiton*, while the Latin *toga* is only a fuller *himation*. Their method of building was also the same. Such evidence (and it could easily be extended) must be regarded as conclusively showing that before the Latino-Italians entered Italy, they had been accustomed to till the ground, to make wine, to keep gardens, to build houses, and to decently clothe themselves. As to their social organization, less can be said. It appears, however—judging from the general bearing of the most ancient traditions, as also from the features exhibited in historical times—that at a very early period, and form causes of which we are now absolutely ignorant, they had begun to develop the germs of what may be called 'state-life.'

As among their Hellenic brethren, the original foundation of their social constitution was 'households' (Gr. *oikiai*, Lat. *vici* or *pagi*, from *pangere*, to 'fix' or 'drive in;' hence 'to build'): these, either by ties of blood, or by nearness of locality, were aggregated into clans, and their dwellings formed clan-villages (thus *pagus*, which probably meant at first only a single 'household,' came, by a natural transition, to denote a collection of households —a hamlet or a village). Such clan-villages were, however, not regarded as independent societies, but as parts of a political canton or community—the *civitas* or *populus*. Each canton or *civitas* possessed a local center or place of assembly, where justice was administered at regular intervals, where markets and sports were held, and religious rites celebrated, and which was besides fortified to serve as an asylum or place of refuge for the inhabitants of the open hamlets and their cattle in time of war. Such a center was termed the *capitolium*, i. e., 'the height,' from being originally fixed on a height or hill-top, and corresponded to the *akra* of the the Greeks. Round this stronghold of the canton, which formed the nucleus or beginning of the earliest Latin towns, houses gradually sprung up, which in their turn were surrounded by the *oppidum* ('work' from *opus*), or the *urbs* ('ring-wall,' connected with *urvus*, *curvus*, *orbis*); hence, in later times, *oppidum* and *urbs* became, naturally enough, the recognized designations of town and city. Evidence is not wanting to justify this view of the genesis of the Latin towns. In the ruder and more mountainous districts of Central Italy, occupied by the Marsi, Æquicoli, &c., the system of living only in open villages prevailed down even to the close of the Empire, and there the Roman antiquarians found to their inexplicable surprise, those solitary strongholds with their mysterious ring-walls, which on the soil of Latium Proper, expanded into towns, but in the recesses of the Apennines never advanced beyond their original design.

The sites of the oldest of these cantonal-centers or primitive towns in Latium are to be sought for on the slopes of the Alban hills, where the springs are freshest, the air most wholesome, and the position most secure. Tradition (which makes Alba Longa the oldest seat of a Latin community) is here in accordance with natural probability.* On the same slopes lay Lanuvium, Aricia, and Tusculum, to the great antiquity of which ancient tradition bears testimony in many ways; on the offshoots of the Sabine range, in the east of Latium, stood Tibur and Praeneste; in the plain between the Sabine and Alban ranges, Gabii, Labici, and Nomentum; on or near the coast, Laurentum and Lavinium; and on the isolated hills overlooking the Tiber (the boundary between Latium and Etruria), the frontier town of Rome. How many cantons were originally in Latium, it is neither possible nor important to know. Tradition mentions 30 sovereign or politically independent communities (with Alba Longa at their head), which formed the famous Latin league. The historical order of their constitution is a point regarding which we are equally ignorant, but there is reason to believe that the Roman canton, or at least its capital, the town of R., was among the latest political organizations of the Latins. The history and fortunes of this canton we now proceed briefly to trace.

History of R. during the Earliest or Regal Period.—According to the myth of Romulus, R. was an offshoot from Alba-Longa, and to the biography of that hero we refer the reader for an outline of the ancient legend; but the most rational view of the city's origin is that which is suggested by a consideration of its site. It probably sprang into existence as a frontier-defence against the Etruscans, and as an emporium for the river-traffic of the country; but whether it was founded by a common resolve of the Latin confederacy, or by the enterprise of an individual chief, is beyond the reach even of conjecture. The date fixed upon for the commencement of the city, by the formation of the *Pomœrium*, viz., 21st April 753 B.C., is, of course, perfectly valueless in its precision. We know and can know nothing whatever on the point. The three 'tribes,' Ramnians, Tities, and Luceres, who appear in the Romuleian legend, as the constituent parts of the primitive commonwealth, suggest the idea that R. (like Athens) arose out of a *synoikismos* or amalgamation of three separate cantons; but Mommsen rejects as 'irrational' the common opinion that these cantons represent different races, and that the Romans were a 'mongrel people,' made up of Latins, Sabines, and Etruscans, with perhaps a dash of Hellenic and imaginary 'Pelasgic' blood in their veins! The existence of a Sabine element, represented by the Tities, is indeed admitted; but its introduction is thrown back to a period long anterior to the foundation of the city, when the Roman clans were still living in their open villages, and nothing of R. existed but its 'stronghold' on the Palatine. Nor is there anything to indicate that it materially affected the Latin character, language, polity, or religion of the commonwealth which was subsequently formed.

The motives which probably led to the building of R., also led to its rapid development, so that the great peculiarity of the Roman, as compared with the other Latin cantons, is the prominence which its urban life assumed in the earliest period. No doubt the Roman continued to manage his farm in the cantonal territory, but the insalubrity of the Campagna, as well as the advantages of river-traffic, and the necessity for watchfulness imposed upon all frontier towns in rude ages, must ever have acted as an inducement to him to take up his residence as much as possible in the city. The consequence was that the Roman became essentially a 'citizen,' while the other Latins remained essentially 'rustics.' So markedly is this the case, that the beginnings of Roman history—if the ancient legend may be so designated—are mainly records of its urban expansion and political growth. That the Palatine Hill was the oldest portion of the city is attested by a variety of circumstances. Not only does it hold that rank in the Romuleian legend, but on it were situated the oldest civil and religious institutions. The Romuleian myth of the establisment of an asylum on the Capitoline (see CAPITOL) for homicides and runaway slaves, with all its famous consequences—the *Rape of the Sabine Women*, the wars with the Latins of Cænina, Antemnæ, and Crustumerium, but especially with the Sabines of Cures under their king Titus Tatius, the tragic fate of Tarpeia, and the fine feminine valor of the ravished maidens, who had learned to love their captors, is historically worthless; except, perhaps, so far as it shows us how from the beginning the Roman burghers were engaged in constant feuds with their neighbors for the aggrandizement of their power. The entire history of the 'regal period,' in fact, has come down to us in so mythical and legendary a form, that we cannot feel absolutely certain of the reality of a single incident. That such personages as Numa Pompilius, Tullus Hostilius, Ancus Martius, Lucius Tarquinius Priscus, Servius Tullius, and Lucius Tarquinius Superbus, ever existed, or, if they did, that the circumstances of their lives, their institutions, their conquests, their reforms, were as the ancient narrative describes them, are things which no critical scholar can believe.

The destruction of the city records by the Gauls, when they captured and burned R. in the 4th c. B.C., deprived the subsequent chroniclers of authentic information in regard to the past, and forced them to rely upon treacherous reminiscences, on oral tradition, on ballads, and on all the multifarious fabrications of a patriotic fancy, that would naturally seek compensation for political disaster in the splendor with which it would invest its

* It is perhaps hardly necessary to remark that the story of the foundation of *Alba Longa* by Ascanius, the son of Æneas, and the introduction of a Tyrrheno-Trojan element into the primitive history of Latium, is an utterly worthless fable.

primeval history. The utmost reach, therefore, to which our knowledge can attain, is to form some general idea—mainly by inference from the institutions that we find existing in later times—of the course that social and political progress followed in the Roman commonwealth.

From the very beginning of the city—and probably long before—the inhabitants were divided into two orders (exclusive of 'slaves')—viz., householders and their dependants, better known perhaps as 'patricians' (from *pater*, a father) and 'clients' (i. e., 'listeners' from *cluere*, 'to listen'). The former alone possessed political—i. e., burgess-rights. It was they who exclusively constituted the *populus* ('the people'); while the clients had no political existence whatever. How this latter class originated we do not know, but 'superiors' and 'inferiors' exist everywhere, and there is really nothing wonderful in the phenomena, except the rigor of their political subjection. In a thriving community like the Roman, which seems to have always held a somewhat isolated and antagonistic position to the other Latin cantons, newcomers, such as refugees and the like, would be frequent; and these alien settlers, it is clear, never obtained (except under very special circumstances) the privileges of the original Roman families. That the clients formed a body essentially different from the *plebs*, is not true, and seems based merely on the mythical account of what followed the destruction of Alba Longa by Tullus Hostilius.

The name plebs (i. e., 'the multitude,' from the same root as *pleo*, I fill, *plenus*, full; with which is perhaps connected the other Latin word *vulgus*, Eng. *folk*), is doubtless, as its signification indicates, of later origin than *clientes;* but both are applicable to the same persons, who were called 'listeners,' in reference to their being dependents on the different burgess-households, and the 'multitude,' in reference to their want of political rights. The constitution of the state was simple. All the burgesses were politically on a footing of equality. From their own ranks was chosen the king or 'leader' (*rex*), who was therefore nothing more than an ordinary burgess—a husbandman, a trader, a warrior, set over his fellows. But it must at the same time be observed, that his authority was great, for the Roman state was based on the Roman household, and something of the absoluteness of the *patria potestas* appears in the uncircumscribed nature of the regal powers. The *rex* held his office for life; he consulted the national gods; he appointed the priests and priestesses; he called out the *populus* for war, and led the army in person; his command (*imperium*) was not to be gainsayed, on which account on all official occasions he was preceded by 'messengers' or summoners' (*lictores*, from *licere* 'to summon,' though commonly given from *ligo*, 'to bind'), bearing the 'fasces' (axes and rods tied up together), the symbols of power and punishment; he had the keys of the public chest, and he was the supreme judge in all civil and criminal suits. The Roman religion or *cultus* was from the first thoroughly subordinate to the authority of the state; and all that we can infer from the myth of Numa is that R. perhaps owed its colleges of augurs and pontiff to the wisdom of some enlightened sovereign who felt himself at times embarrassed in his decisions on matters of religious and public law, and recognized how valuable might be the aid afforded him by a body of sacred experts. We may rest certain that originally the sole power was the regal, and that the subordinate magistracies found at a later time arose from a delegation of regal authority, rendered necessary by the ceaseless increase of state-business.

'All the officials of the earliest period,' says Mommsen (who has expounded this view with admirable sagacity in his chapter on the "Original Constitution of Rome"), 'the ordinary city-warden (*præfectus urbi*, who doubtless governed in the absence of the *rex*), as well as those who were probably nominated regularly the "trackers of foul murder" (*quæstores parricidii*), and the "leaders of division" (*tribuni*, from *tribus*, part) of the infantry (*milites*), and of the cavalry (*celeres*), were mere royal commissioners and not magistrates in the subsequent sense of the term.' On the other hand, we may believe that the *senatus*, or Council of the Elders, from its very nature, was as old an institution as the monarchy itself. Among the very first things the 'citizen-king' would do, would be to choose out of the ranks of his fellow-burgesses a number of experienced men to assist him with their counsel; but it is to be observed that this body possessed no coercive or constraining powers. They gave their advice when the *rex* chose to ask it; that was all. Yet as the tenure of their office was for life, they necessarily possessed great *moral* authority; and it was only when the king, the senate, and the community were at one in regard to any important matter—a war, for example—that it was held to be righteous and likely to be favored by the gods. The burgesses, or householders, were divided into *curiæ*—i. e., 'wardships,' connected probably with *cura* and *curare*, 'to care for,' rather than with *quiris*, and the Sabine *cures*, as Varro thinks. Ten households formed a *gens* (a 'clan' or 'family'); 10 clans, or 100 households, formed a *curia*, or wardship; and 10 wardships, or 100 clans, or 1000 households, formed the *populus civitas*, or community. But as Rome was a *synoikismos* of three cantons, the actual number of wards was 30, of clans 300, and of households 3000. Every household had to furnish one foot-soldier (hence the name *mil-es*, the 'thousandth walker,' from *mil*, and *eo* (?) 'to go'), and every clan a horseman and a senator. Each ward was under the 'care' of a special warden (the *curio*), had a priest of its own (the *flamen curialis*), and celebrated its own festivals. None but burgesses could bear arms in defence of the state (hence their designation, *populus*, 'the warrior body,' connected with *populari*, 'to lay waste,' and *popa*, 'the priest, or priest's assistant, who felled the victim at the altar—the sacred butcher').

In the old litanies the blessing of Mars is invoked upon the *pilumnus populus* ('the spear-armed warrior-body'), and when the *rex* addressed them, it was by the name of *quirites* ('lancemen,' from *quiris*, or *curis*, a 'lance,' and *eo*, 'to go'). The original Roman army, or *legio* (i. e., 'the gathering'), was composed of three 'hundreds' (*centuriæ*) of horsemen (*celeres*—i. e., 'the swift,' or *flexuntes*, 'the wheelers'), under their divisional leaders (*tribuni celerum*); and three 'thousands' of footmen (*milites*), also under divisional leaders (*tribuni miletum*); to whom were added a number of light-armed skirmishers (*velites*), especially 'archers' (*arquites*). The *rex*, as we have said, was usually the general, but as the cavalry force had a colonel of its own (*magister equitum*), it is probable that he placed himself at the head of the infantry. Military service was no doubt the prime duty of the Roman burgesses, but the king could impose upon them any labors that he reckoned necessary or advantageous to the welfare of the state, such as the erection of public edifices, the tilling of the royal demesnes, the execution of royal commissions, or the building of the city walls.

The 'foreign policy' of R. seems to have been aggressive from the first, and this character it retained as long as the aggrandizement of the state was possible. We have, it is ture, no certain knowledge of the primitive struggles in which the enterprising and ambitious Roman burghers were engaged, but it appears from the legend that at a very early period the neighboring Latin communities of Antemnæ, Crustumerium, Ficulnea, Medulla, Cænina, Corniculum, Cameria, Collatia, were subjugated. The crisis of the Latin War, however, was undoubtedly the contest with Alba Longa, in which that 'sacred metropolis' of Latium was destroyed, and its leadership passed to the conqueror. How deadly the struggle between the two was, may be inferred from the tragic details in which the legend abounds. As a rule, on the subjugation of a canton, the conquered inhabitants were allowed to remain in their open hamlets, but their *capitolium* was razed, their weekly market, their justice-court, their gods—everything, in short, strictly national—were removed to R., while they themselves were enrolled among the clients or plebs. But sometimes the inhabitants themselves, in whole or part, were transferred to R., and individuals or clans were even received into the ranks of the Roman burgesses, as in the case of Alba Longa.

Some of the famous Roman *gentes* claimed to be of Alban descent—the Julii, Servilii, Cloelii, Geganii, Curiatii, and Metilii. The wars with the Etruscans of Fidenæ and Veii—assigned, like the destruction of Alba Longa, to the reign of Tullus Hostilius—were apparently indecisive; those with the Rutuli and Volsci, however, were probably more fortunate; but uncertainty hangs like a thick mist over the ancient narrative. Even the story of the Tarquins, though it belongs to the later period of the monarchy, is in many of its details far from credible. Both Niebuhr and Mommsen consider 'Tarquin the Proud' a historical personage, and without accepting literally all the circumstances of the tradition, believe the general outline—his character, his exactions, his expulsion, and his desperate efforts for the recovery of the throne—to be trustworthy. The memory of such a monarch was likely to be preserved by the very strength of the hatred he excited, and an act so daring as his expulsion (which was at the same time the death-knell of a system of government that had prevailed for ages) could hardly be a mere invention, though it might be overlapped with fold upon fold of picturesque fiction. The view taken by Napoleon III. (see *Histoire de Jules César*, vol. i.), that the primitive monarchy had served its purpose, and had consequently to disappear, is perhaps not so erroneous as the oracular language of the imperial author would lead us to suppose. The aristocracy or *populus* had become so much more powerful than the individual *rex*, that they wished to possess *de jure* as well as *de facto* the supreme authority. The pride and tyranny of a Tarquin may very well have aided in furthering their designs.

Meanwhile a great internal change had taken place in Rome. This is usually designated the Servian 'Reform of the Constitution,' although the expression is calculated to mislead. There was nothing directly political in the 'reform.' It was only a reform in the burgess-levy—i. e., in the mode of raising the army. Formerly, as we have seen, none but burgesses could bear arms in defence of the state; but the increase of the general popula-

tion, caused partly by the annexation of the conquered Latin communities, and partly by time, had totally altered the relation in which the non-burgesses, or *plebs*, originally stood to their political superiors. The *plebs* could, of course, acquire property and wealth, and could bequeath it just as legally as the *populus;* moreover, such of the Latin settlers as were wealthy and distinguished in their own communities, did not cease to be so when they were amalgamated with the Roman 'multitude.' It was therefore felt to be no longer judicious to let the military burdens fall exclusively upon the old burgesses, while the rights of property were equally shared by the non-burgesses. Hence the new arrangement, known in Roman history as the formation of the *Comitia Centuriata.* When or with whom the change originated, it is impossible to say. The legend assigns it to Servius Tullius, predecessor of Tarquin the Proud; and it was in all probability the work of some kingly ruler who saw the necessity of reorganizing the national forces. That it cannot be regarded as a change brought about by party-zeal, is obvious when we reflect that it conferred no rights, but only imposed duties on the plebeians. Its details were briefly as follows: Every Roman freeholder from the age of 17 to 60, whether patrician or plebeian, was made liable to serve in the army; but he took his place according to the amount of his property.

The freeholders were distributed into five *classes* (i. e., 'summonings,' from *calare*, to 'summon' or 'call out'), and these *classes*, all of whom were infantry, were again subdivided into *centuriæ* ('hundreds'). The *first* class, which required to possess property valued at 100,000 ases, or an entire hide of land, furnished 82 'hundreds;' the second, property valued at 75,000 ases, or ¾ths of a hide of land, furnished 20 'hundreds;' the third, property valued at 50,000 ases, or ½ hide of land, furnished 20 'hundreds;' the fourth, property valued at 25,000 ases, or ¼th hide of land, furnished 20 'hundreds;' and the fifth, property valued at 12,500 ases, or ⅛th hide of land, furnished 32 'hundreds.' A single 'hundred' was, moreover, added from the ranks of the non-freeholders, or *proletarii* (mere 'children-begetters'), although it is possible that from the same order came the two 'hundreds' of 'horn-blowers' (*cornicines*), and 'trumpeters' (*tibicines*), attached to the fifth class. Thus the infantry 'hundreds' amounted 175, that is, 17,500 men, besides whom were 18 'hundreds' of *equites* ('horsemen') chosen from the wealthiest burgesses and non-burgesses; so that the Roman army now numbered in all nearly 20,000 men. We have stated that the original design of this new arrangement was merely military, but it is easy to see that it would soon produce political results. Duties and rights are correlative. The former suggest the latter, and create a desire for their attainment. Hence the Servian military reform paved the way for the grand political struggle between the patricians and the plebeians, which commenced with the first year of the Republic, and only terminated with its dissolution.

The Roman Republic from its Institution to the Abolition of the Decemvirate.—1. *Internal History.*—According to the legend, the expulsion of the Tarquins was mainly the work of their cousins, Junius Brutus and Tarquinius Collatinus, in revenge for the outrage on the honor of Lucretia, and was followed by the abolition of the monarchy. The date usually assigned to this event is 509 B.C. The story is intensely tragical, and if we must consider it poetry rather than fact, yet it may safely be taken as evidence that it was an unbridled lust of power and self-gratification that brought ruin on the Romano-Tuscan dynasty. Of course, we can make nothing definite out of the early years of the republic. Dates and names, and even events, must go for very little. Valerius Publicola or Poplicola, Sp. Lucretius, M. Horatius, Lars Porsenna (q. v.) of Clusium, Aulus Postumius, with the glorious stories of Horatius Cocles and the battle of Lake Regillus, will not bear to be scrutinized. We must content ourselves with the knowledge of historical tendencies and general results. The change from 'kings' to 'consuls' (*consules*, 'those who leap together'—more generally, those who *act* together) was not intended to diminish the administrative power of the supreme rulers, but only to deprive them of the opportunity of doing harm—of becoming Tarquins; and this it effectually succeeded in doing, by limiting their tenure of office to a year, and by numerous other restrictions. (For an account of their original functions, and of the subsequent modifications which these underwent, see CONSUL.) It is believed to have been about this time, and in consequence of the new political changes, that the old assessors of the king, such as the *quæstores parricidii*, formally became standing magistrates instead of mere honorary counsellors, and also that the priesthood became a more self-governing and exclusive body. During the regal period the priests were appointed by the king, but now the colleges of augurs and pontiffs began to fill up the vacancies in their ranks themselves, while the vestals and separate 'flamens' were nominated by the pontifical college, which chose a president (*pontifex maximus*) for the purpose.

The lapse of years ever increasing the quantity of sacred lore, also increased its importance, and the importance of those who specially studied it; and nothing comes out more clearly in the early history of the republic than the fact, that the opinions of the augurs and pontiffs became more and more legally binding. This is to be connected with the fact, that in every possible way the patricians or old burgesses—now rapidly becoming a mere *noblesse*—were seeking to rise on the ruins of the monarchy, and to preserve separate institutions for the benefit of their own order, when they could with difficulty longer exclude the *plebs* from participation in common civic privileges. In the details given us of the 'Servian Reform,' we can easily discern a spirit of compromise, the concessions made to the plebeians in the constitution and powers of the *Comitia Centuriata* being partially counterbalanced by the new powers conferred on the old burgess body, the *Comitia Curiata*—viz., the right of confirming or rejecting the measures passed in the Lower Assembly. Towards the new assembly, therefore, it stood somewhat in the relation in which the House of Lords stands to the House of Commons, but the analogy must not be pushed too far; it is only general. The character of the senate altered under the action of the same influences. Although it never had been formally a patrician body—although admission to it under the kings was obtainable simply by the exercise of the royal prerogative, yet, practically, 299 out of the 300 senators had always been patricians; but after the institution of the republic, we are told that the blanks in the senate were filled up *en masse* from the ranks of the plebeians, so that of the 300 members less than half were *patres* ('full burgesses'), while 164 were *conscripti* ('added to the roll'), hence the official designation of the senators *patres et conscripti* ('full burgesses and enrolled').

As yet, however, it is to be observed the plebeians were rigorously excluded from the magistracies. They could vote—i. e, they could exercise legislative powers—but they had no share in the administration. None but patricians were eligible for the consulship, for the office of quæstor, or for any other executive function, while the priestly colleges rigidly closed their doors against the new burgesses. The struggle, therefore, between the two orders went on with ever-increasing violence. One point comes out very clearly from the narrative, however dubious we may be of the particular details, viz., that the establishment of the republic and the reconstitution of the burgess body, instead of allaying discontent, only fostered it. Power virtually passed into the hands of the capitalists, and though some of these were plebeians, yet they would seem to have preferred their persoual money-interests to the interests of their order, and to have co-operated with the patricians. The abuse by these capitalists of the *Ager Publicus*—that is, such portion of the land of a conquered people as had been taken from them, annexed to the Roman state, and let out originally to the patricians at a fixed rent (see AGRARIAN LAW), together with the frightful severity of the law of debtor and creditor, the effect of which was all but to ruin the small plebeian 'farmers,' who constituted, perhaps, the most numerous section of the burgesses—finally led to a great revolt of the plebs, known as the 'Secession to the Sacred Hill,' the date assigned to which is 494 B.C. On that occasion the plebeian farmer-soldiers, who had just returned from a campaign against the Volscians, marched in military order out of Rome, under their plebeian officers, to a mount near the confluence of the Anio with the Tiber, and threatened to found there a new city, if the patricians did not grant them magistrates from their own order; the result was, the institution of the famous plebeian tribunate (see TRIBUNE)—a sort of rival power to the patrician *consulate*, by means of which the plebeians, at least, hoped to be shielded from the high-handed oppressions of the wealthy. To the same period belongs the institution of the ÆDILES (q. v.). A little later, the *Comitia Tributa* emerged into political prominence. This was really the same body of burgesses as formed the *Comitia Centuriata*, but with the important difference, that the number of votes was not in proportion to a property classification.

The poor plebeian was on a footing of equality with the rich patrician; each gave his vote, and nothing more. Hence the *Comitia Tributa* virtually became a plebeian assembly, and when the *plebiscita* ('Resolutions of the plebs' carried at these *comitia*) acquired (as they did by the Valerian Laws passed after the abolition of the Decemvirate) a legally binding character, the victory of the 'multitude' in the sphere of legislation was complete. From this time the term *populus* practically, though not formally, loses its exclusive significance; and when we speak of the Roman citizens, we mean indifferently patricians and plebeians. The semi-historical traditions of this period—for we are now (5th c. B.C.) beginning to emerge out of the mythical era—unmistakably show that the institution of the tribunate led to something very like a civil war between the two orders. Such is the real significance of the legends of Caius Marcus, surnamed *Coriolanus* (q. v.); the surprise of the Capitol by the Sabine marauder, Appius Herdonius, at the head of a motley force of political outlaws, refugees, and slaves; the migrations of numerous Roman burgesses

with their families to more peaceful communities; the street-fights; the assassinations of plebeian magistrates; the annihilation by the Etruscans of the Fabian *gens*, who had left R. to escape the vengeance of their order for having passed over to the side of the plebeians; and the atrocious judicial murder of Spurius Cassius, an eminent patrician, who had also incurred the deadly hatred of his order, by proposing an agrarian law that would have checked the pernicious prosperity of the capitalists and overgrown landholders. Finally, 462 B.C., a measure was brought forward by the tribune C. Terentillius Ursa, to appoint a commission of ten men to draw up a code of laws for the purpose of protecting the plebeians against the arbitrary decisions of the patrician magistrates.

A fierce, even a frantic opposition was offered by the patricians, and the ten years that followed were literally a period of organized anarchy in Rome. At length the nobles gave way, and the result was the drawing up of the famous code known as the *Twelve Tables*—at first *Ten*, to which two were afterwards added—the appointment of the DECEMVIRI (q. v.), and the abolition of all the ordinary magistrates, both patrician and plebeian. The government by decemvirs, however, lasted only two years; according to tradition, the occasion of its overthrow was the attempt of the principal decemvir, Appius Claudius (q. v.) to possess himself by violence of the beautiful daughter of Virginius, a Roman centurion; but the real cause was doubtless political, though the cruel lust of a Claudius may have afforded the occasion; the result of which was the restoration of the predecemviral state of things—the patrician consulate and the plebeian tribunate.

2. *External History.*—The external history of R., from the establishment of the republic to the abolition of the decemvirate, is, it need hardly be said, purely military. The Romans fought incessantly with their neighbors. Long before the close of the regal period they had acquired, as we have seen, the leadership of Latium, and in all the early wars of the republic they were assisted by their allies and kinsmen; sometimes also by other nations—as, for example, the Hernicans, between whom and the Romans and Latins a league was formed by Spurius Cassius in the beginning of the 5th c. B.C. The most important of these wars were those with the southern Etruscans, especially the Veientines, in which, however, the Romans made no way, and even suffered terrible disasters, of which the legend concerning the destruction of the Fabian *gens* on the Cremera (477 B.C.) may be taken as a distorted representation; the contemporaneous wars with the Volscians, in which Coriolanus is the most distinguished figure; and those with the Æqui (458 B.C.), to which belongs the fine legend of Cincinnatus (q. v.).

From the Abolition of the Decemvirate to the Defeat of the Samnites, and the Subjugation of all the 'Italians' (449—265).—1. *Internal History.*—The leading political features of this period are the equalization of the two orders, and the growth of the new aristocracy of capitalists. After the abolition of the decemvirate, it would seem—judging from the course of events—that the whole of the plebeian aristocracy, senators and capitalists (from motives of selfish aggrandizement), combined with the 'masses' of their order to make a series of grand attacks on the privileges of the old Roman *noblesse*. The struggle lasted for 100 years; and ended, as it could only end, by the removal of all the social and political disabilities under which the plebeians had labored—though the stratagems and artifices to which the old aristocracy had recourse, proved the reluctance with which they succumbed to fate. First in 445 B.C., only four years after the fall of all the decemvirs was carried, the *Lex Canuleia*, by which it was enacted that marriage between a patrician and plebeian should be legally valid. At the same time, a compromise was effected with respect to the consularship. Instead of two patrician consuls, it was agreed that the supreme power should be intrusted to new officers termed 'Military Tribunes with Consular Power,' who might be chosen equally from the patricians or plebeians. Ten years later (435 B.C.), the patricians tried to render the new office of less consequence by the transference of several of the functions hitherto exercised by consuls to two special patrician officers named *Censors* (q. v.). The 'censorship,' Mommsen remarks, 'gradually became the palladium of the aristocratic party, less on account of its financial influence, than for the sake of the right annexed to it of filling up vacancies in the senate and in the equites.' In 421 B.C., the quæstorship (see QUÆSTOR) was thrown open to the plebeians; in 368 B.C., the mastership of the horse; in 356 B.C., the dictatorship (see DICTATOR); in 351 B.C., the censorship; in 337 B.C., the prætorship (see PRÆTOR); and in 300 B.C., the pontifical and augurial colleges. These victories were not all won without the shedding of blood. How great was the exasperation of the patricians may be estimated from the story of Spurius Maelius, the rich plebeian, who was murdered simply because in a season of famine he sold corn at a very low price to the poor.

The only effect, it is to be observed, of these political changes was to increase the power of the rich plebeians; and consequently, the social distress continued to show itself as before. No genuine national concord was possible so long as *that* remained unmitigated. Efforts were repeatedly made by individuals to remedy the evil, but without success. Such were the attempts of the tribunes Spurius Maecilius and Spurius Metilius (417 B.C.) to revive the agrarian law of Spurius Cassius; and of the noble and patriotic patrician, Marcus Manlius, who, though he had saved the Capitol during the terrible Gallic siege, was hurled from the Tarpeian Rock (384 B.C.), on the customary charge, as groundless in his case as it was base, of aspiring to the monarchy; but at length (367 B.C.), after a furious struggle of eleven years, the famous Licinian Rogations (see AGRARIAN LAW) were carried, by means of which it was hoped that an end had been put to the disastrous dissensions of the orders. Thus, at least, we interpret the act of the dictator Camillus, who raised a temple to the goddess *Concord*, at the foot of the Capitol.

That these laws operated beneficially on the class in whose interest they were passed, viz., the plebeian-farmers or middle-class of the Roman state, is unquestionable; but events proved that they were inadequate to remedy the evil, and after a time they ceased to be strictly enforced. On the other hand, there can be as little doubt that, owing partly to these changes, and still more to the splendid and far-reaching conquests achieved in Italy during this period of internal strife by the Roman arms, the position of the plebeian farmer was decidedly raised. Not only were the 'general coffers filled' by the revenue drawn directly or indirectly from the subjugated lands, so that a *tributum* (a forced loan) seldom required to be enforced at home, but the numerous colonies which R. now began to send forth to secure her new acquisitions, consisted entirely of the poorer plebeians, who always received a portion of the land in the district where they were settled.

The long struggle between the two orders was thus virtually at an end; but the date usually assigned to the termination of the strife is 286 B.C., when the *Lex Hortensia* was passed which confirmed the Publilian Laws of 339 B.C., and definitely gave to the *Plebiscita* passed at the Comitia of the Tribes, the full power of laws binding on the whole nation. Gradually, however, by steps which we have not room to trace, the importance of the popular assemblies declined, and that of the senate rose. This was owing mainly to the ever-increasing magnitude of the Roman state, and to the consequent necessity of a powerful governing body. The senate, it will be remembered, originally possessed no administrative power at all, but now it commenced a series of vast usurpations of which the best defence is that they excited no opposition among the community. Every matter of general importance—war, peace, alliances, the founding of colonies, the assignation of lands, building, the whole system of finance—came under its supervision and authority. Nor, on the whole, did it prove itself the unworthy arbiter of a nation's destinies. It was not a self-elected oligarchy, but was rather composed of the ablest representatives of both orders.

2. *External History.*—We have said that the military successes of R. during this period of internal strife were great; but we can only briefly allude to them. The irruption of the Gauls into sub-Apennine Italy (391 B.C.), though accompanied by frightful devastations, was barren of results, and did not materially affect the progress of Roman conquest. No doubt the battle on the Allia, and the capture and burning of R. (390 B.C.), were great disasters, but the injury was temporary. The vigilance of Manlius saved the Capitol, and the heroism of Camillus revived the courage and spirit of the citizens. Again and again in the course of the 4th c. B.C., the Gallic hordes repeated their incursions into Central Italy, but never again returned victorious. In 367 B.C., Camillus defeated them at Alba; in 360 B.C., they were routed at the Colline Gate; in 358 B.C., by the dictator, G. Sulpicius Peticus; and in 350 B.C., by Lucius Furius Camillus. Meanwhile, aided by their allies, the Latins and the Hernicans, the Romans carried on the long and desperate struggle with the Æquians, Volscians, and Etruscans. Finally, but not till after they had sustained repeated defeats, the Romans triumphed.

The causes that led to the decline of the Etruscan power, which at the close of the regal period in R., and during the infancy of the republic, had been enormous, both by sea and land, cannot be considered at length here. Suffice it to say, that the terrible irruption of the Gallic barbarians into Etruria, and the victories of the Samnites in Campania, where also the Etruscans had established themselves, as well as the miserable jealousies of the different cities, combined to paralyze the power of this people, and paved the way for the final triumph of Rome. But even before the Gauls had crossed the Apennines, the fate of Etruria was virtually sealed. The fall of Veii (q. v.), 396 B.C., was really the death-knell of Etruscan independence. Although the story has undoubtedly descended to us in a mythical dress, the siege of Veii is by no means to be placed in the same category with the siege of Troy, albeit, like it, it is said to have lasted ten years. Falerii, Capena, and Volsinii—all sovereign cities of Etruria—hastened soon after to make peace, and by the middle of the 4th

c., B.C., the whole of Southern Etruria had submitted to the supremacy of R., was kept in check by Roman garrisons, and denationalized by the influx of Roman colonists. In the land of the Volsci, likewise, a series of Roman fortresses were erected to overawe the native inhabitants; Velitrae, on the borders of Latium, as far back as 492 B.C., Suessa Pometia (442 B.C.), Circeii (393 B.C.), Satricum (385 B.C.), and Setia (382 B.C.): besides the whole Volscian district, known as the Pontine Marshes (q. v.), was distributed into farm-allotments among the plebeian soldiery. Becoming alarmed, however, at the increasing power of Rome, the Latins and Hernicans withdrew from the league, and a severe and protracted struggle took place between them and their former ally. Nearly thirty years elapsed before the Romans succeeded in crushing the malcontents, and restoring the league of Spurius Cassius. In the course of this war, the old Latin confederacy of the 'Thirty Cities' was broken up (384 B.C.) probably as being dangerous to the hegemony (now rapidly becoming a supremacy) of R., and their constitutions were more and more assimilated to the Roman. The terms of the treaty made by the Romans (348 B.C.) with the Carthaginians show how very dependent was the position of the Latin cities. Meanwhile, the Romans had pushed their garrisons as far south as the Liris, the northern boundary of Campania. Here they came into contact with the Samnites (q. v.), a people as heroic as themselves, their equals in everything but unity of political organization; perhaps their superiors in magnanimity.

The Samnites had long been extending their conquests in the south of Italy, just as R. had in the center and in Etruria. Descending from their native mountains between the plains of Apulia and Campania, they had overrun the lower part of the peninsula, and under the name of Lucanians, Bruttians, &c., had firmly established themselves, threatening everywhere the prosperity of the Greek and Etruscan possessions in those regions. But it was the dwellers in the original mountain territory who properly bore the name of Samnites, and between them and the Romans now commenced a tremendous struggle; the former fighting heroically for the preservation of their national freedom—the latter warring with superb valor for dominion. We cannot afford space to recount the circumstances that brought about the collision, further than to state that the Samnite colonies had in the course of time become so detached in sympathy, and so changed in character and interests from the parent stock, as almost to forget their original unity. Hence, hostilities were common between them; and the forays of the Samnite Highlanders in the rich lowlands of Campania were dreaded above all things by their more polished but degenerate kinsmen of Capua, who had acquired the luxurious habits of the Greeks and Etruscans. It was really to save themselves from these destructive forays that the Campanians offered to place themselves under the supremacy of R.; and thus Romans and Samnites were thrown into a position of direct antagonism. The Samnite Wars, of which three are reckoned, extended over 53 years (343—290 B.C.). The second, generally known as the 'Great Samnite War,' lasted 22 years (326—304 B.C.). At first, the success was mainly on the side of the Samnites; and after the disaster at the *Caudine Forks* (q. v.), it seemed as if Samnium and not R. was destined to become the ruler of Italy, but the military genius of the Roman consul, Quintus Fabius Rullianus (see FABIUS), triumphed over every danger, and rendered all the heroism of Caius Pontius, the Samnite leader, unavailing.

In 304 B.C., Bovianum, the capital of Samnium, was stormed and the hardy Highlanders were compelled to acknowledge the supremacy of the republic. The third war (298—290 B.C.) was conducted with all the sanguinary energy of despair; but though the Etruscans and Umbrians now joined the Samnites against the Romans, their help came too late. The victory of Rullianus and of P. Decius Mus, and Sentinum (295 B.C.), virtually ended the struggle, and placed the whole of the Italian peninsula at the mercy of the victor. It only remains to be mentioned here that at the close of the first Samnite War, which was quite indecisive, an insurrection burst out among the Latins and Volscians, and spread over the whole territory of these two nations; but the defeat inflicted on the insurgents at Trifanum (340 B.C.) by the Roman consul, Titus Manlius Imperiosus Torquatus, almost instantly crushed it, and in two years the last spark of rebellion was extinguished. The famous Latin league was now dissolved; many of the towns lost their independence and became Roman *municipia;* new colonies were planted both on the coast and in the interior of the Latino-Volscian region; and finally, so numerous were the farm-allotments to Roman burgesses, that two additional tribes had to be constituted.

From the Close of the Samnite to the Commencement of the Punic Wars.—The war with Pyrrhus (q. v.), king of Epirus, which led to the complete subjugation of Peninsular Italy, is a sort of pendant to the great Samnite struggle. It was brought about in this way. The Lucanians and Bruttians, who had aided the Romans in the Samnite Wars, considering themselves cheated of their portion of the spoil, entered into negotiations with the enemies of their former associate throughout the peninsula. A mighty coalition was immediately formed against R., consisting of Etruscans, Umbrians, and Gauls in the north, and of Lucanians, Bruttians, and Samnites in the south, with a sort of tacit understanding on the part of the Tarentines that they would render assistance by and by. The rapidity with which it took shape shows alike the fear and the hatred inspired by the Roman name.

In the course of a single year, the whole north was in arms, and once more the power, and even the existence of R., were in deadly peril. An entire Roman army of 13,000 men was annihilated at Arretium (284 B.C.) by the Senonian Gauls, but that dauntless spirit which the republic never failed to display in the crisis of its fortunes, and which gives a sublime dignity to its worst ambition, now shone out in the fulness of its splendor. Publius Cornelius Dolabella marched into the country of the Senones at the head of a large force, and literally extirpated the whole nation, which henceforth disappears from history. Shortly afterwards the bloody overthrow of the Etrusco-Boian horde at Lake Vadimo (283 B.C.) shattered to pieces the northern confederacy, and left the Romans free to deal with their adversaries in the south. The Lucanians were quickly overpowered (282 B.C.); Samnium, broken by its long and luckless struggle, and overawed by the proximity of a Roman army, could do nothing. A rash and unprovoked attack on a small Roman fleet now brought down on the Tarentines the vengeance of R., at the very moment R. was free to exert all her terrible power. Awaking to a sense of their danger, the Tarentines invited Pyrrhus (q. v.), over from Epirus, and appointed him commander of their mercenaries. This royal adventurer, a man of the most brilliant, but also of the most volatile genius, resembling no modern general so much as Charles Mordaunt, Earl of Peterborough, arrived in Italy (280 B.C.) with a small army of his own, and a vague notion in his head of founding a Hellenic empire in the west, that should rival that created in the east by his kinsman, Alexander the Great. It is not necessary to narrate here the varying fortunes of the struggle between Pyrrhus and the Romans, which lasted only six years, and ended in his being obliged to return to Epirus without accomplishing anything.

After Pyrrhus, baffled in his attempts to check the progress of R., had withdrawn to Greece, the Lucanians and Samnites, whom his reputation and original successes had induced to rise once more against the dreaded foe, continued the unequal struggle, but 'even the bravery of despair,' as it has been said, 'comes to an end; the sword and the gibbet at length (269 B.C.) carried peace even into the mountains of Samnium.' Tarentum had surrendered three years earlier, and now from the Macra and the Rubicon to the Straits of Messana, there was not a nation in Italy that did not acknowledge the supremacy of Rome. Distant kingdoms began to feel that a new power had risen in the world; and when Ptolemy Philadelphus, sovereign of Egypt, heard of the overthrow of the famous Epirote warrior, he sent an embassy to R. (273 B.C.), and concluded a treaty with the republic. To secure their new acquisitions, the Romans established in the south military colonies at Pæstum and Cosa, in Lucania (273 B.C.); at Beneventum (268 B.C.), and at Æsernia (263 B.C.), to overawe the Samnites; and in the north, as out-posts against the Gauls, Ariminum (268 B.C.), Firmum in Picenum (264 B.C.), and the burgess colony of Castrum Novum. Preparations were also made to carry the great Appian highway as far as Brundisium, on the Adriatic, and for the colonization of the latter city as a rival emporium to Tarentum.

The political changes were almost as important as the military. The whole population of Peninsular Italy was divided into three classes—1. *Cives Romani*, or such as enjoyed the full burgess privileges of Roman citizens; 2. *Nomen Latinum*—that is, such as possessed the same privileges as had been enjoyed by the members of the quondam Latin league—viz., an equality with the Roman burgesses in matters of trade and inheritance, the privilege of self-government, but no participation in the Roman franchise, and consequently no power to modify the foreign policy of the state; 3. *Socii*, or 'Allies,' to some of whom were conceded most liberal privileges, while others were governed in an almost despotic fashion. The *Cives Romani* no longer embraced merely the inhabitants of the old Roman community, the well-known 'tribes' (of whom there were now thirty-three), but all the old burgess-colonies planted in Etruria and Campania, besides such Sabine, Volscian, and other communities as had been received into the burgess body on account of their proved fidelity in times of trial, together with individual Roman emigrants or families of such, scattered among the *municipia*, or living in villages by themselves. The cities possessing the *Latinum Nomen* included most of the 'colonies' sent out by R. in later times, not only in Italy, but even beyond it; the members of which, if they had previously possessed the Roman franchise, voluntarily surrendered it in lieu of an allotment of land. But any 'Latin' burgess who had held a magistracy in his native town, might re-

turn to R., be enrolled in one of the tribes, and vote like any other citizen. The *Socii* comprised all the rest of Italy, as the Hernicans, the Lucanians, Bruttians, the Greek cities, &c. All national or cantonal confederacies and alliances among the Italians were broken up, and no means were left unemployed by the victors to prevent their restoration.

The Punic Wars.—The origin of Carthage, and the steps by which she rose to power, are sketched in the article CARTHAGE. At the time when she came into collision with R. she was indisputably the first maritime empire in the world, ruling as absolutely in the central and western Mediterranean seas as R. in the Italian peninsula. Between the Carthaginians and the Romans there had long existed a nominal alliance—the oldest treaty dating as far back as the 6th c. B.C. But this alliance had never possessed any real significance, and latterly the two nations had come to regard each other with considerable distrust. The incident that occasioned the outbreak was quite trivial, and need not be recorded. Suffice it to say that in 264 B.C., war was formally declared between the two nations, and incomparably the most terrible contest in which R. was ever engaged, began.

We do not propose to follow minutely the course of the famous Punic Wars—the details of which are narrated at sufficient length under the heads CARTHAGE, HAMILCAR, HANNIBAL, HASDRUBAL, HIERO, REGULUS, METELLUS, FABIUS, MARCELLUS, SCIPIO, and NUMIDIA, to which we refer the reader, but we may briefly indicate their character and result. The wars with Carthage, like those with Samnium, were three in number. The *first* lasted 23 years (B.C. 264—241), and was waged mainly for the possession of Sicily. Its leading feature was the creation of a Roman navy, which, after repeated and tremendous misfortune, finally wrested from Carthage the sovereignty of the seas. R., indeed, had never been a merely agricultural state, as may be inferred from a variety of particulars—e. g., the antiquity of the galley in the city arms, of the port-dues on the exports and imports of Ostia, and of commercial treaties with transmarine states—but events had hindered it from engaging to any large extent in maritime enterprise; and its shipping, or at least its fleet, was still quite insignificant, although it had become master of nearly all the Italian seaboard. The necessity for a navy now began to show itself. Not only was there a difficulty felt in transporting troops to Sicily, but the shores of the mainland were completely exposed to the ravages of Carthaginian squadrons.

So energetically did the senate set to work, that (we are told) in sixty days from the time the trees were felled, 120 ships were launched, and soon after the consul Caius Duilius gained a brilliant success (260 B.C.) over the Carthaginians off Mylae, on the north-east coast of Sicily. The exultation of the Romans knew no bounds; and the 'triumph' which Duilius received on his return to the city, had more the aspect of a carnival than of a noble ceremony. The *Columna Rostrata* ('Beaked Column') in the Forum preserved for ages the memory of the 'glorious victory.' Subsequent events, however, were less favorable. An invasion of Africa by Regulus (q. v.) ended in disaster, and the war, which was henceforth confined to Sicily, miserably languished. Thrice was the Roman navy annihilated by storms at sea (255 B.C., 253 B.C., and 249 B.C.); and in spite of a series of unimportant successes by land, the Romans long found it impossible to make any impression on the great Carthaginian stronghold of Lilybæum and Drepanum, mainly on account of the brilliant strategy with which they were held in check by Hamilcar Barca, the father of Hannibal. At last, however, a great sea-fight took place off the Ægates isles (242 B.C.), in which a Roman fleet, commanded by the consul Lutatius Catulus, obtained a magnificent victory. The Carthaginian government, whose treasury was empty, and who had in vain tried to raise a state-loan in Egypt, could—for the present—continue the struggle no longer, and the whole of Sicily, except the territory of Hiero of Syracuse, who had been a firm ally of the Romans, passed into the hands of the victors, who constituted it a Roman province, and placed it under the government of a prætor.—A lapse of 23 years occurred before the second Punic War began, but during that interval neither Romans nor Carthaginians had been idle. The former, with worse than 'Punic faith,' had bullied their weak and exhausted rival into surrendering Sardinia and Corsica, which, like Sicily, were transformed into a Roman province. In addition, they had carried on a series of Gallic wars in Northern Italy (231—222 B.C.), the result of which was the complete humiliation of the barbarian Boii, Insubres, &c., and the extension of Italy to its natural boundary—the Alps.

On the eastern coast of the Adriatic also, the Romans made their power felt, by the vigor with which they suppressed Illyrian piracy (219 B.C.). Meanwhile, the descent of Hamilcar on the Spanish coast was followed, after some ineffectual opposition on the part of the natives, by the establishment of a new Carthaginian empire, or at least a protectorate, in the west; and thus, almost before the Romans were aware of it, their hated rival had made good her losses again, and was even able to renew the struggle in a more daring fashion than before. How confident the bearing of the Carthaginians had now become, may be seen from the fearless spirit in which they accepted the Roman challenge, and entered on the *second* Punic—or (as the Romans called it) the *Hannibalic*—War, the grand events of which were the crossing of the Alps by Hannibal, the terrible disasters of the Romans at Lake Trasimene (q. v.) and Cannæ (q. v.), and the final overthrow of Hannibal at Zama (q. v.), 202 B.C., by Scipio, which once more compelled the Carthaginians to sue for peace. It was with Carthage as with Samnium. The *second* war virtually sealed her fate, and the *third* displayed only the frantic heroism of despair. Her Spanish possessions, like her Sicilian, passed to the Romans (who formed out of them the provinces of *Hispania Citerior* and *Hispania Ulterior*); so did her protectorate over the Numidian sheiks. She was forced to surrender her whole navy (excepting ten triremes), and all her elephants, and to solemnly swear never to make war either in Africa or abroad, except with the consent of her vanquisher. In a word, the imperial supremacy of R. was now as unconditional in the western Mediterranean as on the mainland of Italy. Her relations, indeed, to the conquered Italian nationalities became much harsher than they had formerly been, for, after the first victories of Hannibal, these had risen against her. The Picentes, Bruttii, Apulians, and Samnites, were deprived either of the whole or the greater part of their lands—some communities were actually turned into serfs—the Greek cities in Lower Italy, most of which had also sided with Hannibal, became the seats of burgess-colonies. But the loss of life and of vital prosperity was frightful. 'Numbers of flourishing townships,' says Mommsen, '400 it was reckoned, were destroyed and ruined.'

Slaves and desperadoes associated themselves in robber-bands, of the dangers of which an idea may be formed from the fact that in a single year (185 B.C.) 7000 men had to be condemned for robbery in Apulia alone; the extension of the pastures with their half-savage slave-herdsmen, favored this mischievous barbarizing of the land. But the exultation of victory closed the eyes and the ears of the Romans against every omen, and the perilous work of conquest and subjugation went on. During 201—196 B.C., the Celts in the valley of the Po, who, with the fiery unwisdom of their race, had recommenced hostilities at the very moment R. was freed from her embarrassments, were thoroughly subjugated; their territory was Latinized, but they themselves were declared incapable of ever acquiring Roman citizenship; and so rapidly did their nationality dissolve, that when Polybius, only 30 years later, visited the country, nearly all traces of Celtic characteristics had disappeared. The Boii were finally extirpated about 193 B.C.; the Ligurians were subdued 180—177 B.C.; and the interior of Corsica and Sardinia about the same time. The wars in Spain were troublesome and of longer duration, but they were not at all serious. The natives were indeed perpetually in arms, and the Romans suffered frequent defeats from their sudden and impetuous insurrections; but in the end the superior discipline of the legions always prevailed, and the fiery and chivalrous tribes had of course to make ignominous submission. So little reliance, however, could be placed on these forced submissions, that the Romans felt it necessary to hold Spain by military occupation, and hence arose the first Roman standing armies. Forty thousand troops were maintained in the Spanish peninsula year after year. The most distinguished successes were those achieved by Scipio himself, by Quintus Minucius (197—196 B.C.), by Marcus Cato (195 B.C.), by Lucius Æmilius Paullus (189 B.C.), by Caius Calpurnius (185 B.C.), by Quintus Fulvius Flaccus (181 B.C.), and by Tiberius Gracchus (179—178 B.C.).

Macedonian and Greek Wars.—The causes that led to the interference of R. in the politics of the East are too complicated to be given here, but the *Macedonian Wars* were owing immediately to the alliance formed by Philip V. of Macedon with Hannibal after the battle of Cannæ. Like the Samnite and Punic, the Macedonian Wars were three in number. The *first* (214—205 B.C.) was barren of results, mainly because the whole energies of R. were directed to Spain and Lower Italy; but the *second* (200—197 B.C.), though it lasted only a third of the time occupied by the first, taught Philip that another and not he must rule in Greece. The battle of *Cynoscephalæ* ('Dogs' Heads' Hills, a range in Thessaly) was followed by a treaty which compelled him to withdraw his garrisons from the Greek cities, to surrender his fleet, and to pay 1000 talents towards the expenses of the war. Philip was thoroughly quelled, and during the remaining 18 years of his life, he adhered (like old Hiero of Syracuse, though less sincerely) to his Roman alliance. But the miserable Ætolians, who had formed an alliance with R. against Philip, with even more stupidity than insolence, quarreled in wanton jealousy with their powerful 'friends,' and persuaded Antiochus (q. v.) of Syria to come over seas to Thessaly, and fight them. A similar fate befell him to what had befallen Philip. After a war of three years, he found himself obliged to surrender all his possessions in Europe and Asia Minor, all his elephants and

ships, and to pay 15,000 Euboic talents (£3,660,000) within 12 years. Next year the Ætolians were crushed, and a little later, the despicable quarrels between the Achaians and Spartans led to a general Roman protectorate over the whole of Greece.

Philip of Macedon dying (179 B.C.), was succeeded on the throne by his eldest son Perseus (q. v.), who resolved once more to try the fortune of war with the Romans; and in 172 B.C., the *third* and *last* Macedonian War began, the result of which, after four years of fighting, was the utter destruction of the Macedonian army at Pydna (168 B.C.) by the Roman consul Lucius Æmilius Paullus (q. v.), the capture of the king, who adorned the triumph of the conqueror, and the dismemberment of the Macedonian empire, which was broken up into four oligarchic republics, the members of which were subjected to severe disqualifications; while in Greece itself, trials and executions for implication in the war of Perseus spread terror everywhere; the conspicuous 'patriots'—i. e., all who had made themselves notorious by their anti-Roman and Macedonian policy—were deported to Italy; further, the imperial republic stopped Antiochus Epiphanes in his career of Egyptian conquest, ordered him instantly to abandon his acquisitions, and accepted the protectorate of Egypt, which the grateful and frightened monarch offered her (168 B.C.). Even the allies of Rome—the Pergamese, the Rhodians, &c.—were treated with shocking harshness and injustice. We may here, for the sake of connection, anticipate the course of history, and mention the last *Greek* and *Punic* Wars. Both of these came to an end in the same year (146 B.C.) The former was caused by an expiring outburst of pseudo-patriotism in the Achaian League, consequent on the return of the exiles from Rome, and was virtually closed on the siege and destruction of Corinth (q. v.) by the consul Mummius. The latter was not so much a war as a bloody sacrifice to the genius of Roman ambition. After Hannibal's death, his party in Carthage seems to have recovered the ascendancy, and as coincident therewith, the commercial prosperity of the city began to revive, a bolder front was shown in resisting the encroachments of Masinissa, the Numidian ruler, whom the Roman senate protected and encouraged in his aggressions. This was enough. Fierce old Cato only expressed the instinctive sentiment of the Roman burgesses, when he came to utter incessantly *Delenda est Carthago*, and in 149 B.C., the senate adopted his barbarous conviction. After a siege of three years, in which the inhabitants displayed superhuman energy and heroism, Carthage was stormed by Scipio Africanus Minor, and the Carthaginian empire vanished for ever from the earth.

Position of Rome at the Close of the Punic Wars, and sketch of its subsequent Social Condition to the termination of the Republic.—'Polybius dates from the battle of Pydna the full establishment of the universal empire of Rome. It was in fact the last battle in which a civilized state confronted Rome in the field on a footing of equality with her as a great power; all subsequent struggles were rebellions or wars with peoples beyond the pale of the Romano-Greek civilization—the barbarians, as they were called. The whole civilized world thenceforth recognized in the Roman senate the supreme tribunal, whose commissioners decided in the last resort between kings and nations; and, to acquire its language and manners, foreign princes and noble youths resided in Rome.' But contemporaneous with this enormous extension of power and authority in foreign lands, the national character underwent a complete and fatal alteration. The simplicity and stern integrity of life, the religious gravity of deportment, and the fidelity with which common civic and household duties were discharged—well expressed in the saying of Cato, that it was 'better to be a good husband than a great senator'—which in early times nobly distinguished the Roman burgess, had now all but disappeared. Those hardy virtues—frugality, temperance, justice, and rectitude—which, combined with courage and energy, had given the strength to the nation that made it great, required for their permanence the social conditions out of which they sprang. But the class of peasant proprietors who had laid the foundations of Roman greatness were either extinct or no longer what they once had been. The original causes of their social degradation have been already noticed, and here it is only necessary to say that the victories of R. abroad furthered rather than retarded that degradation. The long and distant wars made it more and more impossible for the soldier to be a good citizen or a successful farmer.

The freedom and licentiousness of camp-life, the sweets of pillage and rapine, ever grew more pleasant to the Italian burgess and colonist; thus indolence, inaptitude, and spendthrift habits, aided the greedy designs of the capitalists, and in most cases the paternal acres gradually slipped into the possession of the great landlords, who found it more profitable to turn them into pasture or cultivate them by gangs of slaves. The rise of the slave-system—though an inevitable result of foreign conquest—was, indeed, the most horrible curse that ever fell on ancient R., and the atrocities inflicted on its unhappy victims are far beyond the possibility of description; Mommsen does not exaggerate when he considers it probable that, 'compared with the sufferings of the Roman slaves, the sum of all negro suffering is but a drop.' If the Italian farmer honorably strove to retain his small farm, he was exposed to the competition of the capitalists who shipped immense quantities of corn from Egypt and other granaries, where slave-labor rendered its production cheap, and of course he failed in the unequal struggle. Not less pernicious was the change that passed over the character of the rich. We have already shown how the old Roman patricians lost their exclusive privileges, how the plebeians gradually acquired a full equality with them, and how the germs of a new social aristocracy originated, based on wealth rather than pedigree, and comprising both plebeians and patricians. During the 4th and 3d centuries B.C., the political power of this order immensely increased. In fact, the whole government of the state passed into their hands. They became an oligarchy, and while it is not to be denied that they displayed extraordinary ability in the conduct of foreign affairs, the vices inseparable from oligarchic rule—selfishness, nepotism, and arrogance, of which Scipio is a striking example—gradually became rampant. Regarding themselves as the Roman community *par excellence*, and the poor burgesses as a mere *canaille*, whose wishes and interests were unworthy of a moment's consideration, they virtually relapsed into the exclusiveness of the ancient *populus*, with this difference for the worse, that their wealth, influence, and pride were a thousandfold greater than those of Coriolanus or Camillus. But far worse than even the nepotism and selfishness of the nobles was their ever-increasing luxury and immorality.

When R. had conquered Greece, and Syria, and Asia Minor, the days of her true greatness were ended. The wealth that poured into the state coffers, thence to be (really if not formally) distributed among the clique of nobles, the treasures which victorious generals acquired, enabled them to gratify to the full the morbid appetites for pleasure engendered by exposure to the voluptuousness of the East. Such results were, it is true, not brought about in a day, nor without a resolute protest on the part of individual Romans. The attitude of Cato Major towards the Hellenizing tendencies of his brother nobles was doubtless patriotic, and posterity has been generous in its laudation of his antique virtue; but Cato Major was nevertheless only a political fanatic and incarnate anachronism. So long as R. chose to subdue foreign nations, and to hold them by the demoralizing tenure of conquest—i. e., as mere *provinces*, whose inhabitants, held in check by a fierce and unscrupulous soldiery (like the Kabyles of Algeria by the French, or, until recently, the Hindus by the British), neither possessed political privileges nor dared cherish the hope of them—it was morally impossible for the citizens, either at home or abroad, to resume the simple and frugal habits of their forefathers. After Cato's time, things grew worse instead of better, nor from this period down to the final dissolution of the empire, was a single *radical* reform ever permanently effected. The momentary success of Tiberius, and of his far abler brother, Caius Gracchus (q. v.), in their desperate and revolutionary attempts to prevent the social ruin of the state, by breaking down the powers of the senate, redistributing the domain lands, reorganizing the administration, and partially restoring the legislative authority of the popular assemblies, hardly survived their death; and the reaction that ensued proved that the senate, like the Bourbons, could learn nothing from adversity, and that the rabble of the city were incapable of elevation or generosity of political sentiment. Henceforth, the malversation of the public money by prætors and quæstors became chronic, and the moral debauchery of the mob of the capital by the largesses of ambitious politicians and the vile flattery of demagogues, complete.

The old Roman faith, so deep, and strong, and stern, disappeared from the heart. The priests became Pharisees, the nobles 'philosophers' (i. e., unbelievers), their wives practices of oriental abominations under the name of 'mysteries;' while the poor looked on with unmeaning, yet superstitious wonder at the hollow but pompous ceremonies of religion. It would serve no useful purpose to dwell longer on these aspects of Roman society, and we now turn to sketch in a few words the course of outward events to the close of the republic.

From the Destruction of Carthage to the Termination of the Republic.—We have already alluded to the wars waged in Spain during the first half of the 2d c. B.C. The humane and conciliatory policy pursued towards the natives by Tiberius Sempronius Gracchus, father of the ill-fated tribunes, brought about a peace, 179 B.C., that lasted 25 years; but in 153 B.C., a general rising of the Celtiberians took place, followed by another on the part of the Lusitanians of Portugal. The struggle maintained by these gallant barbarians against their mighty oppressor lasted, with intervals of peace, for the space of 20 years, but ended in spite of gleams of brilliant success, as such contests invariably do, in the final overthrow of the undisciplined and uncivilized combatant. All the valor of the shepherd-warrior, Viriathus (q. v.), even if the

assassin's steel had spared his life, would not have prevented the annexation of Lusitania to the Roman empire, nor did the unsurpassable heroism of the besieged Numantines avail to baffle the military skill of the younger Scipio.

Towards the conclusion of the Numantine War occurred the first of those horrible social outbreaks known as 'servile' or 'slave' wars, which marked the later ages of the republic. The condition of the slaves has been already referred to; but what aggravated the wretchedness of their lot was the fact that most of them had been originally freemen—not inferior in knowledge, skill, or accomplishments to their masters, but only in force of character and military prowess. The first slave insurrection broke out in Sicily, 134 B.C., where the system was seen at its worst. Its leader was one Eunus, a Syrian, who, mimicking his native monarch, took the title of King Antiochus. The suddenness and barbaric fury of the revolt for a time rendered all opposition impossible. The slaves overran the island, like demoniacs let loose; and routed one Roman army after another. But a slave insurrection has no aim beyond immediate revenge, and when the first wild paroxysms of ferocity are over, it becomes powerless, more even from a moral than a physical exhaustion, and can be quelled with ease. In 132 B.C., the consul Publius Rupilius restored 'order' in the island. In the East, fortune continued to smile upon the Roman arms. Attalus III., Philometer, a villainous despot of the true oriental stamp, who massacred or poisoned every one that ventured to give him advice, dying 133 B.C., bequeathed his client-kingdom of Pergamus to its protector—R.; and after a fierce struggle with an ambitious pretender called Aristonicus, the Romans obtained possession of the splendid bequest, and formed it into the province of Asia, 129 B.C.

We may here enumerate the different provinces into which the Roman senate divided its foreign conquests, in the order of their organization. 1. Sicily, 241 B.C.; 2. Sardinia and Corsica, 238 B.C.; 3. Hispania Citerior, and 4. Hispania Ulterior, 205 B.C.; 5. Gallia Cisalpina, 191 B.C.; 6. Macedonia, 146 B.C.; 7. Illyricum, *circa* 146 B.C.; 8. Achaia (or Southern Greece), *circa* 146 B.C.; 9. Africa (i. e. the Carthaginian territory), 146 B.C.; 10. Asia (kingdom of Pergamus), 129 B.C. A few years later, 118 B.C., an 11th was added by the conquest of the southern part of Transalpine Gaul, and was commonly called, to distinguish it from the rest of the country, 'the Province;' hence the modern *Provence*.

In Africa, the overthrow of Jugurtha (q. v.), 104 B.C., by the consul Marius, added yet further to the military renown and strength of the republic. Meanwhile, from a new quarter of the world, a gigantic and unforeseen danger threatened the Roman state. North of the Alps there had long been roaming in the region of the Middle Danube an unsettled people called the CIMBRI (q. v.), whose original home was probably the northwest of Germany. They first came into collision with the Romans in Noricum, 113 B.C.; after which they turned westward, and poured through the Helvetian valleys into Gaul, where they overwhelmed alike the native tribes and the Roman armies. At Arausio (Orange) on the Rhône, 105 B.C., a Roman army of 80,000 was annihilated; but instead of invading Italy, the barbarians blindly rushed through the passes of the Pyrenees, wasted precious months in contests with native tribes of Spain as valiant and hardy as themselves, and gave the Romans time to recover from the effects of their terrible defeat. Marius, who had just returned from his Numidian victories, was reappointed consul; and at Aqua-Sextiæ (Aix, in Dauphiné), he literally exterminated the dreaded foe, 102 B.C. Next year, near Milan, the same doom befell another northern horde—the Teutones, who had accompanied the Cimbri in their irruption into Spain; but on their withdrawal, had parted from their associates in Gaul, forced their way back through Switzerland, and descended into Italy by the Tyrolese valleys. In the same year a second insurrection of the slaves in Sicily, which had reached an alarming height, was suppressed by the consul Marcius Aquillius.

For the next 10 years the internal history of R. is a scene of wild confusion and discord. Marius, an admirable soldier, but otherwise a man of mediocre talents, and utterly unfit to play the part of a statesman, was the idol of the poor citizens, who urged him to save the state from the rapacious misgovernment of the rich. His attempts were pitiable failures; the brave honest soldier fell into the hands of unscrupulous demagogues like Glaucia and Saturninus, and sullied the laurels he had won in war by associating with men who did not hesitate to assassinate a political opponent. Not less fruitless was the wise and patriotic effort of Livius Drusus—'the Gracchus of the aristocracy'—to effect a compromise between the privileges of the rich and the claims of the poor. The oligarchic party among the former, i. e. the senate, were enraged by his proposition to double their numbers by the introduction of 300 equites; the latter by his offer to the 'Latins' and 'Allied Italians' of the Roman franchise. Drusus fell 91 B.C., by the steel of a hired bravo. Hardly a year elapsed before the whole of the subject 'Italians'—i. e., the Marsians, Peligmians, Marrucinians, Vestinians, Picentines, Samnites, Apulians and Lucanians—were up in wild and furious revolt against R.; and, though the rebellion was crushed in less than two years by the superior generalship of Marius, Sulla, and Pompeius Strabo (father of the 'great' Pompey), the insurgents virtually triumphed; for the promise which Drusus had held out to them of the 'Roman franchise,' was made good by the *Lex Plautia Papiria* 89 B.C. Yet the cost was terrible. It is calculated that 300,000 men—the flower of R. and Italy, perished in the struggle; nor was even this tremendous holocaust sufficient to appease the Fates. The jealousy that had long existed on the part of Marius towards his younger and more gifted rival, Sulla (q. v.), kindled into a flame of hate when the latter was elected consul 88 B.C., and received the command of the Mithridatic War—an honor which Marius coveted for himself. Then followed the fearful years of the 'civil wars' between the two chiefs, 88—82 B.C., when blood was spilt like water; and proscriptions and massacres were the order of the day. It was a 'Reign of Terror'—surpassing even the excesses of the French Revolutionists.

Sulla, the leader of the aristocracy, which was nominally the party of order, triumphed, but the ferocious energy displayed by the revolutionists convinced him that the 'Roman franchise' could never again be safely withdrawn from the 'Italians;' and Roman citizens, therefore, they remained till the dissolution of the empire; but, on the other hand, his whole legislation was directed towards the destruction of the political power of the burgesses, and to the restoration to the senatorial aristocracy and priesthood of the authority and influence they had possessed in the times of the Punic Wars. That his design was to build up a strong and vigorous executive cannot admit of doubt, but the rottenness of Roman society was beyond the reach of cure by any human policy. It would be hopeless in our limits to attempt even the most superficial sketch of the complicated history of this period, which, besides, will be found given with considerable fulness of detail in the biographies of its leading personages, SERTORIUS, LUCULLUS, CRASSUS, POMPEY, MITHRIDATES, CÆSAR, CICERO, CATILINE. MARK ANTONY, LEPIDUS, CLEOPATRA, CLODIUS, BRUTUS, CASSIUS, CATO, and AUGUSTUS. The very utmost we can attempt is to enumerate results.

Abroad the Roman army continued as before to prove irresistible. About 13 years after the extermination of the northern barbarians, the Cimbri and Teutones, or in 88 B.C., broke out in the far east the first of the 'Mithridatic Wars,' which, like the Samnite, Punic, and Macedonian Wars, were three in number. Begun by Sulla, 88 B.C., they were brought to a successful close by Pompey, 65 B.C., although the general that had really broken the power of Mithridates was Lucullus. The result was the annexation of the sultanate of Pontus, as a new province of the Roman republic. Next year, Pompey marched southward with his army, deposed Antiochus Asiaticus, king of Syria, and transformed his kingdom also into a Roman province, while in the following year (63 B.C.) he reduced to a state of dependence Phœnicia, Cœle-Syria, and Palestine, storming Jerusalem, and, to the horror of the Jews, violating their Holy of Holies. But what a terrible commentary it is upon these glittering triumphs to remember that during the same year there was hatched at R. the Conspiracy of Catiline (q. v.), which, if it had not been crushed by an extraordinary display of decision on the part of the consul Cicero, would have placed at least the city of R. at the mercy of a crew of aristocratic desperadoes and cutthroats.

One thing now becomes particularly noticeable, viz., the paralysis of the senate—that 'governing board' as Mommsen calls it, that had once been the mightiest power in the world. In spite of all that Sulla did to make it once more the governing body in the state, the power passed out of its hands. Torn by wretched jealousies, spites, piques (personal and partisan), it could do nothing but squabble or feebly attempt to frustrate the purpose of men whom it considered formidable. Henceforth the interest as well as the importance of Roman history attaches to individuals, and the senate sinks deeper and deeper into insignificance, until at last it becomes merely the obsequious council of the emperors. The famous coalition of Crassus, Pompey, and Cæsar (known as the *First Triumvirate*), which dates from the year 60 B.C., proves how weak the government and how powerful individuals had become; and the same fact is even more dismally brought out by the lawless and bloody tribunates of Clodius and Milo (58—57 B.C.), when R. was for a while at the mercy of bravos and gladiators. The campaigns of Cæsar in Gaul (58—50 B.C.), by which the whole of that country was reduced to subjection; his rupture with Pompey; his defiance of the senate; the civil wars; his victory, dictatorship, and assassination; the restoration of the senatorial oligarchy; the second triumvirate, composed of Antony, Lepidus, and Octavian; the overthrow of the oligarchy at Philippi; the struggle between Antony and Octavian; the triumph of the latter, and his investment with absolute power for life (29 B.C.), which put an end at least to the civil dissensions that had raged so long (and was therefore so far a blessing to the state), are described in the biographical articles already referred to.

THE ROMAN EMPIRE.—When Augustus had gathered up into himself all the civil and military powers of the state, its political life was at an end; henceforth the voices of the citizens are dumb, and only the rude clamor of the legions or the Prætorians (q. v.) is heard, as emperors rise and fall. It is, indeed, amazing to consider how long brute force managed to keep under the elements of anarchy and dissolution in the empire; but it must be remembered that it was the East that ruined R., and not R. the East. Even in the worst days of the republic, the Roman administrators of the provinces were acknowledged to be less unjust, ravenous, tyrannical, and cruel than the native princes and sultans; and the servile myriads of Asia Minor and Syria witnessed the deposition of their dynasts without a shadow of regret—sometimes even with a cry of joy. The Romans had therefore comparatively little difficulty in retaining and even increasing their eastern conquests, while the superior discipline of their well-trained soldiery enabled them to repel and subdue even the intrepid barbarians of the North, though singly these were probably more gallant men than the rank and file of the imperial legions. But no military prowess, however great, will, beyond a certain time, serve to keep a nation alive that is otherwise moribund; and even Christianity, with all its antiseptic and revivifying influences, came too late to reanimate the national life of the empire. When Augustus died (14 A.D.), the Roman empire was separated in the north from Germany by the Rhine, but it also included both Holland and Friesland; from about the Lake of Constance it ran along the Danube to Lower Mœsia, though the imperial authority was far from being firmly established there. In the east, the boundary-line was, in general, the Euphrates; in the south, Egypt, Libya, and, in fact, the whole of Northern Africa, as far west as Morocco, and as far inland as Fezzan and the Sahara, acknowledged Roman authority.

The Roman franchise was extended to transmarine communities, and in the western provinces especially it became quite common. To keep this enormous territory, containing so many different races, quiet, an army of 47 legions and as many cohorts was maintained, most of whom were levied among the newly-admitted burgesses of the western provinces. The reigns of Tiberius (q. v.), Caligula (q. v.), Claudius (q. v.), Nero (q. v.), Galba (q. v.), Otho (q. v.), and Vitellius (q. v.), present little of any moment in a general survey of the external history of the empire, though the chronicle of their lives—those of Galba and Otho, perhaps, excepted—has all the horrible and revolting interest that attaches to records of conspiracy, assassinations, poisonings, massacres, lust, debauchery, and delirious madness. The most notable incident of this period is probably the concentration of the Prætorian Guards in the vicinity of R. during the reign of Tiberius, which Niebuhr even pronounces 'the most momentous event in the history of the emperors;' and not without reason, for, until their dissolution by Diocletian, they were the real sovereigns of the empire. In Nero's time, Armenia was wrested from the Parthians, and only restored to them on condition of their holding it as a 'fief' of the empire; the Roman authority in England was likewise extended as far north as the Trent; and a great rebellion in Gaul (not, however, against R., but only against Nero), headed by Julius Vindex, a noble Aquitanian and a Roman senator, was crushed by T. Virginius Rufus, the commander of the Germanic legions. During the profound peace that the empire had enjoyed everywhere, except on its frontiers—since the usurpation of the imperial authority—its material prosperity had greatly increased. The population was more than doubled; the towns became filled with inhabitants, and the wastes were peopled, wherever, at least, the Publicani (q. v.) or farmers-general had not got the land into their rapacious hands; but the immorality of the rich, especially among the females, became yet worse than before, and virtuous men actually preferred concubinage with a slave, to marriage with a free-born Roman lady.

With the accession of Vespasian (q. v.) a better era commenced, which, if we except the reign of Domitian, continued uninterrupted for a space of 100 years, comprising the reigns, besides those mentioned, of Titus (q. v.), Nerva (q. v.), Trajan (q. v.), Hadrian (q. v.), Antoninus Pius (q. v.), and Marcus Aurelius (q. v.). These were all men of fine and honorable character—some, as e. g., Trajan, Hadrian, and Marcus Aurelius, were really illustrious rulers, worthy of the best days of Rome. Under all of them the provinces were better governed, the finances better administered, and public morals wonderfully improved. Nothing, indeed, is more clear than that, after the time of Vespasian, that *restaurator rei publicæ*, as he has been justly called, the worst days of Rome (in a moral point of view) were over. Never again did she give way to the horrible sensuality, gluttony, and profligacy of the 1st century. Bad emperors she had as well as good, but they did not again succeed in corrupting their age. Blood, indeed, was shed freely enough, hostilities on the frontiers were as frequent as ever, and the violence and selfishness of military ambition were things that paganism did not seek, and had not the power, to quell; but the wild abyss of anarchy into which the empire latterly fell is less dreadful than the saturnalia of vice that filled the soul of Juvenal with indignation in the days of Domitian. How far the change was due to the influence of the ever-extending Christian religion, it is impossible to tell; but that Christianity did send a reinvigorating breath of new life through the old decaying body of the state is beyond all dispute, and is written on the very face of the history of the first centuries. The chief military events, from the days of Vespasian to those of Marcus Aurelius, are the final conquest of Britain by Agricola (q. v.), the final conquest of the Dacian monarchy, the victorious invasion of Parthia and of Northern Arabia; and the conquest of the valley of the Nile as far south as Upper Nubia, by Trajan; the chastisement of the Marcomanni, Quadi, Chatti, &c., by Marcus Aurelius.

Hadrian's long rule of 21 years was peaceful, but is memorable as the most splendid era of Roman architecture. The reigns of Commodus (q. v.), Pertinax (q. v.), and Didius Julianus (q. v.) were insignificant, except in so far as they show us the wretched confusion into which the administration of affairs inevitably fell when bad, or hated, or feeble rulers were invested with the purple. Able generals, respectable jurists, honorable senators are not wanting, but their influence is personal and local. The reign of Septimius Severus (193—211 A.D.) is memorable as marking the first real change in the attitude of the emperors towards Christianity. The new religion was beginning to make itself felt in the state; and Severus, who was a Carthaginian, while his wife was a Syrian, may have felt a special interest in a faith that like themselves was of Semitic origin. At all events it was taken under the imperial protection, and began to make rapid way. Caracalla (q. v.) and Elagabalus (q. v.) are perhaps the worst of all the emperors in point of criminality; but the mad brutality of the one and the monstrous debauchery of the other were purely personal affairs, and were regarded with horror by the citizens of the empire. The reign of Alexander Severus is marked by the downfall of the Parthian dynasty of Persian kings, and the rise of the native Sassanidæ (q. v.), which, as Niebuhr observes, 'was one of the unluckiest things that could have happened to the Roman empire,' for the latter proved far more formidable enemies than the Parthian rulers. After the assassination of Severus (235 A.D.) followed a period of confusion, bloodshed, and general mismanagement. The names of Maximin (q. v.), Maximus (q. v.), Balbinus (q. v.), Gordianus (q. v.), and Philip (q. v.), recall nothing but wretched quarrels, often ending in assassination. Then followed 'the beginning of the end.' The whole of Europe beyond the Roman frontier—the mysterious North—began to ferment. The Franks showed themselves on the Lower Rhine, the Swabians on the Maine; while the Goths burst through Dacia, routed the forces of Decius (q. v.), and slew the emperor himself at Mount Haemus, crossed the Euxine, and ravaged the whole northern coast of Asia Minor.

A little later—during the reigns of Valerian (q. v.), Gallienus, and the so-called *Thirty Tyrants*—the empire is nothing but a wild distracted chaos, Franks, Alemanni, Goths, and Persians rushing in from their respective quarters, like vultures scenting prey. The Goths swept over the whole of Achaia, pillaging and burning the most famous cities—Athens, Corinth, Argos, &c.; while the Asiatic hordes of Sapor committed even greater havoc in Syria and Asia Minor; and but for the courage and skill of Odenathus, husband of Zenobia (q. v.), who had built up a strong independent kingdom in the Syrian desert, with Palmyra for its capital, might have permanently possessed themselves of the regions which they merely devastated. With Claudius Gothicus (268—270 A.D.), the fortunes of the empire once more begin to brighten. By him, and his successors Aurelian (q. v.), Probus (q. v.), and Carus, the barbarians of the north and north-west, as well as the Persians in the east, were severely chastised. Nay, when Diocletian obtained the purple (284 A.D.), it seemed as if the worst were over, and the empire might still be rescued from destruction; but his division of the empire into East and West, with separate *Augusti* and assistant *Cæsars*—though it sprang from a clear perception of the impossibility of one man administering successfully the affairs of so vast a state—led to those labyrinthine confusions and civil wars, in which figure the names of Maximian (q. v.), Constantius (see CONSTANTINE), Galerius (q. v.), Maxentius (q. v.), Maximin (q. v.), Licinius (q. v.), and Constantine, and which were only brought to a close by the surpassing genius of the last-mentioned.

Under Constantine (324—337 A.D.) as all the world knows, occurred the greatest revolution in Roman history since the birth of Christ—viz., the establishment of Christianity as the religion of the state. He also transferred the seat of government from R. to Byzantium, on the Bosporus, where he founded a new city and named it after himself. But no sooner was the great statesman dead than the mutinous discords that he had kept under by the vigor of his rule, broke loose; the empire underwent a triple division among his sons; and though Constantius, the youngest, ere long became sole ruler, he failed to display the genius of his father, and in his repeated campaigns against the Persians reaped

nothing but disaster and disgrace. But the political fortunes of the empire now possess only a secondary interest; it is the struggles of the Christian sects and the rise of the Catholic Church that mainly attract the attention of the historian. There, at least, we behold the signs of new life—a zeal, enthusiasm, and inward strength of soul that no barbarism could destroy. Christianity came too late to save the ancient civilization, but it enabled the Roman world to endure three centuries of utter barbarism, and afterwards to recover a portion of the inheritance of culture that it once seemed to have lost for ever. Julian's attempt to revive paganism was a lamentable anachronism, but his efforts, when governor of Gaul under his kinsman Constantius, to repel the incessant incursions of the Franks and Alemanni, displayed a fine valor and generalship, and were crowned with success. The judgment of the poet Prudentius on the apostate is that of posterity: *Perfidus ille Des sed non et perfidus orbi.* But after the death of Julian, the signs of the approaching dissolution of the empire became more unmistakable. Yet the great state was, if we may so speak, loath to die; and again and again in her death-agony, she put forth a momentary strength that amazed her foes, and taught them that even the expiring struggles of a giant were to be feared. Valentinian (q. v.) Gratian (q. v.), and Theodosius (q. v.) were rulers worthy of better times. The last-mentioned is even known to history as the 'Great.' But they fought against destiny, and their labor was in vain. Already swarms of ferocious Huns (q. v.) from the east had driven the Goths out of Dacia, where they had long been settled, and forced them to cross the Danube into the Roman territory, where the cruelty and oppression of the imperial officers, goaded the refugees into insurrection; and in their fury, they devastated the whole east from the Adriatic to the Euxine.

Theodosius indeed subdued and even disarmed them; but he could not prevent them from drawing nearer to the heart of the empire, and already they are found scattered over all Mœsia, Servia, and Northern Illyricum. Hardly was Theodosius dead when they rose again, under their chief, Alaric (q. v.), against Honorius, emperor of the West. R. was saved (for the moment) only by the splendid bravery and skill of Stilicho (q. v.), the imperial general; but after his assassination, the barbarians returned, sacked the city (410 A.D.), and ravaged the peninsula. Three years earlier, hordes of Suevi, Burgundians, Alemanni, Vandals, and Alans burst into Gaul (where the native Celts had long been largely Romanized in language and habits), overran the whole, and then penetrated into Spain, where a Vandal empire was rapidly set up: It is utterly impossible (within our limits) to explain the chaotic imbroglio that followed in the West—the struggles between Visigoths and Vandals in Spain, between Romans and both, between usurpers of the purple and loyal generals in Gaul—the fatal rivalries of those otherwise noble and gifted men —Boniface, governor (*comes*) of Africa, and Ætius, governor of Gaul—which led to the invasion of Africa by Genseric (q. v.), and its devastation from the Straits of Gibraltar to Carthage (429 A.D.). While such was the state of affairs in the West, things were not a whit better in the East. There the Huns, from mere love of havoc, had reduced vast regions to an utter desert; for nearly 50 years, indeed, the little ferocious demons had rioted in destruction. At last, a trivial quarrel sent them into Gaul; but somewhere in Champagne, they were routed with great slaughter (451 A.D.) by a combined force of Visigoths, Burgundians, Franks, and Roman mercenaries, under Ætius and Theodoric, king of the Goths; and in spite of their successful invasion of Italy in the following year, their strength was permanently broken, and henceforth they play an insignificant part in history.

But Ætius, the only man who could have decently propped up the wretched ruin, called the Western Empire, was assassinated by his contemptible sovereign Valentinian, whose own outrages led to his murder too; while his widow, Eudoxia, to be revenged on his murderer and successor, Petronius Maximus, invited Genseric, the 'scourge of God,' over from Africa, and exposed R. to the horrors of pillage for 14 days. Ricimer, a Sueve, next figures as a sort of governor of the city, and what relics of empire it still possessed, for Gaul, Britain, Spain, Western Africa, and the islands in the Mediterranean, had all been wrested from it. While Majorian—the last able emperor—lived, Ricimer's position was a subordinate one, but, thenceforth, the western emperor merely was an emperor in name—a *roi faineant*—while the real sovereignty was exercised by this Suevic *Maire du Palais*, who was succeeded in his functions by the Burgundian King Eunobald, and the latter again by Orestes, in whose time the final catastrophe happened, when Odoacer (q. v.), placing himself at the head of the barbarian mercenaries of the empire, overthrew the last, and the most ridiculous, occupant of the throne of the Cæsars (476 A.D.), who, by a curious coincidence, bore the same name as the mythical founder of the city—Romulus. See, besides the ancient histories of Polybius, Livy, Sallust, Tacitus, &c , the modern histories of Gibbon, Niebuhr, Arnold, Merivale, Duruy, Mommsen, and Ihne.

ROME, the capital of ancient Italy, stood on the left bank of the Tiber, about 16 miles from the sea. The legend of its origin belongs to Roman history, and is discussed partly under that heading, and partly in the article ROMULUS. It was built at first in the form of a square (*Roma Quadrata*), and gradually extended, until, in the reign of Servius Tullius, it embraced one after another the famous seven hills—viz., the Palatine, Capitoline, Quirinal, Cælian, Aventine, Viminal, and Esquiline. Servius Tullius (according to the legend) so extended the *pomœrium* as to make the sacred enclosure of the city identical with its walls. After its first destruction in 390 B.C. by the Gauls, it was hastily rebuilt without respect to order, and with narrow irregular streets. At the close of the wars against Carthage, Macedonia, and Syria, public buildings and private houses of great architectural beauty were added; and under Augustus, improvements of a similar kind were made, while the mean and narrow streets were allowed to stand. In the reign of Nero, 64 A.D., two-thirds of the city were destroyed by fire, a catastrophe which furnished that emperor with the opportunity of gratifying his architectural predilections, in widening and straightening the streets, and in restricting the height of the houses, of which a certain part was built of fireproof stone from Gabii and Alba. Although it had long outgrown the limits prescribed by Servius Tullius, still the walls of that king marked the extent of R. properly so called down to the 3d c. A.D. Under Aurelian, however, the need of fortifications led to the construction of new walls, which took in the city of Servius Tullius with all the suburbs, such as the Mons Janiculus on the right of the Tiber, and the Pincian on the left. These walls, begun 271 A.D., were completed by the next emperor, Probus, were eleven miles in circumference, and were afterwards restored by Honorius, and partially rebuilt by Belisarius.

Extent and Population of Rome.—Under Servius Tullius, the walls were seven miles in circumference, but the space which they comprised was not entirely occupied by buildings. Under Aurelian, the new walls were 11 miles in circumference, and the city went on extending until it reached a circumference of 13 miles under Vespasian. The population at any given period cannot be exactly determined. According to the *Monumentum Ancyranum*, the *plebs urbana* under Augustus amounted to 320,000; with the addition of women, senators, and knights, the inhabitants must have numbered about 650,000; while the slaves, who cannot have been less numerous than the free population, must have given an aggregate of at least 1,300,000. Considering the enlargement of the city under Vespasian, we may safely set its population down at not less than two millions in his reign.

The Walls and Gates.—The first wall, that attributed to Romulus, embraced merely the Palatine, and was pierced by three gates. The larger wall of Servius Tullius does not appear to have been continuous, but only to have connected the seven hills by fortifications drawn across the narrow valleys intervening. According to Pliny, there were 37 gates in this wall. Subsequent to the walls of Servius were those of Aurelian, which, with the exception of the part beyond the Tiber, are the same as those which surround the modern city. They were divided by 14 gates. The Tiber was crossed by eight bridges.

In the interior of the city were several open spaces of ground, paved with stones, which were used as places of business or as market-places, and were called *fora* (see FORUM.) Besides these, there were other open spaces of much larger extent, which were grass-grown, and set with trees and works of art. Of these, which were called *campi*, and were used by the people in their exercises and amusements, the chief was the Campus Martius.

Surrounding these fora and campi were the private and public buildings of R., which were arranged in streets and districts. The chief street was the celebrated Via Sacra, remains of which are still to be seen in the Forum of modern Rome.—R. contained no fewer than 400 temples, the oldest being the temple of the Feretrian Jupiter, on the Capitoline, which was built, according to tradition, by Romulus, and restored by Augustus. The most famous in history, and the most magnificent in architecture, was the Capitolium, placed on the summit of the Capitoline (see CAPITOL). The only other temple requiring special mention was the Pantheon (q. v.), built by Agrippa, 27 B.C. It is still standing. —For other striking features of the ancient city, see CIRCUS, AMPHITHEATER, BATH, BASILICA.

R. also abounded in covered walks, supported by columns, and open on one side. These were known as *porticus*, and were frequented for the purposes of recreation, or of transaction of business. They were in many cases adorned with paintings and other works of art, and furnished with libraries.—More peculiar to ancient Rome, however, were the triumphal arches. See ARCH, TRIUMPHAL.—The great prison of R. was the Carcer Mamertinus, built by Ancus Martius on the slope of the Capitoline, which overhangs the Forum. Servius Tullius added to it a subterranean dungeon, 12 feet underground, walled and arched over with masonry.—In addition to the prisons, we may mention the barracks (*castra*), such as the Castra Prætoria, built by

the Emperor Tiberius for the imperial guards; and the Castra Peregrina, where the foreign troops were quartered; the aqueducts (see AQUEDUCT); and the sewers (see CLOACA MAXIMA).

R. also abounded in palaces (*palatia*). Of these, the Palatium, or imperial palace, fronting the Forum, was so enlarged by Augustus, that from being the private house of Hortensius the orator, it became the imperial residence. Nero built two still more splendid palaces, one which covered the whole Palatine Hill and part of the Esquiline, and was burned down in the great fire; and one which replaced the other. Many of the private palaces were also on a magnificent scale.—On the hills around the city were laid out *horti*, or parks and gardens, and were adorned with handsome buildings and works of art.—R. was also rich in sepulchral monuments. See ROMAN ARCHITECTURE.—In addition to these imperial or private mausolea, columns were also erected to the more illustrious of the Romans, such as the Columna Rostrata, in honor of the consul C. Duilius for his victory over the Carthaginian fleet; the Columna Trajani, in the Forum; and the Columna Antonini Pii, in the Campus Martius.—Obelisks (q. v.), mostly transported from Egypt, occupied prominent parts of the city. Since R. has again become the capital of Italy, extensive excavations among the ruins have been carried on upon a systematic plan, and with interesting results.

Modern Rome occupies the plain on each side of the Tiber and the slopes of the seven hills. Its geographical position at the Observatory of the Collegio Romano is lat. 41° 53′ 52″ N., long. 12° 28′ 40″ E. and its height above the level of the sea, on the Tiber, under the Ælian Bridge, is 20 feet. Pop. (1871) 229,356; (1881) 272,010 (*Commune* in 1881, 300,467). The members of religious orders, in 1867, were 7400, including 30 cardinals, 35 bishops, 2832 monks, and 2215 nuns. It contained 4650 Jewish residents, still compelled to inhabit a particular quarter, called the Ghetto. 50,000 persons were then in receipt of public alms.

The city is built on marshy ground, and is divided by the Tiber into two very unequal parts, that on the left bank being R. Proper, and that on the right bank being the Leonine city, or Trastevere. Its walls, 12 miles in circuit, and containing 16 gates, of which 4 are built up, enclose a space of which little more than one-third is inhabited, the greater part to the south of the Capitol being cultivated as gardens or vineyards. The site of the ancient Campus Martius constitutes the lower and most densely populated part of the town, in which all the trade is carried on. Its central part is crossed by the Corso, a street about one mile long, and running from the Piazza del Popolo, or great northern entrance of R., to the Palazzo di Venezia, at the foot of the Capitol. From the Piazza del Popolo, a handsome open space, with an obelisk from the Temple of the Sun at Heliopolis in the middle, branch out to the right and left of the Corso, the Piazza di Spagna, the favorite quarter of foreigners, and the Ripetta. More than halfway up the Corso, and to the right, runs the wide street or Strada del Gesù, leading to the noble church and convent of that name, the chief residence of the order of the Jesuits. On either side of the Corso, the buildings are regular and substantial, and consist of palaces, such as the Borghese, the Ruspoli, the Ghigi, and others, besides many churches. Between the Corso and the Tiber, to the west, the streets are irregular, densely peopled with inferior tradesmen, and consisting mainly of market-places, shops, and dwellings of a low class. In this quarter is the University La Sapienza, between which and the Corso is the Rotunda or Pantheon. South of Ponte Sisto, on the left bank of the Tiber, and winding round the western base of the Capitol to the foot of the Palatine, is the Ghetto, or Jews' Quarter, consisting of narrow dirty alleys, with rows of high old houses.

Still further south, and on the left bank of the Tiber, runs a series of narrow streets as far as the Palatine, containing some of the oldest churches in R., such as the Santa Maria in Cosmedin, built in the 3d century. Beyond this extend to the south-east the Aventine, Palatine, and Cælian hills, which are covered with gardens, vineyards, and orchards, besides churches, convents, and ruins. At the eastern extremity of the Cælian stands the magnificent Basilica of San Giovanni in Laterano. To the south of the Aventine, and between it, the river, and the walls, are the Prati del Popolo Romano, forming part of a large space of lowlying cultivated ground. Near the Prati lies the Protestant Cemetery.

On the slope of the Pincian and Quirinal hills, and covering part of the plateau which joins all the eastern hills of R., lies the upper town, consisting mainly of palaces villas, churches, convents, and other buildings on a large scale. It abounds with ample courts, and gardens, and is crossed by two long streets, which intersect each other at right angles on the crest of the Quirinal. The Pincian is laid out in fine walks, which are the favorite promenade of the Romans; while between the Pincian and the Quirinal stands the great Barberini Palace. On the summit of the Quirinal is the famous pontifical palace and garden; and in the square before the palace are the two colossal statues of Castor and Pollux, with their horses, whence the hill receives its other name of Monte Cavallo. On the Esquiline, which here joins the Quirinal, and forms the eastern extremity of the city, stands the magnificent church of St. Maria Maggiore; beyond it to the north, east, and south, the Esquiline is entirely covered with gardens, villas, and fields, with here and there a church. The principal buildings on the Capitol are three palaces, the work of Michael Angelo, which form three sides of a square, in the center of which stands the equestrian statue of M. Aurelius Antoninus. One of the palaces is the Capitoline Museum, one of the finest collections of statuary and sculpture in Italy.

The third great division of the modern city lies on the right bank of the river, and is subdivided into two parts—the Vatican (otherwise called Il Borgo) and the Trastevere. Divided from the latter by an inner wall, the Borgo or Leonine city occupies the space between the bridge of St. Angelo and the Piazza of St. Peter's. Its chief buildings are the palace of the Vatican (q. v.), and the Basilica of St. Peter's (q. v). Besides the Vatican and St. Peter's, the Leonine city contains the great hospital of the Santo Spirito, which accommodates annually 13,500 patients, laboring under all diseases, whether mental or bodily. The Castle of St. Angelo, with massive circular tower, called from its founder the 'Mole of Hadrian,' is surrounded with ramparts, ditches, and bastions, mounted with cannon, and forms the citadel of Rome.

To the south of the Borgo, and between the Janiculum and the Tiber is the Trastevere, properly so called. The Janiculum, a straight ridge, about a mile and a half long from north to south, rises about 300 feet above the level of the river. The northern half of its length is occupied by the long street called the Lungara, running closely parallel to the Tiber, which, at the southern extremity of the Lungara, makes a bend to the east, and bounds the greater part of the Trastevere district. On the Janiculum is the Villa Spada, near the gate, outside of which is the Villa Pamfili, a favorite promenade of the Roman youth. On the same hill, the fountain called L'Acqua Paola, the largest in Rome, occupies a commanding site, and, as seen from a distance, resembles a triple triumphal arch, through which streams of water rush.

The churches, of which there are upwards of 300, form a notable feature in R., from their architecture, their paintings, and other decorations. So also are the palaces of the aristocracy, which are often of great magnitude, with vast courts and spacious apartments. Of even better style as residences are the villas, both within and without the walls; while the handsome fountains, of which there are at least 12 principal ones, impart a cheerful and refreshing aspect to the city. There are three modern aqueducts, which keep R. supplied with abundance of water: the Acqua Vergine, the Acqua Felice (the ancient Acqua Marcia and Claudia), and the Acqua Paola (the ancient Alsietina).

R. is, on the whole, a healthy city, except at the close of summer and the beginning of autumn, when the malaria is prevalent. The Trastevere is its most uniformly healthy district, the inhabtants of which are superior in physical development to those of the other parts. The neighborhoods of the Pincian and the Quirinal, particularly the former, are most frequented by Englishmen. The trade of the city is insignificant, consisting of a few trivial manufactures of hats, silk scarfs, gloves, artificial feathers, false pearls, mosaic trinkets, &c., and of such articles as artists need and visitors fancy. The only great manufacture, if it can be called so, is that of pictures, original and copied; for the painting of these, R. offers not only the advantage of numerous galleries of art, but purity of sky. The worst feature of R. is its dirtiness. In October, 1870, R., along with the rest of the Papal territory, was annexed to the kingdom of Italy, and is now the capital. The Pope retains the rights of a sovereign within the Vatican.

ROME, a township and village of New York, U.S., on the Mohawk River, Erie Canal, Black River Canal, and New York Central Railway, 100 miles north-west of Albany. It contains a U. S. arsenal, court-house, jail, academy, 15 churches, 2 newspapers, and numerous manufactories. Pop. (1870) 11,000; (1880) 12,045.

RO'MFORD, a market-town in the county of Essex, stands on the river Bourne, or Rom, 12 miles from London, on the Great Eastern line. The annual horse-fair commences on Midsummer Day, and lasts three days. There are extensive breweries of the famous 'Romford ale.' Agricultural implements are largely manufactured. Pop. (1881) 6861.

ROMILLY, SIR SAMUEL, English lawyer and law reformer, born March 1, 1757, was descended from a family of French Protestants, who, after the revocation of the Edict of Nantes, emigrated to England. At the age of 16, R. was articled to Mr. Lally, one of the sworn clerks in Chancery; and at 21 he entered himself at Gray's Inn. At first he made little progress in his profession; but after a time he began to apply himself to the study of criminal law; and in 1789, entertaining, like many other English Liberals, a sanguine expectation of the happy effects of the French Revolution, he published a short pamphlet on the subject.

In 1792, and again in 1795, he declined Lord Lansdowne's offer of a seat for Calne. In 1806, he was, at the instance of Mr. Fox, appointed Solicitor-general in the Grenville administration. He unwillingly received the honor of knighthood; but the king having, for the last twenty years, knighted all his Attorneys and Solicitors-General on their appointment, would take no refusal. He was afterwards returned for Queensborough, was one of the managers of Lord Melville's trial, and passed a bill to amend the bankrupt laws. In 1807, he went out of office, and was elected for Horsham, but being unseated, was returned for Wareham. He now devoted himself to ameliorate the severity of the criminal law, and proposed the abolition of the punishment of death in various cases of theft. He also published a pamphlet *On the Criminal Law as it relates to Capital Punishments*.

His bills were, session after session, opposed by the government of the day, the judges, and many of the bishops, as dangerous innovations; but R. nevertheless persevered, and lost no opportunity of protesting against the severity and frequency of capital punishments. The measures he proposed for mitigating the severity of the criminal law were, for the most part, carried by others; but he framed an act for rendering the punishment of high treason less barbarous, and another for taking away corruption of blood, as a consequence of attainder of felony. He took an active part in the anti-slavery agitation, and in opposing the suspension of the Habeas Corpus Act, the spy system, and the despotic acts of the government. In 1818, he was spontaneously chosen by the electors of Westminster as their representative. The death of his wife, following upon prolonged mental exertion, preyed upon his mind, and three days afterwards (November 2, 1818) he died by his own hand. He had at this time attained the foremost rank at the Chancery bar, and his professional gains were said to average £14,000 a year. His death excited profound sympathy, and was considered a public calamity. His *Speeches in Parliament* have been published in two vols.; and his Autobiography, with a selection from his Correspondence, admirably edited by his sons, has also been published in 2 vols.—His second son, Baron Romilly, educated at Trinity College, and called to the bar at Gray's Inn, 1827, was made Solicitor-general in 1848, Attorney-general in 1850, Master of the Rolls in 1851, and created a Baron in 1866. As Master of the Rolls R. incidentally rendered great services to his country, by superintending the publication of public records tending to throw much light upon English history and events. He died on December 23, 1874.

ROMORANTIN, a small town of France, in the dep. of Loir-et-Cher, 25 miles south-east of Blois. At the siege of this town by the Black Prince in 1356, artillery is said to have been first used. Various woollen fabrics are manufactured. Pop. (1876) 7436.

RO'MPU, in Heraldry, a term applied to a chevron when the upper part is taken off, and remains above it in the field.

RO'MULUS, the mythical founder of the city of Rome. His name is only a lengthened form of Romus, and he is therefore to be regarded rather as a symbolical representation of the Roman people than as an actual individual, like Æolus, Dorus, and Ion, the eponymous ancestors of the Æolians, Dorians, and Ionians. But though the legend of R. cannot be accepted as history in its details or its outlines, it is nevertheless interesting to know how, after the lapse of years, when Rome had become a place of importance, its inhabitants tried to conceive a probable origin for it. We will therefore relate the story of R. as it is usually given. At Alba Longa, in Latium, there had ruled for some centuries a line of kings descended from the Trojan prince, Æneas. One of the latest of these, at his death, left the kingdom to his eldest son, Numitor. Amulius, a younger brother of Numitor, who was ambitious, deprived the latter of the sovereignty, murdered his only son, and compelled his only daughter, Silvia (generally, but incorrectly, called Rhea Silvia), to become a vestal virgin, thereby hoping to secure immunity for his crime. But Silvia having become the mother of twins by the god Mars, his fears were aroused, and he resolved to drown all the three. A cradle containing the babes was thrown into the Anio, whence it was carried into the Tiber. That stream was then in flood, and had overspread its banks far and wide. The cradle was stranded at the foot of the Palatine, and the infants thus wonderfully saved from death by drowning, were no less wonderfully saved from death by hunger. A she-wolf carried them into her den, near at hand, and suckled them, while a woodpecker brought them whatever other food they wanted. This marvelous spectacle was at length beheld by Faustulus, the king's shepherd, who bore the infants home to his wife, Acca Larentia, and had them brought up with his own children.

A strife having one day arisen between them and the herdsmen of Numitor, who stalled their cattle on the Aventine, Remus, one of the twins, was taken prisoner, and carried off to Numitor. When the latter looked on the youth, he could not help thinking of his grandsons; and the story of the miraculous preservation of the twins, strengthened the suspicions that were beginning to form in his mind. R. now made his appearance, accompanied by his foster-father; an *éclaircissement* took place; Numitor acknowledged the boys as the sons of his daughter Silvia, and they immediately proceeded to avenge the family wrongs, by slaying Amulius, and placing their grandfather on the throne. But, continues the legend, R. and his brother did not care to remain in Alba Longa; they loved their old abode on the banks of the Tiber, and resolved to build a city there. The Palatine was chosen (by augury) for the site, and R., yolking a bullock and a heifer to a ploughshare, marked out the *pomœrium*, or boundary, on which he proceeded to build a wall. Remus laughed at the idea of keeping off enemies by such means, and to show its inefficiency, scornfully leaped ever it, whereupon R. slew him, but was immediately struck with remorse, and could obtain no rest till he had appeased the shade of his brother by instituting the *Lemuria*, or festival for the souls of the departed. The next thing which R. did was to erect a 'sanctuary' on the Capitoline for runaway slaves and homicides, and by this means he soon increased the number of his followers; but as wives were much wanted, R. tried to obtain them legally from the neighboring states. His efforts, however, failed: a 'runaway slave' not being considered a desirable match for his daughter by a Latin or Sabine paterfamilias, and he was compelled to have recourse to stratagem. This led to the celebrated *Rape of the Sabine Women*, the incidents of which are too familiar to require narration. The consequence of this wholesale abduction of virgins was a series of wars, in which, however, R. was invariably victorious, until Titus Tatius, at the head of a large army of Sabines, drove him from the open fields, and forced him to take refuge in his city on the Palatine.

R. had also garrisoned the Capitoline, but the treachery of Tarpeia, a daughter of the lieutenant of the fort, placed it in the hands of his adversaries. Next day, a battle took place in the valley between the two hills. It was long and fiercely contested. Sabines and Romans fought till they were exhausted, when the Sabine women rushed in between their husbands and fathers, and implored them to be reconciled. This was agreed to, and henceforth they resolved to unite and to form only one people—the followers of R. dwelling on the Palatine, those of Titus Tatius on the Capitoline and Quirinal. On the death of Titus Tatius, who was murdered at a festival held at Lavinium, R became sole sovereign, and subsequently—according to a later legend—made successful war against the Etruscan cities of Fidenæ and Veii. The political organization of the Roman *populus* ascribed to R. is given under Rome. After a reign of 37 years, R. was miraculously removed from earth. While he was standing near the 'Goat's Pool,' in the Campus Martius, reviewing his militia, the sun was eclipsed, and a dark storm swept over the plain and hills. When it had passed, the people looked round for their king, but he was gone. His father, Mars, had carried him up to heaven (like the prophet Elijah) in a chariot of fire. Some time after, he reappeared in a glorified form to Proculus Julius, announced the future glory of the Roman people, and told him that henceforth he would watch over them as their guardian god, under the name of Quirinus. The festival of the Quirinalia (17th February) was instituted in his honor; but the nones of Quintilis (7th July) was the day on which he was believed to have departed from earth.

RO'MULUS AUGU'STULUS. See Odoacer.

RO'NALDSHAY, North and South, two of the Orkney Islands (q. v.). *North R.*, situated at the north extremity of the Orkneys, has an area of 4 sq. miles. It is partly under tillage, and partly in pasture. Sea-birds in great variety frequent the coasts, and lobsters and cod are fished. Pop. (1881) 547.—*South R.*, washed on the south by the Pentland Firth, has an area of about 18 sq. miles. St. Margaret's Hope, on the north coast, is a safe and convenient harbor. The inhabitants derive their subsistence for the most part from fishing for cod and herrings. Pop. (1881) 2557.

RONCESVALLES, one of the valleys in Navarre, on the southern side of the Pyrenees, about 20 miles north-north-east of Pamplona, has been rendered famous in poem and story as the scene of a defeat sustained by the army of Charlemagne at the hands of a combined force of Arabs, Navarrese, and French Gascons in 778. Charlemagne, allured by the promise of the feudal supremacy of Catalonia, opened a campaign in aid of the viceroy of that province against the Mohammedans. With a powerful army he passed the Pyrenees, penetrated into Navarre, took Pamplona, the capital, and levelled the walls of the city with the ground. Clearly this was not part of his programme as the champion of the Christian religion in Spain; for Pamplona was the capital of a Christian state, and it is even asserted that prior to 870 A.D. Moors had not been admitted within its walls. Pressing onward, Charlemagne subdued a great part of the country between the Pyrenees and the Ebro; but on his return northward, while threading the defiles of the mountains near R.,

his rear-guard was furiously assailed and annihilated by a mixed force, of which a body of Navarrese, enraged at the destruction of their capital, formed an important section.

Eginhard, the secretary of the emperor, tells us that the whole rear-guard, including many generals and chief nobles, was totally destroyed, and that the spoil of the campaign, together with the whole baggage of the army, fell into the hands of the victors. In this action fell Roland (q. v.), the famous Paladin, and the hero of a hundred romances. The older poets found abundant material in the battle of R., in which, on the one side, ranked the most distinguished chivalry of that time, and on the other the patriotic, high-spirited, mountaineers of Navarre; and in recent times the incident has contributed a spirited allusion to Sir Walter Scott's *Marmion :*

'Oh, for a blast of that dread horn,
On Fontarabian echoes borne,
That to King Charles did come,
When Roland brave, and Olivier,
And every paladin and peer,
On Roncesvalles died!'

RONCIGLIO'NE, a city of Central Italy, in the province of Rome, and 12 miles south-south-east of the city of Viterbo. Pop. 6084. It has a fine cathedral, a Gothic castle, and several fine old palaces. Hats, cloth, and cotton goods, are manufactured, and iron, brass, and copper works are in operation. In the neighborhood of the city there are sepulchral vaults, hollowed out in the porous rock (*tufo*), and several sulphureous springs.

RO'NDA, a picturesque Moorish town of Spain, in the modern province of Malaga, on the Guadiaro, 50 miles north-north-east of Gibraltar. Situated at a considerable elevation, the climate of R. is unusually salubrious, and the town is a favorite summer retreat for the wealthy of Seville, Ecija, and Malaga. The great annual fair takes place in May, at which time R., its bulls and bravoes, are seen to the greatest advantage. On such occasions, the small but active horses of the town are sold in large numbers to officers from Gibraltar; and leather, saddlery, embroidered gaiters, garters, and mantas, are also sold. Pop. 23,500.

RONDELET, WILLIAM, a French naturalist, born at Montpellier in 1507; died 1566. He became a medical practitioner in Montpellier, and professor in the medical school there. He was a zealous student of natural history, and particularly distinguished himself in ichthyology. His *Histoire entière des Poissons* (Lyon, 1558) was one of the first works which contributed much to the progress of that branch of science.

RO'NDO (Ital.), or RONDEAU (Fr.), originally a little poem of 13 lines, divided into three unequal strophes; the two or three first words of the first line serve as the burden, and recur after the 8th and 13th line. Thence, in music, the term has come to denote a light air, consisting of three or more strains, the first terminating in the original key, and each of the others so constructed as to conduct the ear back to a repetition of the first strain. In a more general sense, the name rondo is also often applied to any light lively tune which ends with the first strain repeated.

RONGE, JOHANN. See GERMAN CATHOLICS.

RONSARD, PIERRE DE, a celebrated French poet and reformer of French poetry, was born at the Château de la Poisonnière, in Vendômois, September 11, 1524. At the age of nine, he was sent to the Collége de Navarre, but was soon removed, and shortly after entered the service of the Dauphin as page. Handsome, well-made, and excelling in all bodily accomplishments, he soon became a general favorite. When his master died (1536), he became attached to the household of the Duc d'Orléans, second son of the king, accompanied James V. of Scotland back to his kingdom, with his new bride, Marie de Lorraine, in 1538; and after a stay of nearly three years at the Scottish, and six months at the English court, he returned to France, and re-entered the service of the duke. A little later, however, on recovering from a serious illness, he found himself afflicted with a deafness, which led him to resign the pursuits of arms for those of letters. With this view, he took up his residence in the Collége de Coqueret, and studied hard for five years. He had previously acquired a knowledge of Latin and of several European languages. His own language, as a vehicle of literary instruction, was a subject of continual meditation with him.

Familiar now with the masterpieces of Greece and Rome, he wished (like a true child of the Renaissance, as he was) to invest the national poetry with a classic dignity and grace. Several of his fellow-students shared his opinions and enthusiasm; and in 1549, one of these, Joachim du Bellay, published what may be called the first manifesto of the new school, the *Illustration de la Langue Françoise*. Without denying the necessity or the value of the change thus begun by R. and his friends, we may just remark in passing that the most intelligent French critics now admit that it was too radical, too absolute: it broke abruptly with the national traditions and tendencies, and more than anything else helped to fix that pseudo-classicism of style which was subsequently brought to disastrous perfection in the *splendida vitia* of Corneille and Racine. In 1550, R. himself appeared in the field with his *Amours* and *Quatre Livres d'Odes*. The volume excited the most violent opposition among the adherents of the older national school, and it cannot be said that their antipathy was altogether unreasonable. Rabelais (q. v.) was conspicuous among the adversaries of the new school, and made R. the subject of some bitter sarcasms. But on the whole, the classic party had the best of it. Its efforts were in harmony with the general intellectual tendencies of the time, and besides, R. was just the man to make powerful friends. Marguerite, sister of Henry II., granted him a pension; the illustrious Chancellor De l'Hôpital warmly encouraged him to persevere in his course; and both Henry II. and François II. covered him with honors and pensions. In 1553, a new edition of the *Amours* was published; in 1555, the first, in 1556, the second, volume of his *Hymnes;* and finally, in 1560, an edition of his whole works up to this period, in four volumes. The admiration of his contemporaries intoxicated him; and he did not shrink from conferring on himself a sort of anticipatory apotheosis.

During the religious wars that devastated France, R. made himself noted by the violence of his attacks on the Calvinists or Huguenots. Twenty days after the massacre of St. Bartholomew, he published *La Françiade*, an epic fragment. He meant that it should comprise 24 books, but he only finished 4, having, perhaps, discovered that the subject was not happily chosen, and that epic poetry was a touch above him; yet such was the belief in his genius, that not a few of his contemporaries did not hesitate to prefer it to the *Æneid*. Charles IX. could only express *his* delight by conferring on the lucky bard additional favors. He gave R. the abbeys of Croix-Val and Bellozane, and the priories of Saint-Cosme, of Evailles, &c. But the 'disorders' of what his countrymen call his 'joyous' youth, now began to tell upon him, and, afflicted with premature infirmities, he retired to the abbey of Croix-Val, where he spent most of his remaining years in lettered ease, honored with the attentions of the great to the last. Queen Elizabeth of England sent him a set of diamonds, and Mary Stewart, from her prison, a set of plate worth 2000 crowns, with the inscription :

A' Ronsard, l'Apollon de la Source des Muses.

In 1584, he collected and republished his whole works in one volume, and died on December 27 of the year following.—See Saint-Beuve's *Œuvres Choisies de P. Ronsard, avec Notice, Notes et Commentaires* (Paris, 1828).

ROOD, a measure of surface, the fourth part of an acre, and containing 40 square poles or perches. It is quite different from the rood used in estimating mason-work, for which see ROD.

ROOD (Anglo-Sax. *rod*, a cross), a figure of the cross, and generally of the crucifix. The word is also applied to the actual cross on which our Lord suffered, although, when used to signify the relics of the true cross, it is commonly found with the prefix Holy, from which Holyrood at Edinburgh derives its name; but in its most ordinary signification it is applied to the large and striking crucifix which was placed at the entrance of the chancel in most medieval churches. On either side of the cross most commonly were placed figures of the Blessed Virgin and St. John, in allusion to John xix. 26. The manner of placing the rood differed in different churches; most commonly it stood upon a gallery or screen at the entrance of the chancel, which was called the ROOD-LOFT or Rood-screen. In England, after the Reformation, the rood of course was, as a rule, removed from all churches; but in a few country churches it still remains in a more or less perfect form. A very perfect foreign example of the rood is in the great church of Louvain.

ROOF. The coverings of houses vary in every climate and every age. In warm countries, such as India, flat roofs, covered with cement, are almost invariably used. The frequent allusions in the Bible to the house-top show that the roofs of Palestine were flat in ancient times as they are now. Those of Egypt and Assyria (q. v.) were also flat, and were composed of wooden beams, covered with thick layers of earth, forming an impenetrable protection from the fierce heat of the sun. In countries where the climate is milder, and rain more abundant, roofs sloping from a central ridge are the usual form. The Greeks and Romans constructed their roofs in this way. Those of Greece were, in important works, covered with marble slabs, carefully grooved together, so as most effectually to protect the interior from rain. In the common buildings of Greece and Rome, roofing-tiles are used.

In the rainy climate north of the Alps, roofs of a much steeper pitch are employed, so as the more readily to throw off rain and snow. The angle at the ridge is not uncommonly a right angle; and roofs slated in the usual way should never be less than ¼ of

the span (or width between supports) in height. When large slates are used, ⅓ of the span in height will suffice.

When roofs are well constructed, they serve to bind the walls together, and thus to strengthen the building. In order to do this effectually, they must not be made of too great weight, otherwise they crush the walls. The actual covering of the roof and its supports are therefore made as light as possible, and the strength concentrated in principals or trusses. The following are the commonest forms of these trusses: Fig. 1. represents what is

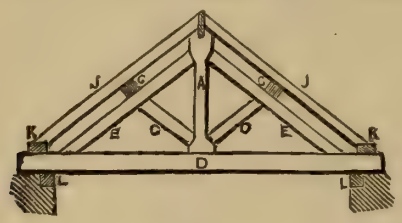


Fig. 1.

called a king-post roof (A being the king-post), and fig. 2 a queen-post roof (B, B being the queen-posts). The latter is used for

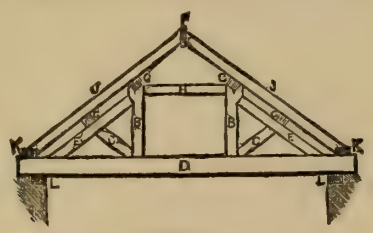


Fig. 2

wider spans than the former, and has the advantage of leaving the center of the roof clear of timbers, so that attic rooms may be introduced. The other members of the truss are named as follows: C, C, C, C, braces or struts; D, D, tie-beams; E, E, E, E,



Fig. 3.

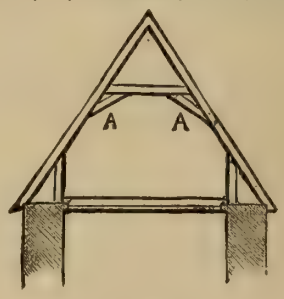


Fig. 4.

principal rafters; F, F, ridge-pieces; G, G, &c., purlins; these and the ridge-piece are laid across from truss to truss, and carry the common rafters, J, J. H is a collar. K, K the pole-plates, and L, L the wall-plates, are laid along at the wall-head, to bind the wall and feet of rafters together.

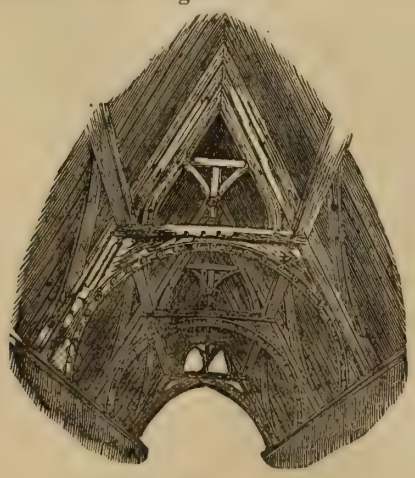


Fig. 5.

The above system of construction has been used from a very early time to the present day. The early Christian, and probably the Roman basilicas, had exactly such roofs. In early Gothic times, roofs of this kind were made ornamental by carving the king-post, and moulding the tie-beam. During the Decorated style, an arch, or a series of cants (A, A) was introduced, as shown in figs. 3, 4, and 5. As the style progressed, curved braces were placed under the tie-beam, to support it; these were carved and rested on elegant corbels, the spandrels between the braces and



Fig. 6.

the wall being filled with tracery. In the Perpendicular style the central part of the tie-beam is cut away, and the beautiful Hammer-beam (q. v.) roofs of the period become usual (see fig. 6.). The roof of Westminster Hall is one of the finest examples of this kind of roof. These open timber-roofs are used both in churches and halls, but chiefly in the latter, as the church roofs were frequently vaulted. See VAULT. In modern times, when great spans have to be roofed over, combinations similar to those used in Lattice Bridges (q. v.) are required. Recently, iron has been introduced, and by means of it, spaces of almost any width can be roofed over.

ROOK (*Corvus frugilegus*), a species of Crow (q. v.), very common in the southern parts of Britain, and found in many parts of Europe and Asia, even to Japan; about the same size with the common or carrion crow, but easily distinguished from it, even at a distance, by its color, which is a glossy, deep-blue black, in certain aspects grayish. On a nearer view, a more notable distinction is found in the naked warty skin at the base of the bill, extending back rather beyond the eyes, and pretty far down on the throat. Still more different are the habits of the birds, the common crow frequenting lonely situations, and preying much on carrion; the R. choosing rather the neighborhood of human habitations, and seeking its food, both animal and vegetable, chiefly in cultivated fields. Moreover, whilst the common crow is solitary, the R. is gregarious; and very large companies often assemble in *rookeries*, making their nests in close proximity, generally in tall trees, the same tree often sustaining many nests. So far are they from disliking the companionship of man, that it is not uncommon for rooks to build their nests in the trees which grow in the midst of great cities. A tree even in Cheapside has been occupied by rooks' nests. Few cities or large towns in Britain are without rookeries, sometimes of considerable magnitude. The smoke seems to be disregarded by the birds. The R. is nowhere more abundant than in England and the south of Scotland, but it becomes rare in the northern parts of Scotland, and is not to be seen in Orkney and Shetland; probably, however, not on account of climate, but from want of trees. Sometimes, indeed, rooks have been known to make their nests in steeples, vanes, &c., but rarely. They have been observed to avoid with peculiar caution trees which are decaying and likely soon to be blown over—perhaps, however, on account of the state of their twigs—and trees that are marked on the trunk for cutting down. They are notable for the care with which they guard against the approach of danger, when they are feeding in fields, a few solitary rooks perched on trees, palings, or the like, being ready to give the *caw* of alarm to the often very numerous flock. They are also notable for their dread of a gun, the danger of which they seem to know; so that a man without a gun may approach them much more nearly than a man who carries a gun, and even a stick lifted up is apt to excite their alarm.

It is also commonly believed in some districts that they know Sunday, and are less timid of the approach of man on that day than on other days of the week. A gig or carriage may approach them much more nearly than a man on foot, and they are very indifferent about the passage of a railway train. It is interesting also to observe how soon they become familiarly acquainted with

scarecrows. The nests of rooks are formed of twigs, lined with grass and fibrous roots; generally containing four or five eggs, of a pale greenish color, blotched with dark greenish-brown. During the nest-making time, rooks rob each other in a remarkable manner, and prodigious quarrels arise in rookeries on this account. Any pair attempting to found a separate colony on a tree far apart, are apt to be assailed by the whole force of the rookery, and the nest pulled to pieces, its materials of course being carried off.

Rookeries are sometimes of great size, and immense flocks of rooks are often to be seen feeding together in fields, or darkening the sky in their outward or homeward flight. Farmers very often complain of them for rooting up grass and young corn, and for injury to young potatoes, turnips, &c.; but on the other hand, it is urged that they are of very great use by eating up wire-worms, cock-chafer grubs, and other insect larvæ, slugs, &c., and that the grass pulled by them is very often that of which larvæ have already devoured the roots. The truth appears to be that rooks in moderate numbers are very useful; but that it is possible to protect them too much, until their multitudes become a nuisance in a neighborhood, the insufficient quantity of their favorite food compelling them to other resources not so agreeable to the farmer; and at least in such circumstances they certainly devour large quantities of grain.

It has been supposed that the naked space at the base of the bill of the R. is in consequence of its habit of digging in the ground, and in support of this view it is urged that this space is feathered in the young bird; but it is found to become naked even in rooks caged from the beginning of their life, and there are numerous other arguments against the supposition. The naked space must be regarded as a natural peculiarity of the species.

The same rooks seem to take possession of their old nests year after year, repairing them, and not building new ones. The time of building and repairing nests is one of prodigious clamor in the rookery, and begins early in spring. The male R. feeds the female assiduously during incubation, and sometimes takes her place on the nest. Both parents bring food to their young ones.

The R. is capable of being tamed, and tame rooks have been known to exhibit something of the imitative power of voice possessed by several other birds of the same family.

White, cream-colored, and pied rooks are now and then seen. These peculiarities of plumage probably arise from a more or less diseased condition.

ROOKERIES, in Law. Though rooks are often encouraged to breed in and to frequent the trees of an estate, yet they are not protected in any way by laws resembling the Game Laws, which inflict penalties for illegally trespassing to take or kill them. The rooks, while frequenting the rookery, whether it is an ancient or a newly-made rookery, are in the ordinary category of wild animals, and the owner of the estate or ground where the trees grow has no more property in them than any other person. The owner of a rookery once brought an action against a neighbor for shooting at the rooks as they were flying over the neighbor's estate towards the rookery; but the English courts held that no such action was maintainable, for every person may shoot and catch a wild animal upon his own lands, if he pleases. The law is the same in Ireland and Scotland. No person can be given into custody, or fined, or punished by justices of the peace for trespassing in order to shoot at rooks; nevertheless, the owner or occupier of the ground trespassed upon may bring an action of damages against the trespasser.

ROOKE, SIR GEORGE, a distinguished British admiral, was born in the year 1650, near Canterbury, at the country-seat of his father, Sir William Rooke. Having entered the navy, he found himself, at the age of 30, a post-captain; and in 1689, he was promoted to the rank of rear-admiral. He was engaged in the action off Beachy Head between the Earl of Torrington and the French admiral De Tourville; and in 1692, he took part in the memorable battle of La Hogue, fought between the French fleet and the combined English and Dutch force under Admiral Russell. On this occasion, his services were of the most brilliant and dashing character, and in acknowledgment of them, he received the rank of vice-admiral of the red, the honor of knighthood, and a pension of £1000 a year. His next important service was the destruction of a Spanish plate-fleet in the port of Vigo; and in July 1704, in conjunction with Sir Cloudesley Shovel, he accomplished the capture of Gibraltar. Such was the vigor of the operations, that a single week sufficed for the reduction of a fortress, which, as having defied the most formidable, elaborate, and prolonged attack, has since been reputed impregnable. On the 9th August of the same year, he engaged off Malaga a French fleet of much superior force, under the Comte de Toulouse, and fought one of the bloodiest of our naval battles, the honors of which fairly remained with the English, though the escape of the enemy's force rendered it by comparison a barren triumph. The struggle lasted through nearly a whole day; the French loss was upwards of 3000, the English upwards of 2000 men. On the return of Sir George to England, he was received with marked distinction by Queen Anne; but finding the hostility of the government directed against him on the merely partisan ground of his having previously, as member for Portsmouth, allied himself with the opposition, he resigned his employments, and along with them his seat in parliament; and till his death, which took place on the 24th January 1709, led the life of a quiet country gentleman on the family property in Kent. He was thrice married, and left behind him one son by his second wife.

ROOT, in Botany, sometimes designated the *descending axis* of a plant, that part by which it is fixed to the soil and derives nourishment from the soil. The root is developed in the germination of the seed, at or about the same time with the stem, and forces its way downwards as the stem grows upwards. The root differs from the stem in the irregularity of its ramifications, in the want of a central pith, in the want of buds, in the want of scales or of scars to indicate their former presence, and in the want of stomata. The axis of the root giving off branches, these finally subdivide into *fibrils*, which are little bundles of annular ducts, or sometimes of spiral vessels encased in woody fibre, and covered with a lax cellular integument. The apex of each fibril is sometimes called the *spongiole:* it consists of extremely lax cellular tissue, and has the property of absorbing fluids with great rapidity, thus subserving the nourishment of the plant. See ENDOSMOSE.—Aërial roots occur in some plants, as in some *Epiphytes*, the Banyan, Mangroves, &c.; by which nourishment is derived from the air, in addition to that obtained through the leaves and bark, or by which the branches seek to connect themselves anew with the ground, for support and nourishment; and many plants, as Willows, produce adventitious roots very readily, when any portion of the stem or branch is imbedded in moist soil, of which advantage is taken for their artificial propagation.—The central axis of many roots goes deep into the ground in a tapering manner, forming what is called a *tap-root;* other roots have the descending axis very short, and are called *fibrous.* The roots of some plants spread very widely; those of others occupy a very limited space.

The roots of coniferous trees and palms are very small when compared with the appearance of the tree above ground.—Tap roots sometimes assume a conical form, as in the carrot; others are variously developed in thickness at the upper part, as in the turnip and radish. TUBERS (q. v.), BULBS (q. v.) and CORMS (q. v.) are peculiar developments, evidently intended to secure a store of nourishment for the plant, but which also are very frequently available for the use of man.—Esculent roots are numerous, and many roots also contain secretions either peculiar to themselves, or more abundant than in the other parts of the plant, and become therefore useful in medicine or in the arts, while some are very poisonous. The roots used for food, besides the tubers, bulbs, and corms above mentioned, are generally those which are thick and fleshy. The plants to which they belong are of very different genera and orders—some of the natural order *Cruciferæ*, as the Turnip and others of the genus *Brassica*—some of the order *Chenopodiaceæ*, as Beet and Mangold Wurzel—some of the order *Umbelliferæ*, as the Carrot, Parsnip, &c.—some of the order *Leguminosæ*, as the *Pachyrhizos angulatus*, which is cultivated in all parts of the East Indies, and *P. trilobus*, which is cultivated in Cochin China. In many of the lower classes of plants, particularly the Algæ, there is no root whatever, although the plant is often attached by a base.

ROOT, in Philology, is that part which is common to a group of allied words—the germ out of which they have all sprung. It is arrived at by taking away the formative parts—the suffixes and affixes, and reversing any change that their presence may have caused. Thus, in co-in-*cid*-ence, the root-syllable is *cid*, the primary form of which in Lat. is *cad*, to fall. It is seldom that this analysis can be successfully performed with only one language; in order to get at the true root, the corresponding words in all the languages of the same family must be compared. Thus, in the Eng. words *story*, *history*, *historical*, *historically*, *histor* would seem to be the root; but by comparing the Greek with the Lat. and Sanscrit, we arrive at a syllable *vid*, meaning to see or know, of which the Eng. (to) *wit* (wist) is only another form. And even then we are not sure that we have arrived at the original and most simple form. Thus, Eng. *yoke*, Lat. *jugum*, come from the syllable *jug*, to join, seen in Lat. *ju(n)go*, Gr. *zeugo;* and this might be rested in as the root, were there not a simpler form, *ju*, preserved in Sans., and having the meaning of mingling or being together; this, which may be taken as the primary root, gives rise to the two secondary roots or modifications, *jug*, to join, and *yudh*, to fight (i. e., to join battle).

The roots of the Aryan languages are always monosyllabic, as *i*, to go; *ga*, to go; *ad*, to eat; *vak*, to speak; *star*, to strew. They are divisible into two classes, the one expressing some action

or general property, as in the instances now given; the other indicating relative position, as *ma*, here or me; *ta*, there or that. The one class are called *predicative* roots; the other, *pronominal* (see PRONOUN, PREPOSITION). They all expressed primarily some physical notion or relation palpable to the senses; but from these the transition to the impalpable conceptions of the mind is natural and obvious; thus, *vid*, to see, served also for to know. The notion expressed by a root-word is always of a very general kind; but by a variety of expedients, such as lengthening the vowel, reduplication of the syllable, prefixing and affixing letters and syllables (many of which at least are evidently pronominal roots), and composition with other predicative roots, one germ gives rise to a whole group of words expressive of the specific applications of the generic idea. Thus, from the root *spac* or *spec* (in Gr. *skep*), to look, have sprung a numerous family of words in the English and other kindred tongues; *spy*, *despise* (to look down upon), *spite* (through Fr. *despit*), *respite*, *respectable*, *suspicion*, *prospect*, *inspect*, *auspices*, *speculum*, *species* (i. e., the appearance or individual form, as opposed to the kind or genus), *spices*, &c.

Roots, in the Aryan languages, never enter into speech in their pure and simple form; to make them words, they almost always take on the addition of a pronominal element. Thus, the reduplicate root *da-da*, having the sense of giving, becomes, by the addition of *mi*, my, the word *da-dâ-mi*, I give; *vak*, to speak, by affixing *s* (for *sa*, that), becomes *vaks*, in Lat. *vox* (*voks*), voice (i. e., that speaking). See INFLECTION.

It requires but a few germs to produce, by the processes above described, the most copious vocabulary. The 50,000 words of the Chinese dictionary are formed from 450 roots; those of Hebrew and of Sanscrit are reckoned at about 500; and there are probably not many more in English (see Max Müller's *Lectures*, 1st series, p. 252). The theories as to the origin of the roots themselves, and why a particular thing or notion should have become associated with a particular sound more than with any other, are noticed under PHILOLOGY and ONOMATOPŒIA.

ROOT, in Algebra, denotes any value of the unknown quantity in an equation, which will render both sides of it identical. See EQUATION, INDETERMINATE PROBLEMS, IRREDUCIBLE CASE, &c. The determination of the roots of equations, either formally or actually, constitutes the greater portion of the science of Algebra, while the approximation to roots of those equations whose degree is still beyond a general solution (4th and upwards) forms almost a separate branch of itself. Roots are divided into various classes; they are *real* when they consist of numerical quantities positive or negative; and *imaginary* when they assume the form $a + b\sqrt{-1}$.

ROOT-MILDEW, a name given, not to any well-determined species of fungus, but to certain *mycelia*, which infest the roots of peaches, apples, roses, currants, &c., and cause their death. The tree or shrub is often very suddenly cut down, from apparently perfect health. The roots are found more or less decayed, and covered with filmy white threads. The *mycelium* is supposed to belong to species of *Polyporus*. In some plants, as roses, the state of the bark just above the soil is believed to be premonitory of the disease, which may perhaps then be arrested by washing with a solution of corrosive sublimate. But the mycelium is not easily destroyed, and a tree of the same kind should not be planted where it has proved fatal.

ROOT-PARASITES, plants which grow upon, and derive their nourishment from, the roots of other plants. Such are the Broomrapes (*Orobancheæ*, q. v.), species of *Thesium*, &c., and the *Rafflesias* (q. v.), with other *Rhizantheæ* (q. v.).

ROOT-STOCK, or RHIZOME (*Rhizoma*), in Botany, a stem running along the surface of the ground, partially covered with soil; sending out roots from its lower side, and leaf-buds from its upper. The common yellow iris affords a very perfect example of it. Many ferns have root-stocks. The root-stock is often regarded as a creeping root; it is, really, however, not a root, but a stem.

ROPE AND ROPE-MAKING. Ropes are usually made of vegetable fibres, and differ only from twine in their much greater thickness. The fibre most commonly used in Britain is hemp; but large quantities of plantain fibre, called Manilla hemp, made from the leaf-stalks of *Musa textilis*, are also employed, especially for the large ropes used for various purposes on board ships. Ropes consist of many thicknesses of yarn, which is spun by hand in places called rope-walks. The spinner has a large bundle of the fibre loosely gathered round his waist, from which he pulls out a few fibres, and attaches them to a hook in the turning wheel or whirl, which is stationary, and is worked by an assistant. Experience teaches him what number of fibres to draw out, and how to twist them so as to hold firmly on to the hook. He then walks slowly backward down the rope-ground, gradually drawing out or regulating the pulling out of the fibres so as to make an equal yarn, which receives the necessary twist from the whirl. When he has got to the end of the walk, another spinner takes the yarn from the hook of the whirl, and fixes it to a reel, which is then set in motion; and he attaches a second portion of hemp from his own supply to the hook, and proceeds down the walk as the previous one had done. In the meantime, the first spinner gradually walks up the ground, carefully guiding his length of yarn as it is wound on the reel. When he reaches the reel, it stops, and he waits until the second spinner's length is completed. He then in his turn takes it off the hook, and twists it on to his own; and the reel being again started, receives the additional length from the second man, and so on until the full length required is made up.

The next operation is called *warping*, and consists in stretching out the number of yarns required for a rope. These are all slightly twisted again separately, and stretched to an equal length. Then, if they are intended for tarred ropes, each yarn is drawn separately, either lengthwise or in a hank, through a kettle of hot tar. The superfluous tar is removed by drawing it through a hole lined with oakum. In the next process, called *laying*, two or more yarns are attached to hooks on a whirl, so that when it is turned they will be twisted together the contrary way of the original twist they received in the first spinning. When this is done, it is called a strand. Then as many of these strands as are required for the rope are stretched at full length, and are attached at each end to whirls. One of the whirls has but one hook, to which all the strands are attached; the other has as many hooks as there are strands, one always being central, and a strand is attached to each. The whirls are then put in motion, but in opposite directions, and this causes the outer strands to be laid with great regularity and firmness around the central one. Such is the ordinary process of rope-making; but machines have been invented which produce ropes with such mathematical precision that the strength of the rope may be calculated with great exactness. Captain Huddart has the merit of effecting these improvements; and very few applications of mechanism are more beautiful in their details than those which he has worked out. They, however, do not alter the principle of the manufacture. Within the last few years a great improvement has been patented by Mr. Edward Sang of Edinburgh, and is now in profitable use in the large establishment of the Edinburgh and Leith Ropery Company. It consists of a machine which spins the yarn from material supplied as before by hand, but it does away with the long walk, and can be used in a small room.

Large ropes are either what is called *cable-laid* or *hawser-laid*. The former consist of three large strands, each made up of three smaller strands. A cable-laid rope of eight inches' circumference is made up in this way of nine strands, each containing thirty-seven original yarns, or altogether 333 yarns. A hawser-laid rope consists of only three strands, each containing a sufficient number of yarns to make up the required thickness. The numerous lives and the vast property depending on the efficiency of ropes employed in shipping have caused a great amount of ingenuity and care to be brought to bear on the manufacture. One very great improvement of modern times has been the introduction of wire-ropes, which are now extensively used in rigging ships, and for other purposes. They are generally made of iron wire, sometimes but not always galvanized. The twisting is effected in the same way as that in which the strands of a hempen rope are laid together.

ROQUE, ST., a popular saint of the Roman Catholic Church in France, who is especially considered the patron of those sick of the plague. Of his history, nevertheless, few particulars have been preserved. He was born of a noble family in Montpelier, early in the 14th, or at the end of the 13th c.; and having undertaken a pilgrimage to Rome, was surprised, upon his way through Italy, by an outbreak of the plague at Piacenza, where he devoted himself with generous zeal to the care of the victims of this pestilence. Falling sick of the plague himself, and abandoned by man, he contrived to drag himself to a neighboring wood, where a dog used to lick his sores; and it pleased God to restore him to health. He returned to France; and after a life of great sanctity, died at Montpelier, probably in 1327.

RO'REE, RORI, or LOHRI, a decayed town of Sinde, stands on a picturesque rocky eminence, on the east bank of the Indus, in lat. 27° 38′ N. Steamers ply to and from Hyderabad. Cotton and silk fabrics, gold and silver wares, paper, and leather, are manufactured. Pop. (1872) 8580.

RO'RQUAL (*Rorqualus*, *Balænoptera*, or *Physalus*), a genus of Cetacea of the same family (*Balænidæ*) to which the Greenland whale belongs, and distinguished by having a dorsal fin, which, however, is not large in comparison with the size of the animal, and is pointed, the point directed backward; and also by the form of the head, which, instead of having the upper jaw much arched, as in the Greenland whale, has it in the skeleton nearly straight, the plates of baleen or whalebone being therefore much shorter

whilst along the throat and belly are many longitudinal folds, allowing of the distention of the integuments so as to form a great pouch for the reception of water and prey, to be afterwards sifted by the plates of baleen. For a long time these folds of the throat



Northern Rorqual.

and belly were a puzzle to naturalists, but their use seems now to be thoroughly ascertained. The form is more elongated than in the Greenland whale, and as the girth of the largest rorquals has been found equal to that of the largest Greenland whales, the rorquals appear to be the largest of the Cetacea, and indeed of all animals at present existing in the world.

The northern R. sometimes rather exceeds 100 feet in length. Concerning the species of this genus, there is great doubt and uncertainty. Some naturalists confidently assert the existence of several species in the northern seas, and a genus *Rorqualus* or *Physalus*, has been constituted distinct from *Balænoptera*, the largest species being referred to the former; and a smaller one, said not to exceed 25 feet in length, and known as the *Pike Whale*, from the resemblance of the mouth to that of a pike, being assigned to the latter. Other naturalists of no mean reputation doubt if the Pike Whale (*Balænoptera rostrata*, or *B. musculus*) is anything else than the young of the Great Northern R. (*R. Boops*), the *Fin-fish* or *Razor-back* of whalers. The question was supposed to have been determined by Mr. F. Knox, of Edinburgh, who found the number of vertebræ to be different in specimens cast upon the Scottish shores; but the number of vertebræ has been found so different in other specimens examined, that either this must be a comparatively unimportant character, or the number of species must be greater than has been supposed. The northern R. is of a slate-gray color, whitish beneath. It is found in the arctic seas, visiting also those of the northern temperate regions, and is not very unfrequent on the coasts of Britain. When it comes to the surface of the water to blow, it does not lie motionless, as the Greenland whale usually does, but swims at the rate of about five miles an hour, and in blowing, it makes a prodigious noise. Its speed, when harpooned, is very great.

Scoresby mentions an instance of one carrying out 3000 feet of line in a minute. It is not easily captured; and whalers dislike it, because the Greenland whale is seldom found near it, whilst its own value is very inferior, owing to the comparative thinness of the blubber, and the shortness and inferior quality of the whalebone. It is, however, an important object of pursuit to the Laplanders and Greenlanders, who wear it out by assailing it with weapon after weapon, and finally divide the spoil. A large R. yields 4000 gallons of oil.—The R. does not feed so exclusively on small prey—acalephæ, molluscs, &c.—as the Greenland whale. Its gullet is much wider, and it preys much on fishes, the shoals of which it follows into bays and estuaries, devouring them in multitudes. The stomach of a R. has been found to contain 600 large cod, and a great quantity of pilchards. One which frequented the Firth of Forth for 20 years was well known to the fishermen there, and much detested by them. It was at last stranded at Abercorn in 1692. It was 78 feet long.—In the southern seas, another, species of R. is found (*R., B.*, or *P. Australis*), which has a long dorsal fin, placed further forward than in the northern rorqual. It attains a large size. The South Sea whalers do not care to pursue it. Its range seems to extend to the northern hemisphere in the Pacific.

ROSA, SALVATOR, was born at Renella, in the neighborhood of Naples, in 1615. His first instructor was Francesco Francaziani, who had married his sister. Some of his landscapes attracted the notice of Lanfranco, who purchasing them, enabled and encouraged the young artist to pursue his studies. He became a pupil of Aniello Falcone, a painter of battle-pieces, and afterwards of Spagnoletto. Having gone to Rome, he was employed to paint an altar-piece and some other works by the Neapolitan cardinal Brancacci, and he accompanied Prince Carlo de' Medici to Florence, and executed several important works for him. He finally settled in Rome in 1638, and died there, March 15, 1673. Salvator has a great reputation as a painter, and he owes this mainly to his landscapes, which, though faulty in many respects, arrest attention by originality in subject and treatment, being generally representations of wild and savage scenes, executed with a freedom and decision remarkably appropriate. Salvator executed numerous etchings, highly characteristic of his peculiar style.

ROSA'CEA, known also as GUTTA ROSEA and ACNE ROSACEA, is a disease which usually first appears at or near the end of the nose; and in some cases it is confined to the nose, while in others it extends to the cheeks, forehead, chin, or even to the whole face. The skin in the part affected assumes a deep red color, which usually disappears after a time, but returns either on no special provocation, or in consequence, apparently, of some gastric disturbance, and after a time becomes permanent; pustules of acne—a chronic pustular disease of the skin—now appear, and their yellowness contrasts strongly with the redness with which they are surrounded. The skin of the diseased part becomes irregularly swollen, and is marked with blue or red streaks, caused by congestion and enlargement of the capillaries; the whole surface, in a severe case, presenting a very disagreeable and repulsive appearance. This affection is no doubt often a result of intemperate living, but it may occur in persons of regular habits of life. Disorder of the digestive system is so often associated with it, as to exclude the idea that the combination is accidental, and the skin disease may often with great probability be referred to gastric disturbance as the exciting cause. The disease is confined almost exclusively to persons in middle or advanced life, and women are especially liable to it about the period in which what is popularly known as the 'change of life' occurs: moreover, it has occasionally been observed to be hereditary.

The general treatment consists in the administration of the compounds of iodine and mercury (singly or conjoined) in alterative doses, and Donovan's Solution has been especially recommended; and a nourishing but bland and non-stimulating diet should be prescribed. In the early stages of the disease, the local treatment should be soothing. Emollient lotions, such as emulsion of bitter almonds, cream, glycerine, &c., may be occasionally used during the day, and in severe cases a bread poultice may be applied to the face at night. When the affection becomes indolent, the emollients should be gradually replaced by stimulating applications, such as Eau de Cologne, or a solution of corrosive sublimate in alcohol, in the proportion of from 1 to 2 grains in the pint; and at a still later stage, iodide of sulphur ointment, in the proportion of 15 grains or a scruple of the iodide to an ounce of lard, is well deserving of a trial. When the disease is of long standing, it sometimes defies all known remedies.

ROSACEÆ, a natural order of exogenous plants, containing many species of great usefulness, and many that are in the highest esteem for their beauty. It contains trees, shrubs, and herbaceous plants, natives chiefly of cold and temperate regions, and far more abundant in the northern than in the southern hemisphere. Within the tropics, they are chiefly but not exclusively found in elevated situations. The leaves are alternate, have stipules, and are either simple or compound. The flowers are generally hermaphrodite, but sometimes unisexual; the inflorescence various. The calyx is 4—5-lobed, generally 5-lobed; the petals as many as the divisions of the calyx, or occasionally wanting, perigynous. The stamens are few or many, arising from the throat of the calyx; the ovary sometimes solitary, sometimes there are several ovaries; each one-celled, with a lateral style; or a number of ovaries are united into a many-celled pistil; the ovules generally two or more.

The fruit is sometimes a drupe; sometimes a pome; sometimes follicular; sometimes an achœnium; sometimes a heap of achœnia, or of one-seeded berries; sometimes a heap of achœnia, covered with the fleshy tubes of the calyx.—This natural order contains at least 1000 known species; but in some of the genera, as *Rosa* and *Rubus*, the determination of the species is attended with great difficulty, and varieties—sometimes reckoned species—are numerous.—The order, as generally received, is divided into a number of sub-orders, several of which have by some botanists been elevated to the rank of distinct orders, as *Amygdaleæ*, *Pomaceæ*, *Sanguisorbeæ*. See also ROSE, RUBUS, STRAWBERRY, POTENTILLA, TORMENTIL, AGRIMONY, GEUM, SPIRÆA, CUSSO, &c.

ROSA'RIO, a town of the Argentine Republic, on the right bank of the Parana, 170 miles north-west from Buenos Ayres, 210 miles by river. It is the most important town on the Parana, and is rapidly increasing in population and commerce. The customs duties amount to considerably over £140,000 a year. In 1874 the value of merchandise imported direct was $7,046,400; of the exports, $2,101,100, of which $1,073,540 consisted of wool, hides, &c., sent to the United States. Pop. above 40,000.

ROSARY OF THE BLESSED VIRGIN MARY (Lat. *rosarium*, a chaplet of roses), the name given to a very popular form of prayer in the Roman Catholic Church. The name rosary has

been variously traced either to the title 'Mystical Rose,' one of the titles under which the Blessed Virgin is addressed in the Litany of Loretto (q. v.), or to St. Rosalia's wreath of roses, well known in sacred art, or to the beads being originally made commonly of rosewood. The origin of the devotion itself is popularly traced to St. Dominick (q. v.); but it is quite certain that its characteristic feature, the use of beads as a means of reckoning the number of repetitions of a certain prayer, is of far greater antiquity. See BEADS. Palladius tells of the Abbot Paul, whose daily practice it was to repeat the Paternoster 300 times, that he used a number of small pebbles to secure a correct enumeration, dropping one of these into his lap at each repetition. Later, a string of beads, worn round the neck, and called *Beltidum*, was substituted. As the same use of beads exists among the Mohammedans, some writers have traced the Roman Catholic practice to a Mohammedan origin; but it appears quite certain that the practice existed among Christians before the time of Mohammed. Originally, the prayer so repeated was the Lord's Prayer; but when, in the 11th and 12th centuries, the so-called angelical salutation: 'Hail, Mary!' &c., became a frequent form of prayer, it was added to the 'Our Father;' and it seems beyond all doubt that the rosary in its present form was, if not devised, at least fully introduced and propagated by St. Dominick.

The rosary, although called of the Blessed Virgin Mary, is a series of fifteen prayers, founded on the chief mysteries of the incarnation and passion of our Lord, interspersed with repetitions of the 'Our Father,' the 'Hail, Mary!' and the doxology. It consists of three parts, each of which contains five so-called mysteries, connected with our Lord's incarnation and public mission on earth, his passion and death, his resurrection and ascension, and the assumption of the Blessed Virgin Mary. Each of these parts thus contains five mysteries (called also 'decades' from the ten 'Hail, Maries') consisting of (1) a 'meditation,' briefly proposing the mystery which is to be meditated upon; (2), one 'Our Father;' (3), two 'Hail, Maries;' (4), one doxology; (5), a prayer begging for the special grace or fruit appropriate to the particular mystery. The whole rosary, therefore, consists of 15 mysteries or decades, and thus comprises 15 'Our Fathers' and 'Doxologies,' and 150 'Hail, Maries.' The devotion of the rosary takes several forms. The 'Greater Rosary' consists of the recitation of the whole fifteen mysteries or decades, with their component prayers. The 'Lesser Rosary' consists of one of the three parts, or of five mysteries or decades. The 'Living Rosary' is recited by an association of fifteen individuals, each of whom engages to say daily one mystery. When recited publicly, the prayers are repeated alternately by the priest or other person presiding at prayer, and by the congregation. There is a form of the rosary common in foreign countries, especially Germany, in which the substance of each 'mystery' is condensed into a short prayer of three or four words, which are appended to the 'Hail, Mary!' and thus serve perpetually to recall the subject to the mind of the person praying vocally.

The rosary has been sanctioned and recommended by numberless popes and other ecclesiastical authorities, and Indulgences (q. v.) have been granted to persons reciting it with proper dispositions. It is regarded by Roman Catholics as one of their most excellent forms of prayer, and as placing the devotion to the Blessed Virgin Mary on its true footing—that of a devotion to the incarnation and death of her son, Jesus Christ. It is expressly recommended for the poor and the ignorant; and there are instructions specially designed for these classes, in order to enable them to combine prayer of the mind with prayer of the lips.

The mechanical instrument, so to speak, of this devotion is also called by the name rosary. It consists of a string of beads, equal in number to the 'Our Fathers' and 'Hail, Maries' which are recited in the rosary—the 'Our Father' beads being of a larger size—one of which is passed through the fingers at each recitation of the prayer, and thus secures the person praying from errors of memory. The beads are of various material—berries, wood, stone, ivory, metal, &c., and are often of costly workmanship, and of considerable intrinsic value. They are blessed for the use of the people by the pope, by bishops and superiors of religious orders, and by others having special power for the purpose.

ROSAS, DON JUAN MANUEL, president of the Argentine Confederation, born at Buenos Ayres in 1793, descended from an ancient family of the Asturias. He entered the army of Buenos Ayres and in 1829 rose to be governor or captain-general of his native province, then in federal union with Entre Rios, Corrientes, and Santa Fé. He showed great courage and capacity in subduing the disaffected Indians, and internal peace being thus secured, he turned his attention to the state of the confederation, which, in 1835, was falling to pieces by the feebleness of its governments. A single president was, upon his recommendation, elected for the whole Argentine Confederation, and the choice fell upon Rosas. His residence was to be Buenos Ayres, and to this state were intrusted the external relations of the Confederation, and the management of the more important functions of the executive. Intestine commotion subsided under his rule, the industrial resources of the country were developed, and foreign commerce rapidly increased. The other states, however, became jealous of the growth and power of Buenos Ayres, and R. was accused of a design to extend and uphold the undue predominance of his state, and to give his native city a monopoly of the trade of the River Plate. In the execution of this design, he sought to compel Paraguay to join the Confederation. This involved R. in a war with Brazil, in which his troops were outnumbered, yet he obstinately kept up the struggle for five years. An attack on Monte Video was also rendered necessary by his policy; but England and France interfering for the protection of that city, R. was again defeated; yet he managed to resist the allied forces from 1845 to 1850. His rule had by this time become so oppressive and intolerable, that the subject states revolted, and selected Don J. J. Urquiza as their president and general.

A battle ensued at Monte-Caseros, 3d February 1852, when R.'s forces were put to flight. Urquiza entered Buenos Ayres as president of the Confederation; and R., who was compelled to flee, obtained a refuge in England, in which country he for the most part resided till his death in March 1877.

RO'SCIUS, QUINTUS, was born at Solonium, a village near Lanuvium, and rose to be the greatest comic actor in Rome. So much was he admired, that many of the Roman aristocracy befriended him, and the dictator Sulla, as a token of favor, presented him with a gold ring, the symbol of the equestrian order. Among his most admiring and affectionate patrons, R. also numbered Cicero, who, at the commencement of his career, received lessons in the art of elocution from the great comedian, and even in later life used to make trials of skill with his instructor as to which of them rendered a thought most clearly and effectively—the orator by his diction, or the comedian by his gesticulation. So sensible was R. of the distinction he enjoyed in sharing the intimacy, and even the friendly emulation of the great orator, that he came to look upon his art as one of no small importance and dignity, and wrote a treatise on the comparative methods and merits of eloquence and acting. Cicero's friendship was of use to him in another way, for on his being sued at law by C. Fannius Chærea for the sum of 50,000 sesterces, Cicero defended him before the judex Piso (probably 68 B.C.) in his extant oration, *Pro Q. Roscio Comœdo*. He died 62 B.C., having attained such perfection in his peculiar art, that to be a 'Roscius' became synonymous with pre-eminence in every profession, and leaving, like his famous contemporary, Æsopus the tragedian, an immense fortune, realized upon the stage.

ROSCOE, WILLIAM, the eminent historian of Lorenzo de' Medici and Leo X., was born near Liverpool on the 8th of March 1753. His father was a market-gardener, whose assistant in this business he became in his twelfth year, after receiving the rudiments of learning at a common school. In this occupation he continued for about three years, during which his fondness for reading developed itself; and in 1769, after making trial for a year of a bookseller's shop, he was articled to an attorney at Liverpool, where, in 1774, being admitted an attorney of the Court of King's Bench, he began to practice on his own account. During all this period, he assiduously cultivated his mental powers, turning his attention to the classics, and especially to the Italian language and literature. In 1773, he first appeared in print as the author of a poem; and in 1777, a collection of some of his earlier pieces was published, containing his first protest against the slave-trade, of which, throughout his life, he was a strenuous opponent. In 1796 was published the first volume of his *Life of Lorenzo de' Medici, called the Magnificent*, which had been begun many years before, and in the composition of which he was greatly aided by the collection for him of valuable materials in Italy, from sources in print and manuscript, by his friend Mr. Clarke. The success of this work was extraordinary, and it at once established his literary reputation. The work was received with the highest approbation by those who were best able to appreciate its merits, both in England and on the continent, especially in Italy; it went through several editions, and was translated into German, French, and Italian.

In 1805, appeared his second great work, the *Life and Pontificate of Leo X.*, for which, with the assistance of others, he had been collecting materials for many years. This work also, which, like the former, appeared successively in German, French, and Italian, was received with much commendation by the most impartial judges, though its tone and spirit, especially with reference to the Reformation, were severely criticised by others.

R. at one time had thoughts of adopting the bar as a profession; but about the year 1800, he became partner in a Liverpool bank, a step which involved him eventually in great pecuniary embarrassment. In 1806, he was returned to parliament for Liverpool in the Whig interest, and had the gratification of taking part in the abolition of the slave-trade, but did not again come

forward after the dissolution in 1807. He was, throughout, a consistent opponent of the war with France, against which he published several pamphlets, and was on all points the advocate of liberal opinions. He took an active part in founding the Liverpool Royal Institution, and was a zealous promoter of literature, and patron of the fine arts. R. died at Liverpool, June 30, 1831. During the latter years of his life, he devoted himself much to the study of botany, and in honor of him, a rare genus of Monandrian plants received in 1826 the name *Roscoea*.

ROSCO'MMON, an inland county of Ireland, in the east of the province of Connaught, and bounded on the east by the river Shannon, is 60 miles long from north to south, by 40 miles from east to west. Area, 607,691 acres, of which 440,522 are arable. Pop. (1881) 131,755. 737 persons speak Irish only. Number of pupils on the roll of the National Schools in 1880, 33,925 (of whom 33,245 were Roman Catholics). Number of emigrants from R. between 1851 and 1871, 52,299. The surface of R., which belongs to the central plains of Ireland, is level, with undulations rising in the south into the Slieve Bawn range, the highest point of which is 867 feet in height; and on the north, into the Curlew Mountains, of which Slieve Curkagh attains a height of 1098 feet. Its principal rivers are the Shannon (q. v.) and the Suck. R. communicates by means of the Midland Great Western, the Southern and Western, and North-western railways, with all the extremities of the kingdom. In geological structure it belongs to the central limestone formation, in some districts of which the sandstone protrudes. The soil in the central district is in general light, but fertile, and affords the finest sheep-pasture in Ireland—the celebrated 'Plain of Boyle.' Some portions also contain a rich and fertile loam, which produces good cereal crops; but the chief industry of the R. farming population is the feeding of sheep and cattle, especially the former.—The county can hardly be said to possess any manufacture worthy of mention. The chief towns are Roscommon (q. v.), Boyle, Castlerea, Elphin, Strokestown. Ballinasloe and Athlone lie upon the border, and are partly within this county. R., in the ante-English period, was the country of the septs of MacDermot, O'Daly, O'Kelly, and above all, O'Conor, of which there were two branches, that of the O'Conor Roe (red), and that of O'Conor Don or Dhun (brown). The present representative of the O'Conors, the O'Conor Don, is one of the very few Irish princes who have succeeded to the hereditary estates of their ancestors.

R. sends two members to the imperial parliament. It possesses a vast number of antiquities of the Celtic period, raths, &c.; a portion of a round tower at Oran, several remains of strong castles of the English period, and some fine ecclesiastical ruins, of which Boyle Roscommon, Tulsk, and Clonshanville are the principal.

ROSCOMMON, the capital and assize town of the county of the same name, Ireland, in the middle of the county, 96 miles west-by-north from Dublin. The population, in 1861, was 2699; in 1881, 2117. Of the inhabitants less than 300 are Protestants. R. dates from the 13th c., when it arose around a Dominican abbey, founded by the O'Conor in 1257, and a castle built soon after by Sir Robert de Ufford, the remains of both of which structures still exist. R. is a market-town, in which corn is the principal commodity. It has scarcely any manufacture, and little commercial enterprise of any kind. It returned two members to the Irish parliament, but was disfranchised at the Union. Two newspapers are published here.

ROSCREA', a market-town of the county of Tipperary, Ireland, 94 miles south-west-by-west from Dublin, with which it is connected by a branch from the Great Southern and Western Railway. The population in 1861 was 3543; in 1881, 2801. Of this number over 400 were Protestants of the Episcopal Church. R. is a very ancient town, dating back to the early Christian period, when a monastery was built upon this site in the beginning of the 7th century. The modern town is tolerably well built; the Roman Catholic Church is a handsome structure; and there are considerable remains of the ancient greatness of the place—a castle, a lofty round tower, 80 feet high, and ruins of two abbeys. The only manufacture is coarse woollen cloth, but there is a considerable market for agricultural produce. There are several schools, some with endowments of ancient date.

ROSE (*Rosa*), a genus of plants of the natural order *Rosaceæ*, consisting of shrubs, generally with prickly stems and pinnate leaves, the leaves terminating in a single leaflet; stipules at the base of the leaf-stalks; the calyx 5-fid, its tube contracted at the summit, and finally becoming fleshy, and forming a chief part of the fruit; the corolla of five petals; the stamens numerous; the styles springing from the narrowed throat of the calyx, free, or aggregated into a column. The flowers are generally of the red tint well known as *rose-color*, but sometimes white, more rarely yellow, and sometimes striped. The fruit (*Hip* or *Hep*) consists of the enlarged and colored tube of the calyx, within which are contained many *Achenia* (q. v.) amidst prickly hairs. The species are very numerous, even after allowance has been made for a great number of varieties elevated into species. There is no genus of plants in which the limits of species are more difficult to define, or in which varieties are more apt to be regarded as species. In Withering's *British Botany*, published near the end of last century, only five British species of R. are given; in Hooker and Arnott's *British Flora*, 19 species are recognized, whilst many forms, reckoned as species by some botanists, are noticed as mere varieties. Roses are natives of all the temperate parts of the northern hemisphere, and of its colder regions, even to Lapland and Hudson's Bay. They have long been among the chief favorites in flower-gardens, for the beauty and fragrance of their flowers; and, more than any other flower, emblems of everything beautiful and delightful.

Countless varieties—single and double—have been produced by cultivation, which it is often extremely difficult to refer to their original species.—Amongst the ancients, the R. was sacred to Eros or Cupid, and Aphrodite or Venus, and was accounted the emblem of joy and love, and at the same time of prudence. Its opening buds are a favorite poetic image of innocence and purity.—Among the roses best known to the ancients was the HUNDRED-LEAVED R. (*R. centifolia*), excelled by no other species in beauty and fragrance. It is a native of the Caucasus, and has been cultivated in gardens from very ancient times. Amongst its numberless varieties are the MOSS R., the calyx of which sends forth branching excrescences, so that it seems overgrown with moss, the flower—which is only known as a double rose—being exquisitely beautiful and fragrant; the PROVENCE or CABBAGE R., one of the most common, and also one of the finest roses; the small-flowered BURGUNDY R. &c.—The FRENCH R. (*R. Gallica*) is a native of the south of Europe. Many varieties of it are cultivated, particularly very beautiful double ones. It is distinguished by its hard leaves, which have a peculiar dryness, and its much expanded petals. It has a fainter smell than *R. centifolia*, but its petals are more astringent, and are preferred for the preparation of *Vinegar of Roses* and *Conserve of Roses*.—The DAMASCUS or DAMASK R. (*R. Damascena*), a native of Syria, is much cultivated, and is sometimes called the MONTHLY R., which name, however, is more frequently given to the China Rose.

The MUSK R. (*R. moschata*) is a native of the north of Africa and the south of Spain. Its flowers have a strong and delightful fragrance; they are white, and disposed in rich corymbs. It has been cultivated in England since the end of the 16th century.—The DOG R. (*R. canina*) is common in Britain, and throughout Europe, also in the north of Asia, growing in thickets and hedges. It varies, even in a wild state, in the color of its flowers, which are red, pale, or white. It has long straight shoots, which are often used as stocks for ornamental rose-trees, other kinds of R. being budded upon them. The bark of the root was formerly esteemed of peculiar virtue in preventing fatal consequences from the bite of a mad dog; whence the name of the species.—The VILLOUS R. (*R. villosa*), another common British species, has the fruit larger and more fleshy than the Dog Rose. The leaves are downy.—The FIELD R. (*R. arvensis*) is common in many parts of Britain, in woods and hedges. It has white flowers. It is remarkable for its trailing habit, and long climbing or pendulous twigs, on account of which it is frequently planted and trained to cover walls and trellises. It is often called the AYRSHIRE R., although that name is shared by another kind of similar habit, which is regarded as a deciduous variety of the EVERGREEN R. (*R. sempervirens*), a native of the south of Europe. These often make shoots of 20 feet in a season. Of the same habit also is the MANY-FLOWERED R. (*R. multiflora*), a native of China and Japan, a very fine species, but not sufficiently hardy for the colder parts of Britain.

Very different in habit is the SCOTCH R., or BURNET-LEAVED R. (*R. spinosissima*), a species common on heaths, sands, and chalk downs, in many parts of Britian; a low compact bush, with very small leaves and flowers. It is occasionally found in unfertile situations, so dwarfed in size as not to measure more than three inches from the very tip of the root to the center of the flower (which is undiminished in size). Many fine double varieties are now in cultivation.—The ALPINE R. (*R. Alpina*) is a beautiful ornament of the Alps and of other mountains of Central Europe, remarkable for its flower-stalks bending down in an arch after flowering.—The SWEET BRIER R. (*R. rubiginosa*) is a bushy species, with small leaves and flowers, a native of Britain, but more common in some parts of continental Europe, growing in open bushy places, and remarkable for the sweet balsamic smell of its leaves, on account of which it is much planted in hedges and shrubberies. A kindred species (*R. suaveolens*) is found in North America.—The YELLOW R. (*R. lutea*), a native of Germany, is chiefly remarkable for the color of its flowers, which, however, have a disagreeable bug-like odor. A fine variety is much cultivated, with petals yellow externally, and bright red on the inside.—The INDIAN R., or CHINA R. (*R. Indica*), is a native of China, was thence carried to India, and is now also common in Europe,

being a hardy plant, which does not suffer from the frosts of winter in any part of Britain, although it was at first introduced as a greenhouse plant. It is one of the most important additions recently made to our flower-gardens and shrubberies; flowering not only in the middle of summer, with the other roses, but throughout the year, even in winter, when the weather is mild. It is now very common throughout Europe. The name MONTHLY R. is often given to it from a notion that it flowers every month.

The NOISETTE R., remarkable for its extremely rich corymbs, and the TEA R., of which the dried leaves have a fine fragrance, and are said to be used in China for flavoring tea, are regarded as varieties of it. The odor of the flower is much fainter than that of many other roses; and the bush is never large.

Some kinds of R., as the China R., are easily propagated by cuttings, the other kinds by layers. The finer varieties are budded on stocks of some common kind. Many of the kinds require much pruning and attention of the gardener. The old shoots are cut out, and the young wood thinned and shortened. The flowering of a rose-bush may be retarded by cutting it closely down late in spring, and it will blossom when other roses have disappeared. Roses grow well in all ordinary soils, but are very sensitive to atmospheric influences, and do not succeed amidst the smoke of towns.

The genus *Lowea* has been separated from *Rosa* by Lindley, chiefly on account of the simple leaves. The only known species is a native of Central Asia.

The fruit of roses is used in medicine. See HIP. A mildly astringent and agreeable syrup, and other preparations, are made from the rapidly dried petals and buds of the French rose. A syrup is similarly made from the petals of the Hundred-leaved R.; and water distilled from them, *Rose Water*, is employed for various purposes on account of its agreeable odor. *Rose Vinegar*, made by steeping rose petals in vinegar, is useful as an external application in headaches, for dissipating unpleasant smells in apartments, &c. *Conserve of Roses* is made of the petals of roses pounded with sugar, and is useful as an astringent in diarrhœa of children. Oil or Otto (q. v.) of Roses is one of the most valuable of perfumes.

Rose-bushes are often much injured by a species of Aphis (*A. rosæ*), a small green insect, which swarms upon the leaves. A reddish fungus, *Puccinia rosæ*, often covers the leaves in the latter part of summer.

ROSE, in Heraldry. The heraldic rose is drawn in a conventional form, as in the subjoined woodcut, and never with a stalk, except when expressly directed by the words of blazon. Being sometimes argent and sometimes gules, it cannot be designated proper; but when blazoned 'barbed and seeded proper,' it is meant that the barbs are to be green, and the seeds gold or yellow. The rose gules was the badge of the Plantagenets of the House of Lancaster, and the rose argent of that of York. The York rose was sometimes surrounded with rays as of the sun, and termed *rose en soleil*. As a mark of cadency, the rose has been used as the difference of the seventh son.



Rose.

ROSE, THE, a popular name for Erysipelas (q. v.), which is also known as St. Anthony's Fire, *Ignis Sacer*, &c.

ROSE ACACIA. See ROBINIA.

ROSE APPLE. See EUGENIA.

ROSE BEETLE (*Cetonia aurata*), a coleopterous insect of the section *Pentamera*, of the tribe *Lamellicornes*, and not distantly allied to cockchafers and to the true beetles, or *Scarabæi*. It is a common British insect, about an inch long, of a shiny green above, coppery red underneath, with white marks on the elytra. In its perfect state it frequents flowers, particularly the rose; in its larva state, it inhabits rotten timber, the roots of vines, &c., and is often found in ants' nests, apparently feeding on the small particles of wood which the ants have collected. It remains about three years in the larva state, makes a cocoon of particles of wood, glued together by an excretion of its own; passes the winter as an inactive pupa, and appears in summer in its perfect form. It flies well, with a sort of humming noise, from flower to flower, feeding on honey, and in order to reach it, devouring the nectaries. In North America, the name Rose Beetle is given to another coleopterous insect of the tribe *Clavicornes*, about one-third of an inch in length. It is very injurious to gardens and nurseries in North America, its ravages extending to many plants besides the rose. These insects often appear suddenly in swarms, and disappear as suddenly.

ROSE-ENGINE. See TURNING.

ROSE'MARY (*Rosmarinus*), a genus of plants of the natural order *Labiatæ*, and nearly allied to Sage (*Salvia*), from which it differs in its filaments having an awl-shaped tooth, directed downwards a little above the base. Only one species is known, *R. officinalis*, an evergreen erect shrub of 4—8 feet high, with linear leaves, and pale bluish flowers, growing in sunny places on rocks, old walls, &c., in the countries around the Mediterranean Sea, and generally cultivated, as an ornamental and aromatic shrub, throughout the rest of Europe. The leaves have a short whitish-gray down beneath, a penetrating camphor-like odor, and



Rosemary (*Rosmarinus officinalis*).

a pungent aromatic and bitter taste. They contain a large quantity of an essential oil, *Oil of R.* ($C_{40}H_{32}O_2$), which is not unfrequently used as a stimulating liniment, to promote the growth of the hair, and as a perfume. *Spirit of R.*, made by distillation of sprigs of R. with rectified spirit, is used to give a pleasant odor to lotions and liniments. R. has been advantageously administered internally in cases of chronic diarrhœa, and of a relaxed state of the system.—Oil of R. is a principal ingredient of the perfume called *Hungary Water*, or *Queen of Hungary's Water*.—The name Wild R. is given to *Ledum palustre*, a shrub with narcotic acrid properties.

ROSEN, FRIEDR. AUG., born in Hanover, September 2, 1805, entered Leipzig University in 1822, where he devoted himself to the study of the biblico-oriental languages, and went to Berlin in 1824, where he studied Sanscrit under Bopp, and published his first work, *Radices Sanscritæ* (Berl. 1827). Subsequently, he was called to London University as Professor of Oriental Literature, where he edited the oldest of the still extant Arabic handbooks of Algebra, by Mohammed ben Musa (Lond. 1831), In 1831, R. resigned his professorship. During the next few years, he wrote a portion of the oriental articles for the *Penny Cyclopædia*, undertook the revision of the Sanscrit Bengali Dictionary of Houghton (Lond. 1835), which may be considered entirely his own work, and compiled for the British Museum the catalogue of Syrian manuscripts, which was only published after his death (Lond. 1839). As secretary of the Asiatic Society, he conducted its entire foreign correspondence. Colebrooke intrusted to him the publication of his *Miscellaneous Essays* (2 vols., Lond. 1837). In 1836, he had begun the publication of the Collection of Hymns of the *Rigveda*, when he died September 12, 1837. His unfinished work on the Vedas was published by the Asiatic Society under the title *Rigveda-Sanhita, liber primus, Sanscrite et Latine* (Lond. 1838).—His younger brother, GEORG ROSEN, has also acquired a reputation as an oriental scholar.

ROSENAU, a town of Hungary, beautifully situated on the Sajo, 105 miles north-east of Pesth. It has colleges and a Franciscan convent. There is mining done in the neighborhood, and there are manufactures of woollen cloth and linen, of stoneware, leather, and paper. Pop. (1869) 4855.

ROSENMÜLLER, JOHANN GEORG, a German divine and professor of theology, was born at Ummerstädt in Hildburghausen, 18th December 1736. He was appointed Professor of Theology at Erlangen in 1773, Primarius Professor of Divinity at Giessen in 1783, and was called in 1785 to Leipsic, where he remained till his death in 1815. His chief writings are: *Morgan- und Abendandachten* (7th ed. Leip. 1820); *Betrachtungen über die vornehmsten Wahrheiten der Religion auf alle Tage des Jahres* (4 vols. Leip. 1801); *Auserlesenes Beicht- und Communionbuch* (12th ed. Nürnb. 1827); *Predigten über auserlesene Stellen der Heiligen Schrift* (3 vols. Leip. 1811—1813); *Beiträge zur Homiletik* (Leip. 1814); *Scholia in Novum Testamentum* (6 vols.; 6th edit. by his son, E. F. K. Rosenmüller, Leip. 1815—1831); and his *Historia Interpretationis Librorum Sacrorum in Ecclesia Christiana* (5 vols. Leip. 1795—1814). After his death appeared *Handbuch eines allgemeines fasslichen Un-*

terrichts in der Christlichen Glaubens- und Sittenlehre (2 vols. Leip. 1818—1819).—ERNST FRIEDRICH KARL ROSENMULLER eldest son of the foregoing, distinguished himself as a biblical critic and orientalist. He was born at Hessberg in Hildburghausen, 10th December, 1768, studied at Leipzig, became Extraordinary Professor of Oriental Literature in 1795, Ordinary Professor in 1813, and died 17th September 1835. He was a more accurate and solid scholar and a keener critic than his father. He shared the rationalism of his time, but never carried it to an extreme. His Masterpiece, the *Scholia in Vetus Testamentum* (11 vols. Leip. 1788—1835), is a most comprehensive and learned production, well worthy of consultation on any important point of biblical criticism. Other works of R.'s are: *Handbuch für die Literatur der biblischen Kritik und Exegese* (4 vols. Gött. 1797—1800); *Das alte und neue Morgenland oder Erläuterungen der Heiligen Schrift* (6 vols. Leip. 1818—1820); *Handbuch der biblischen Alterthumskunde* (4 vols. Leip. 1823—1831); *Institutiones ad Fundamenta Linguæ Arabicæ* (Leip. 1818); and *Analecta Arabica* (2 vols. Leip. 1825—1826).—A younger brother, JOHANN CHRISTIAN ROSENMULLER (b. 1771, d. 1820), also acquired a reputation as a writer on anatomy, &c.

ROSE-NOBLE (commonly called also *penny of gold*), an English gold coin, first struck by King Edward III. in 1334, and current at the value of 6*s.* 8*d.* sterling; half-nobles, *oboli*, or gold half-pence, and quarter-nobles, otherwise called *gold farthings* and *quadrantes*, were also coined soon after. The term 'rose-noble' was given to the coin because it was of the same value as the 'noble,' a money of account, and was stamped on one side with the figure of a rose. The Rose-noble and its halves and quarters ceased to be coined after 9 Henry V.; but the 'noble,' the money of account, was used till a much more recent period.—The noble also existed in the Scotch coinage, and was equivalent to one-twelfth of the English coin.

ROSE OF JERICHO (*Anastatica hierochuntica*), a plant of the natural order *Cruciferæ*, which grows in the sandy deserts of Arabia; and on rubbish, the roofs of houses, and other such situations, in Syria and other parts of the East. It is a small, bushy, herbaceous plant, seldom more than six inches high; with small white flowers; and after it has flowered, the leaves fall off, and the branches become incurved towards the center, so that the plant assumes an almost globular form, and in this state it is often blown about by the wind in the desert. When it happens to be blown into water, the branches expand again, and the pods open and let out the seeds. Numerous superstitions are connected with this plant, which is called *Rosa Mariæ*, or *Rose of the Virgin*. If taken up before it is quite withered, the plant retains its hygrometric property of contracting in drought and expanding in moisture, for years.

ROSE'OLA is a common skin disease, included in the division *Rashes*, and sometimes described under the term *Scarlet Rash*. In some cases, it begins with slight febrile symptoms and gastric disturbance, which subside in two or three days, when the rash appears; in other cases, no preliminary fever occurs. The eruption first appears upon the face, neck, and chest, in specks or small patches, which have a tendency to coalesce; and in severe cases, the whole surface of the body assumes a uniformly red tint. The eruption is usually accompanied by itching of the affected parts, and by redness and slight soreness of the throat, and seldom lasts more than two or three days, when it gradually fades away; and its disappearance is not followed by the desquamation of epidermis, which is one of the natural *sequelæ* of scarlatina and certain other skin diseases. The rash differs considerably in appearance in different cases. The disease is never contagious, and one attack affords no immunity from a second.

Among the causes of roseola may be mentioned the irritation excited by dentition, gastric and intestinal irritation, excessive acidity of the stomach, the sudden checking of profuse perspiration, the drinking of cold water when the body is overheated, &c. It often precedes the distinctive eruptions of small-pox and varioloid; and is noticed to be of most frequent occurrence during the prevalence of measles and scarlatina. The diseases with which it may be confounded are erythema, measles, and scarlatina, and it is sometimes impossible to discriminate with certainty between roseola and mild cases of scarlatina, when the former is attended with sore throat. The treatment is very simple, as the disease would probably always terminate favorably if left entirely to itself. If there is a suspicion that the case should turn out to be one of scarlatina, an emetic of ipecacuanha should be given, and the bowels should be freely acted on. In ordinary cases, a few days' confinement to the house, a spare and non-stimulating diet, saline laxatives—such as Seidlitz powders—and an occasional warm bath, if there is much cutaneous irritation, or if the eruption has a tendency to recede too suddenly, constitute all the treatment that is expedient.

ROSES, WAR OF THE, a disastrous civil contest which desolated England during the 30 years from 1455 to 1485, sacrificing 80 princes of the blood, and the larger proportion of the ancient nobility of the country. It was so called because the two factions into which the country was divided upheld the two several claims to the throne of the Houses of York and Lancaster, whose badges were the white and the red rose respectively. After the House of Lancaster had possessed the throne for three generations (see PLANTAGENET), Richard, Duke of York, whose title to the throne was superior to that of Henry VI., began to advance, at first somewhat covertly, his claim to the throne. In 1454, he was appointed Protector of the realm during Henry's illness, and on the king's recovery, he declined to give up his power, and levied an army to maintain it. For an account of the Wars of the Roses, see EDWARD IV., EDWARD V., RICHARD III., and HENRY VII. The accession of Henry VII. may be said to have terminated the Wars of the Roses, although the reign of Henry was from time to time disturbed by the pretensions of Yorkist impostors.

ROSE'TTA, a city of Egypt, situated on the west bank of the old Bolbitic branch of the Nile, about 4 miles above the mouth, in 31° 25′ N. lat., and 30° 28′ 20″ E. long. The name is supposed te be an old Egyptian one, and to have been derived from *Rusat*, or the mouth ef the plains. Here was discovered the so-called Rosetta Stone, or trilingual inscription in the hieraglyphic, demotic or enchorial, and Greek language, which was the key to the interpretation of the hieroglyphs. It is of black basalt, about 3 feet 7 inches in length, and 2 feet 6 inches in width, containing about one-third of the hieroglyphic, and nearly all the Greek and Roman portions, the upper part and portion of the side having been broken away.

The contents of the inscription are a decree in honor of Ptolemy Epiphanes by the priests of Egypt assembled in a synod at Memphis, on account of his remission of arrears of taxes and dues owed by the sacerdotal body. It was set up 195 B.C., and is the only one of the numerous examples ordered to be placed which has been brought to light. This monument was discovered in 1799 by M. Boussard, a French officer of engineers during the French occupatiou of Egypt, in an excavation made at Fort St. Julien, near Rosetta. More recent excavations have shown that it was found on the site of a temple dedicated by the Necho II. of the 26th dynasty to the solar god Atum, or Tum. By the Arabs, R. is called Rashid. It first rose into importance when the accumulation of mud had silted up the Damietta branch, and destroyed the importance of that city. It has been much praised for its verdure and charming gardens, which present an agreeable contrast to the barren wastes by which it is surrounded. It contains a mixed population, reported by the census of 1881 at 16,671. The streets are narrow, running north and south. The river has a sandbar at the mouth, preventing the entrance of large ships-of-war. It was unsuccessfully attacked by the British in 1807.

ROSETTA WOOD is a furniture-wood of a lively orange-red color with very dark veins. It is imported from the East Indies in logs about a foot in diameter; but it is not known what tree produces it. It is little used, because, although extemely beautiful when first cut, the colors become dark by exposure.

ROSE QUARTZ, a variety of Quartz (q. v.), often crystallized in the form of Rock-crystal (q. v.), but also found massive or imperfectly crystallized. It differs from common quartz and rock-crystal chiefly in its color, which is of a delicate pink or flesh color, sometimes crimson or nearly so. The color is due to the presence of manganese. R. Q. is valued as an ornamental stone, the larger masses being made into vases, &c., the smaller pieces into jewels, seals, &c. A bright red kind is known as *Bohemian Ruby*, and is sometimes fraudulently sold as ruby.

ROSE-WATER. See PERFUMERY.

ROSE-WINDOW, a circular window with tracery.

RO'SEWOOD, a name given to the wood of a number of different trees, valued for beauty, and used for ornamental furniture.—The R. of commerce has been thought to be the produce of a species of *Mimosa*, a native of Brazil. It is also said that R. is the timber of several species of *Triptolomea* (natural order *Leguminosæ*, suborder *Papilionaceæ*); but the trees yielding R. are, in general, still doubtful to the botanist, although different kinds of R., imported from South America, are much used for veneering, in making furniture, musical instruments, &c. R. has for a long time been second only to mahogany as a furniture-wood in Europe. It has a dark blackish-brown color, beautifully marked with streaks of dark red, and when being sawn or cut, yields an agreeable smell of roses, from which it receives its name. We receive it chiefly from Para and Maranham, in logs usually about ten feet in length; each log is only half the trunk, which is split in two to be sure it is sound. Violet wood and king wood are from similar trees.

The name R. has been also given to kinds of timber grown in Jamaica, in Africa, and in Burmah. One valuable kind of R. is yielded by an East Indian tree, *Dalbergia latifolia*, also called

Blackwood. It is found chiefly in Malabar, and grows to a height of about 50 feet. It is of the natural order *Leguminosæ*, suborder *Papilionaceæ*. The timber is very valuable. It is much used in Bombay for ornamental furniture. Planks of 4 feet in breadth are sometimes obtained, after the sapwood has been removed. The increasing value of the wood has led to the formation of new plantations, under the care of the government conservator of forests, in several parts of the Madras presidency.

ROSICRU'CIANS, the name of a secret society of the 17th c., which is involved in much mystery, and the history of which has led to a great deal of discussion. The name is explained by Mosheim and others, as derived from *ros*, dew, and *crux*, the cross. CRUX is supposed mystically to represent LUX or light, because the figure + exhibits the three letters LVX; and light, in the opinion of the Rosicrucians, is that which produces gold. Now dew (*ros*) is the greatest solvent of gold in the ancient science of alchemy. But without insisting on this very mysterious explanation of the name Rosicrucians, we must be content with an account of the association itself.

The beginning of the 17th c. was a period which manifested an extraordinary tendency to mysticism in science as well as in religion; alchemy, astrology, and divination divided the public interest with Pietism in the Protestant world, and the Convulsionist mania in the Catholic community. A remarkable impulse was given to this tendency by the simultaneous appearance of two anonymous books, printed at Cassel in 1614, in German, entitled *Universal and General Reformation of the whole wide World;* together with the *Fama Fraternitatis*, or *Brotherhood of the Illustrious Order of the R. C. (Rosy Cross); to the Rulers, States, and learned of Europe; printed at Cassel, by William Wessel.* The first of these books is a kind of mystic allegory. In the reign of Justinian, Apollo, finding the world full of every kind of corruption, resolves on effecting a reformation; and with this view, calls up the seven wise men of Greece, and three Roman philosophers, of whom Cato and Seneca are the chief advisers. Their deliberation forms the subject of the book, which is a satire at once on the philosophy and the political systems and governments of the age. The *Fama Fraternitatis* is the story of a certain holy and reverend Brother Christian Rosenkreuz (i. e., Rosy Cross), who is represented as living in the 14th century. This Father, a German of noble birth, having been educated in a monastery, conceives a design for the reformation of the world; and after learning at Jerusalem and Damascus all the science of the Arabians, spends three years at Fez, in Morocco, in the study of the magical science of the Moors, and returns to Germany, where he establishes, in a house under the title Sancti Spiritus, with the aid of seven monks from the convent where he had been educated, a fraternity, which is the original brotherhood of the Rosy Cross.

These adepts having framed a system with secret symbols, and committed it to paper, sent forth Father Rosenkreuz to propagate the brotherhood, which was to be kept secret for 100 years, the members, however, meeting once each year in the mother-house of Sancti Spiritus. Rosenkreuz died at the age of 106, and the place of his burial was held secret by the adepts; but he ordered that an inscription should be placed on one of the doors of Sancti Spiritus: 'Post cxx. annos patebo.' In the following year, 1615, a third tract appeared, also in German, entitled *Confessio, or Confession of the Society and Brotherhood R. C.*, which purports to be a defence of the brotherhood from the false rumors in circulation regarding it. The mixture of absurdity with seeming fanaticism displayed in these books has long proved a literary puzzle, of which not the least plausible solution is that which regards them as simply a serio-comic satire on the philosophical follies of the time, written by Johann Valentine Andreä, of Herrenberg, as a mere exercise of humor, and without the intention or the expectation of their serious acceptance. Certain it is, that what whatever was the secret of the Rosicrucians, if there really was any, it has been well kept. They are not heard of for the rest of the 17th c., and their supposed connection with the Illuminati of Weishaupt, at the close of the 18th c., is more than doubtful. Equally doubtful is the theory of their connection with the Templars. From a book entitled *Curious Things of the Outside World: Last Fire* (Lond. 1861), it would appear that the Brethren of the Rosy Cross are not yet extinct. See Buhle, *Uber Ursprung und Schicksale des Ordens der Rosenkreuzer* (Gött. 1803); Jenning's *Rosicrucians* (1870).

ROSIN, CHEMISTRY OF. See RESINS. When common Turpentine (q. v.), obtained from several species of Pine (q. v.) and Fir (q. v.), is distilled with water, it yields nearly one-fourth of its weight of essential oil, while the residue in the retort consists of *common rosin*, or colophony. There are two principal varieties of rosin, one of which is of a brown, and the other of a white color. The brown variety is furnished by the Norway Spruce Fir, and is an amber-colored brittle solid, consisting of two isomeric acids, the *sylvic* and *pinic*, having the common formula, $C_{40}H_{30}O_4,HO$. Pinic acid, which is the more abundant of the two, is soluble in cold alcohol, from which it is obtained on evaporation as an amorphous mass. When heated to partial decomposition, it yields another isomeric acid, the *colophonic*. The white variety of rosin, known commercially as *Galipot*, is obtained from the turpentine yielded by *Pinus maritima* (see PINE), and consists almost entirely of an acid, isomeric with the preceding, and termed the *pimaric*. On evaporating its alcoholic solution, the acid is obtained in a semi-crystalline form; and on melting the mass thus obtained, and allowing it to cool, the resulting product is a colorless glass as clear as crystal.

Common rosin dissolves freely in alkaline solutions, and enters largely into the formation of yellow soap. The alkaline resinates are, in point of fact, true soaps, but are inferior in their cleansing properties to the stearates, oleates, and margarates. All the above described acids of rosin are monobasic, soluble in ether and hot alcohol, and insoluble in water.

ROSS, SIR JOHN, C.B., Arctic voyager, born June 24, 1777, at Balsarroch, Wigtonshire, was a son of the Rev. Andrew Ross of Inch. He entered the navy at the early age of 10, was 15 years a midshipman, 7 years a lieutenant, 7 years a commander, and became a post-captain in 1818. When lieutenant of the *Surinam* he was wounded in cutting out a Spanish vessel from under the batteries of Bilbao, in 1806. During the war he was in three different actions. His more important services were rendered in the Arctic regions, whither, in 1818, he proceeded with Sir W. E. Parry. See NORTH-WEST PASSAGE. He published the results of his investigations in 1819. In May 1829, he was employed on a fresh expedition to the Arctic regions (fitted out at his own expense by Sir Felix Booth), and discovered the peninsula of 'Boothia Felix.' R. received, on his return, the honor of knighthood, and was made C.B. He received the freedom of London and other cities, gold medals from the Geographical Societies of London and Paris, was made a knight of various foreign orders, and received other acknowledgments of his services. In 1838, he was appointed British consul at Stockholm, where he remained some years. He was author of *Letters to Young Sea-officers; Residence in Arctic Regions*, &c. (1829—1834); 4to; Appendix to same, 4to; *Memoirs and Correspondence of Admiral Lord de Saumarez*, 2 vols. 8vo; *Treatise on Navigation by Steam*, 4to. He became a rear-admiral in 1851, and died August 30, 1856, at his house in Gillingham Street, Pimlico.

ROSS, SIR JAMES CLARK, Arctic explorer (nephew of the preceding), third son of George Ross, Esq., of Balsarroch, Wigtonshire, was born in London, April 15, 1800. He entered the navy in his 12th year, and served under his uncle in the Baltic, the White Sea, the coast of Scotland, and in all the naval expeditions for the discovery of the North-west Passage (q. v.) from 1818 to 1833. It was while accompanying his uncle in his second Arctic voyage that he discovered, 1831, the North magnetic pole, and on his return he was rewarded with a post-captaincy. Afterwards employed by the Admiralty in a magnetic survey of Great Britain and Ireland, he, in 1836, crossed the Atlantic to relieve the frozen whalers in Baffin's Bay; and in 1839 he was placed in command of an expedition to the Antarctic seas (see POLAR EXPEDITIONS), and approached within 160 miles of the South magnetic pole. On his return in 1843, he received the honor of knighthood; and in 1847 he published his *Voyage of Discovery in Southern Seas*, 1839—1843. In January 1848, he made a voyage in the *Enterprise* to Baffin's Bay, in search of Sir John Franklin, but without success. He received the 'Founder's gold medal' from the Geographical Society of London in 1841, the gold medal of the Paris Society, and D.C.L. from Oxford in 1844. He died in 1862.

ROSS, a Celtic word, meaning a headland, occurring as the name or part of the name of many places in the British Islands, and in other parts of Europe, as Roslin, Culross, Rossberg, Ross (in England), Montrose, Roxburgh, Ardrossan. There is another Welsh root, *rhos*, signifying a moor, which is found in Welsh and Cornish names, as Rossall, Rusholme. In Roseness, in Orkney, the equivalent Teutonic term *ness* has been superadded after the meaning of the Celtic *ross* had been lost.

ROSS, a thriving market-town in Herefordshire, is finely situated on the left bank of the Wye, 14 miles south-south-east of Hereford. In the parish church (date 1316) is buried John Kyrle, celebrated by Pope as the 'Man of Ross' (q. v.). The town is well furnished with schools, carries on a trade in cider, malt, and wool; is much visited by tourists, and contained (1881) 3724 inhabitants.

ROSS AND CROMARTY, treated of in the 'Census of Scotland —1871,' as one Scottish county, is, as such, bounded on the N. by Sutherlandshire, E. by the German Ocean, S. by Inverness-shire, and W. by the Atlantic. Ross comprises the districts of Easter and Wester Ross, Ardmeanach, or the Black Isle, and the island of Lewis (q. v.). R. and C., in many parts, present a wild and

mountainous aspect, intersected by beautiful glens, valleys, lakes, and rivers. Many of the mountains are of considerable altitude, the highest ranging from 3000 to 4000 feet, the most remarkable of which is Ben Wyvis. The high grounds afford excellent pasture for sheep and cattle, and the glens and low grounds, in the more favored portions, are generally of a superior soil, which, with the fine climate, especially in Easter Ross, produce grain of a superior quality. There are numerous fresh water lakes and rivers.

The principal loch is Maree (q. v.). There are several other lakes of considerable size, which altogether occupy an area of 90 sq. miles. There are numerous water-courses, the chief of which are the rivers Oikel and Conon, and several high waterfalls, the principal being Glomach, one of the finest in the kingdom. Limestone and ironstone are to be met with in abundance, as also granite and mica slate; and there are various mineral springs of note, the most famous of which is that of Strathpeffer. About the beginning of last century, the country in many places was nearly devoid of trees, but soon after, numerous plantations were formed, and many parts are now occupied by extensive forests. The lakes, rivers, and coast abound with fish, and the bays and sea-lochs being numerous, the fisheries are carried on extensively, occupying upwards of 22,000 persons.

According to the census of 1871, the area of the two counties is 3151 square miles, or 2,016,375 statute acres. The valued rental in 1674 was £7000; the valuation of 1880—1881 (exclusive of railways) was £283,730. The total acreage under all kinds of crops, bare fallow, and grass, in 1880 was 131,558; under corn crops, 48,470; under green crops, 27,540; clover, sanfoin, and grasses under rotation, 36,763; the permanent pasture, exclusive of heath and mountain-land, was 17,836. The number of horses used for agricultural purposes was, in the same year, 7400; the cattle counted 42,735; the sheep, 361,236; and the pigs, 5631.

The population of the united shires in 1871 was 80,955; (1881) 78,547. The joint parliamentary constituency, which returns one member to parliament, is 1739 in number. The chief towns are Dingwall (q. v.), Fortrose (q. v.), and Tain (q. v.).

ROSS, THE MAN OF, a name given by Pope to John Kyrle, an English gentleman of great benevolence, who was born at Whitehouse, Gloucestershire, in the first half of the 17th century. Kyrle received his appellation from having resided during the greater part of his life in the small town of Ross, Herefordshire. He there spent his time and fortune in building churches and hospitals, which procured for him the love and veneration of his contemporaries. Kyrle may be considered the Howard of his age; and Wharton in his *Essay on the Writings and Genius of Pope*, has stated that he deserved to be celebrated beyond any of the heroes of Pindar.

Pope, during his visits at the old mansion of Holm Lacy, the seat of Viscount Scudamore, near Ross, heard so much of Kyrle's beneficence, that in his *Moral Essays* he celebrates his praises under the name of the Man of Ross:

> 'Behold the market-place with poor o'erspread!
> The man of Ross divides the weekly bread:
> He feeds yon almshouse, neat, but void of state,
> Where age and want sit smiling at the gate:
> Him portioned maids, apprenticed orphans blessed,
> The young who labor, and the old who rest.'

We learn further, from the same poem, that the fortune of Kyrle was no more than £500 a year. Kyrle died in 1724, and was buried in the church of Ross.

ROSSA'NO, a city of Southern Italy, in the province of Cosenza, is situated at the foot of the Apennines, 2 miles from the Gulf of Taranto, on a high rocky hill, surrounded by steep precipices. It is walled and well-built, is defended by a castle, and contains a beautiful cathedral, inlaid with carved marbles. Its fields are very fertile, producing grapes and lemons. R. was laid waste by Totila, king of the Goths. Pop. (1872) 14,818.

RO'SSBACH, a village in Prussian Saxony, in the government of Merseburg, and 8 miles south-west of the city of that name, is celebrated in history for the victory here gained by the Prussians under Frederick the Great over the combined French and Imperialist armies on 5th November 1757. A short time previously, Frederick had been compelled to leave the bulk of his army in Silesia under the Duke of Brunswick-Bevern to check the Austrians on this side, and hastened with 22,000 men to oppose the invasion from the west. The Prince of Soubise (one of the 'amateur' French generals of the period), who was at the head of the confederate army of 60,000 men, thinking from Frekerick's cautious manœuvres that he was terrified and desirous of retreating, at once charged forward with his cavalry, and left his columns at the mercy of General Seidlitz, who attacked them in front and flank with the whole of the Prussian cavalry and artillery. The confederates were speedily thrown into utter disorder, and, being charged in front by the Prussian infantry under Prince Henry, their rout was complete. The 'rout of Rossbach' was so utterly disgraceful that it remained for a long time proverbial in the French army. The Prussians lost (according to a French account) only 300 men, while the loss of the allies was more than 1200 slain, 6000 prisoners, among whom were 11 generals and 300 officers, and 72 cannon, with many other trophies.

ROSSE, WILLIAM PARSONS, third EARL OF, a well-known practical astronomer, was born in York in 1800, and educated first at Trinity College, Dublin, and afterwards at Magdalen College, Oxford, where he graduated first-class in Mathematics in 1822. During the life of his father, he sat in the House of Commons as Lord Oxmantown, representing King's County from 1821 to 1831; he succeeded to the peerage in 1841, and was elected a representative peer for Ireland in 1845. At an early age R. had devoted much attention to the study of practical science, and especially to the improvement of the telescope, and had commenced as far back as 1826 to make experiments in the construction of fluid lenses (see *Philosophical Transactions* for 1840), but he subsequently relinquished those investigations, to engage himself with the problem of the best mode of constructing the speculum of the reflecting telescope. The two great defects which had hitherto baffled opticians were 'spherical aberration' and absorption of light by specula; and in the casting of these of large size, there was the apparent impossibility of preventing cracking and warping of the surface on cooling. However, by a long series of carefully conducted experiments, he succeeded in discovering a mode of operation by which the last defect was wholly obviated, and the two others greatly diminished in amount.

The metal for the speculum of his great telescope (see TELESCOPE), three tons' weight, was poured into the iron mould April 1842, the crucibles being lifted and emptied by means of cranes; and the mould was kept in an annealing oven for 16 weeks, so that the metal should cool equably. It was then polished and mounted in his park at Parsonstown, at a cost of £30,000, the adjustments consisting of a system of chains, pulleys, and counterpoising weights, so complete in all its parts, that the ponderous instrument of 12 tons' weight can be moved so as to point in any direction, and with almost as much precision as the ordinary equatorial of the observatory. The first addition to the body of astronomical knowledge made by this telescope was the resolution of certain nebulæ, which had defied Herschel's instrument, into groups of stars; next came the discovery of numerous binary and trinary stars, and a description of the moon's surface. This telescope, constructed under R.'s personal directions, is described in the *Philosophical Transactions*. He died in 1867, and a statue to his memory was erected in Parsonstown in 1876.

ROSSETTI, GABRIELE, a celebrated Italian author, was born at Vasto in 1783, and came to England as a political refugee in 1824. Two years afterwards he published the *Comento Analitico* on the *Divina Commedia* of Dante, in which he aimed to show that in the middle ages all the poets used a jargon under which they veiled their hatred of the papacy, and concealed the true religion under the form of a woman beloved by them. In conducting this argument he displayed amazing erudition. His opinions naturally excited a great deal of hostile criticism. R. replied to his opponents with the work, *Sullo Spirito Antipapale che produsse la Riforma, e sulla influenza che esercitò nella letteratura di tutta l'Europa e principalmente d' Italia* (1830). But this book did not convince them either, and then R. sought to reduce to method his system, and published *Il Mistero dell' Amor Platonico svelato* (1840), and *La Beatrice Di Dante*. Whatever may be thought of R., he has at least founded a new school of interpretation of Dante, and his partisans are numerous in Italy. His name is well known in the peninsula for his national poems, which have gained for him the title of the Italian Tyrtæus. These are contained in the *Dio e l'Uomo* (1840); *Il Veggente in Solitudine* (1846); *L'Arpa Evangelica* (1852); *Poesie di Gabriele Rossetti* (1847). He was Professor of Italian Literature in King's College, London, and was honored and esteemed by many of the most eminent public men in England. He died in London in 1854.

ROSSETTI, DANTÉ GABRIELE, son of the former, distinguished as a thoughtful and powerful painter, a graceful poet, and an elegant translator of early Italian poetry, was born in London in 1828, and educated at King's College, London. As a painter, he was more talked of than known, probably because his works were transferred into private collections as soon as they left his studio, and without undergoing the publicity of exhibition. Although he never exhibited at the 'Royal Academy,' his pictures were occasionally sent by their proprietors to various public picture-galleries. Of these, his 'Fair Rosamond,' a picture pervaded by earnest thought, and treated in a powerful, though strikingly unconventional manner, was exhibited in the galleries of the Royal Scottish Academy in 1860—1861. Of his other pictures, the chief are 'Ecce Ancilla Domini,' and 'Beatrice Dead.' He contributed some fine drawings to an illustrated edition of Tennyson, which, although inadequately engraved, rank among the first of modern woodcuts. These, like everything this artist has produced, are strongly imbued with the spirit

of the Romantic period. R.'s name was first brought prominently forward by his association with Millais and Holman Hunt in the 'Pre-Raphaelite Brotherhood.' While time and experience modified the practice of some of the original pre-Raphaelites, R.'s pictures displayed to the last the peculiarities of earlier days. As an author, R. is well known by his translations of the *Early Italian Poets from Ciullo d'Alcamo to Dante Alighieri* (1100—1200—1300) (1861). In conjunction with his brother WILLIAM, he edited Gilchrist's *Life of William Blake, Pictor Ignotus* (Lond. 1863), left incomplete at the death of the compiler. *Poems* (1870), new edition, with additions (1881), added to R.'s reputation. His *Ballads and Sonnets* (1881) confirmed and extended this reputation, and were received by the critics with almost unanimous applause. He died April 10, 1882. See Caine's *Recollections of Rossetti* (1882).

R. is not only a painter and author, but a man of thorough acquaintance with and high accomplishment in applied and decorative art. He has borne a distinguished part in the resuscitation of Gothic art in England, both ecclesiastical and domestic.

CHRISTINA R., sister of the above, and born 1830, has made a literary reputation by her *Goblin Market* (1862), *The Prince's Progress* (1866); *Speaking Likenesses* (1874), and *A Pageant* (1881), &c.—WILLIAM M. R. has earned a name as an accomplished critical writer from his translation of Dante's *Hell* (1861); *Criticism on the Poems and Ballads of Swinburne* (1866), &c. In 1850, he was editor of *The Germ*, the organ of the Pre-Raphaelites, devoted to the inculcation of their fundamental principle, which was direct study from nature herself, unfettered by the conventionalities of the 'antique' and 'academies.'—Another sister, MARIA (born 1827, died 1876), was known as the author of an able study of Dante.

ROSSI, PELLEGRINO, was born of a noble family at Carrara in 1787. He carried on his studies at the university of Bologna. In 1812, being 25 years of age, he was appointed Professor of Law in that university. In 1815, King Murat having proclaimed Italian independence, R. sided with him. On the fall of Murat, R. was exiled. He took refuge at Geneva, where he was appointed Professor of the Science of Law. There he published *Le Droit Pénal*, a very learned work, which made him famous in France. In 1833, Louis-Philippe called him to Paris, and appointed him Professor of Political Economy. Then R. commenced the course *Du Droit Constitutionnel*, and the government, in order to reward the great publicist, naturalized him and made him a member of the Chamber of Peers. Protected by Guizot, the prime minister, R. was sent to Rome as ambassador in 1845. There he witnessed all the events of 1848 and took partin them, having again become an Italian subject after the fall of Louis-Philippe. When called to the ministry by Pius IX., R. wished to oppose the party favorable to the House of Savoy, and devised an alliance with the king of Naples, which had for its object a confederation of Italian princes with the pope as their president. This roused the hatred of the Romans, and R. was stabbed by an unknown hand on the 15th November 1848. In 1860, Luigi Carlo Farini decreed the publication of all the writings of R., and that a bust of him should be given to the university of Bologna, where it was inaugurated with great solemnity on the 27th April 1862.—Besides the *Droit Pénal*, R. published the *Cours d'Economie Politique* (1840); the *Lettere d'un Dilettante Politico sull' Allemagna, sulla Francia, e sull' Italia* (Florence, 1848); and left many inedited writings, which, after his death, were published in Paris at the expense of the Italian government.

ROSSIE'NY, a town of European Russia, in the government of Kovno, 66 miles north-west from Kovno on the Dubitza, a branch of the Niemen. Under the Polish government, it was the capital of Samogitia. Pop. (1867) 10,732.

ROSSINI, GIOACCHINO, the greatest composer of the present century for the Italian lyrical stage. He was born at Pesaro in 1792, the son of a horn-player in an orchestra of strolling players. At the age of fifteen, the Countess Perticari, discovering his talent, sent him to study at the lyceum of Bologna, where he received instructions in counterpoint from Padre Mattei. He was, however, principally self-taught, giving days and nights to the study of the great Italian and German masters. Passing over a few juvenile efforts, his first important opera was *Tancredi*, which was first performed in Venice in 1813, and excited an extraordinary sensation throughout the musical world, raising its composer at once to the summit of fame. It was followed in succession by *L'Italiana in Algeri* (1813), *Il Turco in Italia* (1814), and *Aureliano in Palmira* (1814), all inferior to *Tancredi*. In 1815, R. was appointed musical-director of the theater of San Carlo at Naples; and while holding that position he continued to produce operas both at Naples and elsewhere. *Il Barbiere di Seviglia*, the most popular of all his works, was produced at Rome in 1816, and said to have been composed in twenty days; it was followed by *Otello* in the same year; and in 1817, appeared *La Cenerentola* at Rome, and *La Gazza ladra* at Naples. From this time to the close of R.'s engagement at Naples in 1823, he wrote the operas of *Mosè in Egitto, La Donna del Lago, Maometto Secondo* (otherwise known as *L'Assedio di Corinto*) and *Zelmira*. In 1823, he produced *Semiramide*, the most gorgeous of his operas, at Venice, and soon afterwards left Italy. He visited first Paris, and then London, where he was received with great enthusiasm.

Returning to Paris, he received from Charles X. the appointment of director of the Italian Opera in Paris, and while there composed his *Guillaume Tell* (1829), which, though ill-constructed as a drama, ranks musically as high as any of his works. When the revolution of 1830 broke out, R. lost the management of the Italian Opera, but continued to live for some time in Paris; in 1836, he returned to Italy, where, with the exception of a visit to Paris, he principally resided till 1855. With *Guillaume Tell* he may almost be said to have closed his career, having after it composed nothing of importance except his well-known *Stabat Mater*, a pretty and popular work more secular than sacred in its style of music. Large offers from the managers of opera-houses did not succeed in tempting him from his retirement. His statue was inaugurated at Pesaro in 1864, amid a large concourse of Italian statesmen and men of letters. In R.'s early works he developed with great felicity the type established by his Italian predecessors. These compositions are characterized by stirring melody, brilliant instrumentation, and a highly enjoyable vivacity. *Guillaume Tell*, though equally original, approaches far more nearly to the character of the German school. Much as R.'s music continues to be prized, only four of his forty operas, composed from 1810 to 1829, have kept the stage, *Il Barbiere, Otello, La Gazza ladra*, and *Semiramide*. He died November 1868.

ROSSO ANTICO, the technical name for the red porphyry of Egypt. It consists of a red felspathic base, in which are disseminated rose-colored crystals of oligoclase with some plates of hornblende, and grains of oxidized iron ore.

RO'STER (corrupted from Register) is a fixed order preserved in military departments as the rotation in which individuals, companies, or larger bodies are called on to serve. Regiments proceed on foreign service according to the roster.

RO'STOCK, the most important town and seaport of the grand duchy of Mecklenburg-Schwerin, stands in a flat fruitful district on the Warnow, 9 miles from the mouth of that river in the Baltic, and 55 miles north-east of Schwerin by railway. It is surrounded by ramparts and walls pierced by 12 gates, and has still a medieval aspect. The university, founded in 1419, maintains 39 professors and lecturers, and has a library of 120,000 volumes. The handsome new university building is a Renaissance structure in brick. In St. Mary's Church, a large building dating from the 13th c., and possessing one of the finest organs in Germany, is the tomb of Grotius. St. Peter's, dating from the 12th c., has a tower 420 feet high. There are several squares, of which Blucher's Square contains a colossal monument of the general of that name. Manufactures of linen and tobacco, and tanning, brewing, and distilling are carried on. In the year 1866, the town of R. owned 377 vessels. The exports are chiefly wheat, barley, oil-cakes, and cattle-bones to Great Britain. The imports are coals, salt, iron, limestone, herrings and other provisions, timber, &c. At the mouth of the Warnow is Warnemünde, the port of R., at which all vessels drawing more than 10 feet load and unload. Pop. of R. (1880) 36,967.—R. is of Slavic origin, and a shadowy glimpse of it is got in the 11th or 12th c., but the progress of commerce and other causes, chiefly political, rapidly Germanized it, and in 1218 it figures as wholly German. It was a member for centuries of the old Hanseatic League, long ranked in importance with Lübeck, and still enjoys to a wonderful extent its ancient privileges—the municipal constitution of the town being even yet almost republican.

ROSTO'F, a town of European Russia, and one of the most ancient in the empire, in the government of Jaroslav, stands on the banks of Lake Nero or Rostofsky. An important fair is held here, and a flourishing commerce, which the railway from Jaroslav to Moscow promises to increase, is carried on. R. contains numerous factories, the chief manufacture being that of linen. Pop. (1880) 10,000.

ROSTOF ON THE DON, a district town and ferry of South Russia, in the gov. of Ekaterinoslav, stands high on the right bank, and at the head of the delta, of the Don. It owes its origin to the foundation of the fortress of St. Dmetri here in 1749, since which time the progress of the town, owing to its advantageous situation, has been so great that it is now the center of trade in South Russia. Its custom-house was erected in 1835, and in that year the customs' dues amounted to £150,000. The annual exports have amounted to £1,198,526, the principal articles being wheat, iron, tallow, and linseed. Manufactures are carried on with activity in 22 factories, the principal articles produced being cast-iron, bricks, ropes, tobacco, maccaroni, soap, and leather. Railway communication with Vladikaukas in Caucasia was opened in 1875. Pop. (1880) 44,500.

ROSTOPCHINE, Feodor Vassilevitch, Count, a Russian general, directly descended from Genghiz Khan, was born in the province of Orel, March 23, 1765; and, after having filled for some time the office of page to Catharine II., entered the Russian military service as a lieutenant in the Imperial Guard. In 1784 he set out on a course of foreign travel, returning to St. Petersburg in 1792, and obtaining through the powerful influence of some friends, the post of gentleman-of-the-chamber. Having the good fortune to be the first messenger to Paul of his accession to the throne, he was immediately (1796) created general, a rise in rank speedily followed by the successive appointments of grand-marshal of the court, minister of foreign affairs, count (1799), and chevalier of all the Russian orders. R. possessed extraordinary influence over the mind of the half-witted monarch, and succeeded in preventing his vagaries from seriously affecting the government or religion of the empire; but he was repeatedly banished from court and almost immediately recalled, and it was during the last of these banishments (to Moscow) that the czar was murdered. The Emperor Alexander seems to have disliked him, for R. remained in a state of banishment till May 1812, when, having need of the services of all his subjects, and knowing R.'s distinguished patriotism, Alexander appointed him governor of Moscow. On the approach of the French, R., by extraordinary exertions, raised an army of 122,000 men fully equipped, but to his great chagrin was ordered to evacuate Moscow.

R. has been unanimously branded by the French writers as the burner of Moscow, and for a long time this was generally credited in the west, till, in 1823, he published in his own defence, *La Vérité sur l'Incendie de Moscou* (Paris, 1823), in which he rebuts the charge, affirming that this barbarous action was due in part to the fervid patriotism of a few of the inhabitants, and in part to the violence and negligence of the French. At the same time, he showed that the damage done to Moscow was much less than the estimate given by French and English writers, and that the Kremlin, which the French had attempted to blow up, had been in reality little injured. R. certainly set fire to his own mansion-house in the neighborhood, but no other act of incendiarism has been proved against him, the accusations published in the *British Monitor* (1822) having been triumphantly rebutted. He had succeeded in repairing much of the damage done to the city, and in recollecting many of its former inhabitants, when, through a court intrigue, his dismissal from office was effected (August 30, 1814). R. accompanied the Emperor Alexander to the Congress of Vienna, and subsequently (1817) retired to Paris, where he occupied himself in literary pursuits, and in forming a fine collection of pictures and books. In 1825, he returned to Russia, and died January 30, 1826, at Moscow. His wife and one of his sons have made for themselves names in literature, and his daughter-in-law, the Countess Eudoxia Rostopchine, is considered as one of the first poets of Russia. R.'s works, which include a number of historical memoirs, comedies, &c., in Russian and French, were collected and published at St. Petersburg in 1853.

ROT is known in the south-western counties of England under the provincial names of bane, coa, or coathe. It consists in the maturation within the liver and biliary ducts of an entozoon, the *Distoma hepaticum*, or Fluke (q. v.). Although most frequent amongst sheep, it also occasionally attacks rabbits, hares, deer, and cattle. Until of late years, the annual losses amongst the flocks of Great Britain were estimated at a million; but in 1809, 1824, 1830, and 1833, this large mortality is believed to have been doubled. During the wet winter of 1852—1853, and again in the autumn of 1860, and early months of 1861, rot was extensively prevalent. Autumn and early winter are the periods of its most frequent occurrence. Close damp weather, inducing a rapid growth of soft, luxuriant herbage, favors its development. The rising of the Nile is said to rot annually 16,000 sheep. Low, damp, marshy situations, water-meadows, undrained lands, especially when of a clayey, retentive consistence, furnish a large proportion of cases. The hay from such localities induces rot almost as readily as the fresh grass. Sheep grazed even for a few hours upon land subject to rot, or taking a single draught from an infected stagnant pool, may contract the disorder, most probably by swallowing the young flukes. From 15 to 40 days usually elapse before any serious consequences follow from the presence of the parasite. At first, indeed, digestion appears to be stimulated, and the sheep thrive rather better than before; but by and by they rapidly waste, their wool becomes dry, and easily detached, their bowels irregular, their skin and mucous membranes yellow, as is usually conveniently observed by examining the eye and its pearly caruncle, which in rot loses the brilliancy of health, and exhibits a dingy yellow hue.

The body, after death, is soft, flaccid, and indifferently nourished; watery effusions are discovered underneath the jaws and in other dependent parts; the small quantities of unabsorbed fat have a dirty yellow color; the liver is soft and enlarged, and usually mottled with patches of congestion. In the thick and muddy bile, the flukes, with their myriads of spawn, float in variable numbers.

The treatment of rot is seldom very satisfactory; and if the animals, when first affected, are in tolerable condition, no time should be lost in having them slaughtered. If remedial measures are attempted, the sheep should be removed to a dry and sound situation, and liberally supplied with dry nutritive food. During the summer, allow corn or cake with the grass; during the winter, when cases are most frequent, supply clover-hay, pease, or split beans, a little bruised linseed cake, and a few roots: pieces of rock-salt should also be laid about the ground, for the patients to lick at. Medicines are seldom of much avail. Those most to be relied on are turpentine and powdered gentian in two-drachm doses, given daily, beat up with an egg and a little milk, or with some linseed gruel. The turpentine, besides acting beneficially as a stimulant, doubtless also exercises a poisonous action on the flukes, whilst the gentian imparts tone to the irritable and relaxed bowels. The prevention of rot is usually effected by removing from the land all superfluous moisture by deep and thorough drainage.

The improvement of unsound herbage may subsequently be expedited by dressings of lime, salt, soil, or composts of farm-yard manure and earth. On all suspicious grazings, beans and oats should for a time be given in moderate quantity, and access allowed to rock-salt. The Arab and Bedouin shepherds have for centuries recognized the importance of such measures, for, when their flocks become rotten from depasturing on the rank herbage that shoots up after the risings of the Nile, they often prevent serious loss by promptly transferring them to the desert, where the dry forage-plants are very rich in saline matters. The Australian flock-master likewise checks the complaint by promptly removing his sheep, which have become tainted, from the deep alluvial soils to the poorer upland 'salt-brash' countries. In like manner, the salt marshes of Cheshire, and the saltings left along our coasts by the tides, have long enjoyed a well-deserved celebrity in the prevention, and even in early cases, in the cure of sheep-rot.

RO'TA, a town of Spain, in the province of Cadiz, and six miles north-north-west from Cadiz, on the opposite side of the entrance of Cadiz Bay. Rota wine has acquired some celebrity, and is brought to the British market. Pop. 8000.

ROTANG. See Rattan.

ROTA'TION (Lat. *rota*). There is, perhaps, no elementary idea which has been the subject of so much popular misconception as that of rotation. This is probably due to the vagueness of the definitions commonly given.

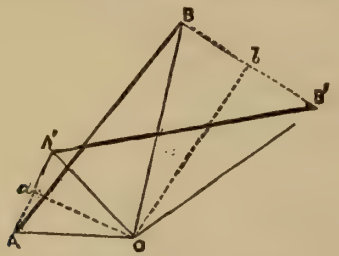
All motion that we can observe is *relative;* for instance, any fixed object on the earth's surface has a certain motion *relative* to the earth's axis, in consequence of the diurnal rotation; the earth itself has a certain motion *relative* to the sun, in consequence of its annual revolution; the sun has a certain motion *relative* to the so-called fixed stars; and it is possible that the whole stellar system may have a motion *relative* to something in space beyond its boundaries. Now, the motion of an object on the earth's surface differs according to the way it is measured: a passenger sitting in a railway-carriage is *at rest* if his motion *relative* to the carriage be considered; he has the same motion as the carriage, if it be measured *relative* to the rails; and if the carriage were running from east to west along a parallel of latitude, so as to complete the circuit in 24 hours, he would be at rest relative to the earth's axis. If, therefore, we wish to talk of *absolute* motion, it must be measured *relative* to Fixed points or directions; and in the violation of this obvious condition lies the error most commonly met with. Thus, to show that the earth rotates about its axis, we may observe its motion relatively to the line joining it with the moon; and we observe that the moon comes to the meridian at intervals of (roughly) 25 hours. Does the earth rotate in 25 hours? We know that it does not, and the error consists in treating as an *absolute* rotation, a rotation measured relative to a line—that joining the earth and moon—which is itself turning. If we take the intervals of the sun's crossing the meridian, we find 24 hours—a much closer approximation; but still not exact, because our line of reference—that joining the earth and sun—is slowly turning.

Would we have an absolute measure, we must choose a *fixed* line, or one so nearly fixed, that its motion is absolutely insensible. Such is the line joining any fixed star with the earth, and the time of the earth's *absolute* rotation about its axis is $23^h\ 56^m\ 4^s.09$—the interval between culminations of the same fixed star. The difference between absolute and relative rotation in any planet gives rise to the difference between the *sidereal* and the *solar* day; and the planet's year contains just *one* more of the former than of the latter.

Now, suppose for a moment that the earth were to revolve only $\frac{1}{365}$th part as fast as it now does, there would be *one sidereal* day in the year, and there would be *no* solar day at all—in other

words, there would be *no* rotation of the earth with reference to the line joining it with the sun; that is, the earth would turn always the same side to the sun; yet it would be *absolutely* rotating about its axis once in a year. This is the case which we observe in the moon's motion relative to the earth, and we see at once that the moon must rotate *absolutely*—that is, with reference to fixed directions in space—in the exact time in which she completes one revolution about the earth. Those who say the moon does not rotate on her axis, make precisely the same mistake as those who fancied that the earth is immovable, and that moon, sun, and stars revolve about it every day. There is a physical cause for this peculiarity in the moon's motion, which leads to very important consequences with reference to the future of the solar system. See TIDES.

Several elementary theorems regarding rotation may now be enunciated; but the proofs, though very simple, will be given merely in outline. Any displacement *whatever* given to a plane figure in its own plane—as to a sheet of paper lying on a table—is equivalent to a single rotation about a definite axis. Let A, B be any two points of the figure, and let them be displaced to A′, B′ respectively. Join AA′, BB′, and bisect them in *a* and *b* by perpendiculars meeting in O. Then, it is easy to show that (1.) OA′ = OA, OB′ = OB, and therefore O is the *same* point of the



plane figure in its first and second positions. (2.) ∠AOA′ = ∠ BOB′, and is therefore the angle through which the whole has turned about the point O. If AA′ and BB′ are parallel, this construction fails; but in this case, if AB and A′B′ do *not* intersect, the motion is simply one of translation: if they *do* intersect, the point of intersection is the axis.

Any number of successive rotations about different points constitute, of course, a displacement, and are therefore reducible to one rotation.

Two equal and opposite rotations about different points give rise to a mere translation.

The first two of these propositions are true of figures on a sphere as well as on a plane surface; for the figure above has only to be drawn with great circles instead of straight lines, and the proof applies letter for letter. Only, here, the first case of exception cannot occur, because two great circles *must* intersect. Hence it follows, that if the center of a sphere be fixed, any displacement whatever is equivalent to a rotation about some axis; that is, after any motion whatever of a rigid body, one point of which is fixed, there is always *one* line of particles which remains undisturbed.

[This simple proposition has been found very hard to believe, even by men of considerable intelligence.] Hence rotations about any number of axes passing through the same fixed point may be compounded into one; and, generally, any motion whatever of a rigid body may be decomposed into two, one of which is a motion of translation of some chosen point, and the other rotation about some axis through that point. Thus, in the case of the moon, we have a motion of translation of its center in its orbit, and one of rotation about its axis; or we may combine them into a single rotation in the period of a lunar month about a fixed axis passing through the earth's center.

Again, any displacement of a plane figure in its plane, or of a spherical figure on a sphere, may be produced by the rolling of a curve fixed in the figure upon another fixed on the plane or sphere. Hence, the most general motion of a body with reference to one point, consists in the rolling of a cone fixed in the body upon another fixed in space, their vertices being at the chosen point. To this, when the cones in question are right circular cones, belong the *Precession* (q. v.) and *Nutation* (q. v.) of the earth and of a top, the evolutions of an ill-thrown quoit, &c.

ROTATION, MAGNETISM OF. This was discovered by Arago in the years 1824—1825. He observed that when a magnetic needle was made to oscillate immediately above a copper plate, it came sooner to rest than it did otherwise. The oscillations were made in the same time as when away from the plate, but they were less in extent; the plate seemed thus to act as a damper to the motions of the needle. This being the action of the plate at rest on the needle in motion, Arago reasoned that the needle at rest would be influenced by the plate in motion. Experiment confirmed his opinion. He made a copper disc revolve with great rapidity under a needle, resting on a bladder placed immediately above it, and quite unconnected with it, the middle of the needle being placed above the center of the disc. As expected, the needle deflected in the direction of the motion of the disc. The deflection of the needle increased with the rapidity of the motion, and when it reached a sufficient amount, the needle no longer remained in a fixed position, but turned round after the disc. This action of the revolving disc was attributed to what was then called the 'Magnetism of Rotation,' and the name has been since retained.

The explanation of this phenomenon was first made by Faraday (1832). He found it to arise from the reaction of currents, induced in the plate in motion by the magnet. The accompanying figure illustrates the electrical condition of the plate. PP is the plate, rotating in the direction indicated by the arrow; NS, is the needle; and the lines with the arrow-heads indicate the general direction of the currents induced by rotation under the magnet in the plate. There are two complete circuits on each side of the disc, coinciding in the middle, and taking the direction CC. It is the conjoined current which affects the needle; it runs in a direction a little in advance of the needle, as the inductive power of the magnet takes some time to act. As the induced current lies below the needle, the deflection (according to Ampere's rule, see GALVANISM) takes place in the direction of the motion of the disc. When cuts are made in the disc in the line of the radii, it loses almost entirely its disturbing power; the currents formed in the whole disc can no longer take place, and those formed in the various sectors are weak in comparison; by filling up the vacant spaces with solder, the power is nearly restored to it. As is to be expected, the effect of the revolving plate depends on the conducting power of the material of which it is made. It is owing to its high conducting power that copper is so much used in these experiments; hence, also, it is that copper should be so much used in the construction of magnetic apparatus. A copper compass-box, for instance, is not only desirable, from its being free from iron, but it acts as a damper to bring the needle quickly to rest when disturbed.

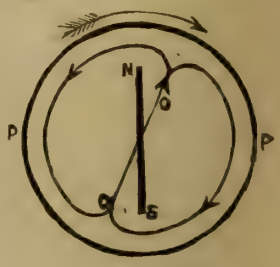


Fig. 1.

The magnetism of rotation is only one of a large class of phenomena, in which the motion, either of a magnet or of a conductor near it, induces an electric current in the conductor. We may here quote two experiments, which may be looked upon as the converse of the magnetism of rotation. In the first experiment, a small cube of copper (fig. 2) is hung by a thread to a frame, and placed between the poles of a powerful electro-magnet; the cube is sent into rapid rotation by the twist on the thread, previously


Fig. 2.

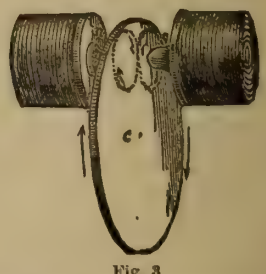


Fig. 3.

given it; it is instantly brought to a halt, when the current is allowed to circulate in the coils of the magnet, and it begins its motion again when the current is turned off. In the second experiment, a disc of copper, *c*, is made to rotate rapidly between the poles, *n*, *s*, of an electro-magnet, by means of a handle and intervening wheel-works, turned by the experimenter. When the current invests the soft iron poles with magnetism, the disc, moving freely before, appears suddenly to meet with an unseen resistance, and the rotation continues slowly or not at all. If persisted in, the rotation causes the disc to rise in temperature, the

rise being proportionate, according to Foucault, to the square of the velocity of rotation. These, and all similar phenomena, illustrate a law that holds universally in magnetic induction, and was first enunciated by Lenz. *When a current is induced by the motion of a magnet or conductor, the inductive action tends to develop in the conductor a current, in such a direction that its action will be to oppose the motion producing it.* Thus, in the last experiment, the part of the disc approaching the poles, has a current developed in it which repels them, and the part leaving the poles, has a current induced in it which attracts them. The approach of the one part, and the departure of the other, are equally opposed by the currents induced in them. The same mode of explanation applies to the other experiments referred to.

ROTA'TION OF CROPS. The plants like the animals of the farm differ much in their habits, and in the different sorts of food on which they subsist. The broad-leafed clovers, turnips, and mangold abstract from the air a large proportion of the materials of their growth; whilst the narrower-leafed grains and grasses, especially if their seeds are ripened, partake more largely of mineral food withdrawn from the soil. The cereals require for their healthy nutrition large supplies of phosphoric acid and silica; leguminous plants devour a large share of lime; turnips, carrots, and clover take up a great amount of potash. Corn-crops, occupying the ground during the greater part of the year, favor the growth of weeds; well-tended root-crops, on the other hand, afford better opportunity for deep culture, for the extirpation of weeds, for the convenient application of manures; whilst, being in great part consumed on the land, they raise its fertility. Mainly from such considerations, the farmer of arable land is led to grow a succession of dissimilar plants, or, in other words, to adopt a rotation of crops. The cereals exhausting the farm, on account of their ripened seeds being sold off, are generally alternated with fallow, root, or cleansing crops, or with beans and peas, which occupy a kind of intermediate position between the cereals and the roots; whilst clovers or grasses are taken at intervals of six or eight years. The rotation most suitable for a particular farm is, however, greatly modified by various circumstances, and especially by the nature of the soil, climate, markets, available supplies of extra manures, amount of live-stock kept, &c. That course of cropping is evidently the most desirable which will economically secure, with thorough cleanness of the soil, a high and increasing state of fertility.

Many rotations are based upon the Norfolk or four-course system, which consists of (1) Clover or mixed grass seeds; (2) Wheat, or in many parts of Scotland, oats; (3) Turnips, Swedes, mangold, potatoes, or bare fallow; (4) Barley. The details of this system are generally as follows. The clovers or grasses are mown or grazed; when cut, they are either used green or are dried for hay; the second crop is carted home for the cattle or horses; near towns, it is sold off; or it is consumed on the ground in racks by sheep, which on most highly cultivated farms receive besides a daily allowance of cake or corn. In districts where town-manure can be obtained, a top dressing is applied as soon as the first crop of grass is cut. On the poor and worse cultivated soils, the grass-crop occasionally remains down for two, or even three years, thus extending a four into a five or six years' rotation. The clovers or mixed seeds are ploughed up in autumn, and followed generally in England by wheat, and in Scotland by oats. These crops are now usually drilled, to admit of horse and hand hoeing. After harvest, the stubble is, if possible, cleaned by the scarifier, grubber, or plough and harrows; or, where the management for several years has been good, any patches of couch-grass or other weeds are best forked out by hand. The land, especially if heavy, or intended for mangold drilled on the flat, as practised in the drier parts of England, may then be manured and deeply ploughed: the grubber and harrows, in April or May, suffice to prepare for the drilling of mangold or Swedes. Heavy land, intended either for roots or barley, should, in spring, be ploughed or disturbed as little as possible. In Scotland, and the cooler moist climates of the north and west of England, turnips and potatoes are grown on raised drills or balks, in which the manure lies immediately underneath the plant.

Frequent horse and hand hoeing should insure the thorough cleaning of the crop. Unless in the neighborhood of towns, where it is greatly more profitable to sell off the whole of the root-crop, part of the Swedes or mangold is taken home for the cattle, but the largest portion is consumed by sheep in the field. After the fallow or cleaning crop, another cereal crop is grown: under the Norfolk system, this is generally barley, with which the clovers or seeds are sown out. Where sewage or tank water is available, Italian rye-grass is often used, and on land in high condition, early large and repeated cuttings are obtained; but rye-grass has the disadvantage of being a worse preparation than clover for the wheat-crop which usually follows. The chief failing of the four-course system consists in the frequent recurrence of clover, which cannot be successfully grown oftener than once in six or eight years. To obviate this difficulty, one-half of the clover quarter is now often put under beans, peas, or vetches, thus keeping the grass or clover seeds eight years apart.

The Norfolk four-course system is unsuitable for heavy land, where a large breadth of roots cannot be profitably grown, and where their place, as a cleaning crop, is taken by bare fallow, vetches, or pulse. Bare fallows are, however, less frequent than formerly, being now confined to the most refactory of clays, or to subjects that are so hopelessly full of weeds as to require for their extirpation several weeks of summer weather, and the repeated use of the steam or horse ploughs, the scarifier, grubber, and harrows. In such circumstances, winter vetches are often put in during September or October, are eaten off by sheep and horses in June or July, and the land afterwards cleaned: this practice is extensively pursued on the heavier lands in the midland and southern counties of England.

In such localities, the following system is approved of—(1) The clover leas are seeded with (2) wheat; then come (3) beans, pulse, or vetches, manured, horse or hand hoed; (4) On good land, wheat succeeds; (5) Oats or barley often follow, but, to prevent undue exhaustion of plant-food, this system requires considerable outlay in artificial manures, cake, and corn; (6) A fallow, or fallow crop, deeply and thoroughly cultivated, and well manured, comes to restore cleanness and fertility; (7) Barley or wheat is drilled, and amongst this, the clover-seeds are sown. On the heavier carse-lands in Scotland, the following plan of cropping is generally practiced—(1) Clover; (2) Oats; (3) Beans; (4) Wheat; (5) Bare fallow or fallow crop, usually including a considerable breadth of potatoes; (6) Wheat; (7) Barley, with which the clovers or mixed grasses are sown. Under this system, it is difficult, with so few cleaning crops, to keep the land clean; roots, besides, are not produced in quantities sufficient properly to supply either cattle or sheep during the winter. To remedy these defects, roots may be introduced after the oats, and would be followed either by wheat or barley. This extends the rotation from seven to nine years.

In all well-cultivated districts, whether of heavy or light land, stock-farming is extending, and a more vigorous effort is being made to raise the fertility of the land. Root-crops are accordingly more largely grown; indeed, it is sometimes found profitable to grow two root-crops consecutively; thus, after turnips, Swedes, cabbage, or mangold, well manured from the town or farmyard, and eaten off by sheep, potatoes of superior quality are produced with one ploughing, and a dose of portable manure. Specialities of management occur in almost every locality. In Essex, winter-beans follow wheat, are got off in August, and are succeeded by common turnips. Near London, and in other southern districts, early potatoes or peas are grown for market, and are immediately followed by turnips. In many parts of England, where the soil and climate are good, rye or vetches sown in autumn are consumed in early summer, and a root-crop then put in.

Good rotations do not necessarily insure good farming; they are merely means to an end. By carefully removing weeds, by deeply stirring the soil, and by applying appropriate manures, wheat may be grown on the same soil for an indefinite number of years. At Lois-Weedon, in Northamptonshire, the Rev. S. Smith has for twenty years cultivated alternate three-foot strips of wheat and well-forked bare fallow; the land that is wheat this year being fallowed next. Although no manure whatever is applied, and only one-half of the experimental plot is each year under crop, the yield continues to stand at four quarters per acre, which is about four bushels per acre in excess of the average acreable produce of Great Britain.

The Lois-Weedon system, owing to the outlay which it entails for manual labor, probably could not be carried out with profit on a large scale. It demonstrates, however, the inherent resources lying dormant, especially in clay-soils, and indicates how they may be rendered available by thorough cultivation. It is mainly by such cultivation that steam-power proves so serviceable in our fields. The soil is turned up deeply to the disintegrating solvent influences of wind and weather; the necessary operations are rapidly overtaken in good season; much work is accomplished in autumn; treading and poaching of the surface is avoided; whilst a larger breadth of roots is attainable for the healthy and economical support of the sheep and cattle-stock, which not only directly enhance the returns of the farm, but also raise rapidly its manurial condition.

As agricultural education and enterprise extend, fixed rotations will be less regarded. The market-gardener, who extracts a great deal more from his land than the farmer has hitherto been able to do, does not adhere to any definite system of cropping. If the farm is kept clean and in improving condition, there can be no harm in growing whatever crops it is adapted to produce. Cropping clauses are only requisite during the three or four last years of a tenancy. The restrictions found in some agreements, preventing the growth of clover for seed, flax, and even potatoes,

are inadmissible. Equally objectionable are clauses against the sale of particular sorts of produce, such as hay or roots.

The farmer, if he is fit to be intrusted with the use of the land, ought to be permitted to grow or sell off any crop he pleases, provided an equivalent in manure be brought back. On well-cultivated land, in good condition, it is now the practice of the best farmers to take oats or barley after wheat; indeed, some of the best malting barley in Essex, on the Scottish carse-lands, and elsewhere, is now grown after wheat. The frequent growth of cereals, and the heaviest of hay and root crops, even when removed from the farm, may be fairly compensated for by large doses of town-dung or of sewage. The plant-food disposed of in the more ordinary sales of the farm is economically restored by the use of bones or superphosphate, guano or nitrate of soda, or by keeping plenty of sheep, penning them over the land, and supplying them liberally with cake and corn.

ROTATO'RIA, or ROTI'FERA, popularly known as WHEEL-ANIMALCULES, derive their name from the Latin word *rota*, a wheel. They have received these names on account of the apparent rotation of certain disc-like ciliated organs, which surround the mouth. Although some of the larger forms may be detected with the naked eye, they are as a class microscopical. They are widely diffused over the surface of the earth, inhabiting both salt and fresh water, and occurring in all climates. There has been much discussion as to their true place in nature. Ehrenberg regarded them as Infusoria, and Dujardin adopted a similar view. There is, however, no doubt that their organization is far more complex than that of the Infusoria, and the main question of dispute at the present day is whether they are most closely allied to the worms or to the crustaceans.

Huxley maintains that they form a link connecting the Echinoderms with the Nematoid (or thread) worms, and that they constitute the lowest step of the Echinoderm division of the Annelida; while Leydig endeavors to show that on various anatomical, physiological, and embryological grounds, they more nearly resemble crustaceans than worms, and proposes to call them *Ciliated Crustaceans*. Science is indebted to Leeuwenhoek for the discovery of this remarkable class of animals. In the *Philosophical Transactions* for 1702, he described one of the commonest of these animals, now known as *Rotifer vulgaris*, his attention having been especially directed towards its power of retaining its vitality after more or less complete desiccation—a fact which has been since confirmed by many other observers, and which is noticed in the article on DORMANT VITALITY. The R. have usually an elongated form, and are, in most cases, covered with a smooth hard skin, which is thrown into folds by the contractions of the subcutaneous tissue. The animal consists of a head and body. The body usually terminates in a prolongation, which, till recently, was termed the tail, but which is now known as the foot, and into which the intestines are never prolonged. The foot is composed of muscular and glandular structures, and often terminates in a pair of forceps, by which the animal can attach itself to leaves, &c. The body generally presents six segments, which are more or less distinctly marked in different genera.

The head presents the characteristic rotatory organs and the mouth, which always lies in the midst of them, so as to receive particles drawn in by their whirlpool action. It is by means of these organs that they swim freely about, revolving on their axis, or when at rest, producing vortex-like disturbances of the water. The form, number, and arrangement of these organs varies extremely in different genera, and has been made a basis of classification by Ehrenberg and others. The rotatory organ may be single, double, or multiple. It often consists of a disc supported by a pedicle, on whose borders are successive rows of regularly arranged cilia, the motion of which gives the appearance of rotation to the disc itself. In the genera *Floscularia* and *Stephanoceros*, these organs undergo peculiar modifications. In the former, there are five or six button-like processes about the mouth, covered with very long bristles, which move feebly and scarcely give rise to vortices; while in the latter, the rotatory apparatus consists of five tentacle-like ciliated processes, and the animal thus closely resembles the Polyzoa (q. v.). The ciliated rotatory organs, unlike ordinary volatile cilia, are entirely under the animal's control. The digestive apparatus differs extremely in the two sexes, which are always distinct in these animals. In the female, the digestive apparatus is well developed, consisting of a mouth opening into a muscular pharynx, which has two horny masticating organs which move laterally upon each other. The pharyngeal masticating apparatus is of a roundish form, and is composed of two jaws having one or several teeth, which are brought together laterally by the action of special muscles.

For further information on the subject, the reader is referred to a very exhaustive memoir by Mr. Gosse, 'On the Structure, Functions and Homologies of the Manducatory Organs of the Class Rotifera,' in the *Philosophical Transactions* for 1856. Succeeding the pharynx is a narrow œsophagus which leads into a dilated stomach, from which proceeds an intestine, which opens externally by an anus. In all the males that have been hitherto discovered, there is an entire absence of digestive organs, a rudimentary pharynx being the most that is ever observed. The nervous system in the R. consists of a cerebral ganglion, with filaments radiating from it. No heart or vessels have been discovered, but the respiratory organs are well developed. The sexual organs of the female are better known than those of the male. The ovary is round or oval, usually lies by the side of the stomach, and the oviduct proceeding from it usually opens into the cloaca. The ovaries only develop a few eggs at a time, and the nearly mature eggs may be readily observed in the body of the animal when examined under the microscope. These animals produce two distinct kinds of eggs, which are similar in their primary formation, but which differ in their ultimate destiny—namely, thin-shelled summer eggs, and thick-shelled winter eggs. The young are liberated from the former immediately after their discharge, while they remain unhatched in the latter during the winter weather. As far as has hitherto been observed, the males, which are much fewer in number than the females, are developed only from summer eggs. Except in regard to their being totally devoid of a stomach or intestine, and in relation to the sexual organs (which in the male have been carefully examined by Mr. Gosse in his Memoir, 'On the Dicœcious Character of the Rotifera,' in the *Philosophical Transactions* for 1857), the organization of the males is similar to that of the females.



Fig. 1.—Male Egg, just laid.

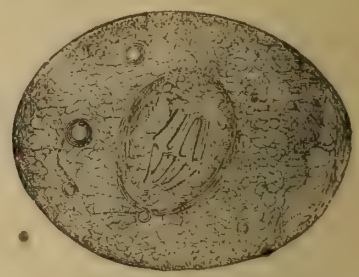


Fig. 2. Female Egg, nearly mature.

The sexes are, however, so unlike that they would be taken for widely remote genera, if their actual hatching had not been observed; the males and the eggs from which they spring being much smaller than the females and the eggs from which they are produced. (In *Brachionus amphiceros*, the female eggs were $\frac{1}{170}$th of an inch in length, while the male eggs were only $\frac{1}{107}$th). The accompanying figures represent the male and female of *Brachionus dorcas* when newly born. The length of the latter an hour after birth was $\frac{1}{98}$th of an inch, while the diameters of the empty shell were only $\frac{1}{176}$th × $\frac{1}{230}$th of an inch—a marvelous increase



Fig. 3.—Male *Brachionus dorcas*.



Fig. 4.—Female *Brachionus dorcas*.

in so short a period. 'Whether,' says Mr. Gosse, 'certain individuals produce only male, and others only female young, or whether separate impregnations are required for the production of the separate sexes, I do not know; but from all my observations I gather that the development of the one sex never takes place coetaneously with that of the other; for male and female eggs are never seen attached to the same parent, and the immature eggs in the ovary invariably develope themselves into the same sex as those which are already extruded. The duration of life in the male is always very brief: I have never been able to preserve one alive for twenty-four hours. Their one business is to impregnate the females, and for this momentary occupation no

supply of loss by assimilation of food is wanted, and hence we can understand the lack of the nutritive organism.'

ROTCHE (*Mergulus* or *Cephus*), a genus of the Auk family (*Alcadæ*), separated from the true auks on account of the thick, short, and indistinctly grooved bill. The COMMON R. (*M.* or *C. melanoleucus*, or *M. alle*, formerly *Alca alle*), known also as the LITTLE AUK, SEA DOVE, DOVEKIE, and GREENLAND DOVE, is about the size of a large pigeon; its general color is black, but the belly is white, and there is a white mark upon each wing. It is very abundant in the arctic seas, and immense flocks are seen on the coasts of Greenland, Spitzbergen, Melville Island, &c. It is, however, truly oceanic in its habits, and scarcely visits the land except during the breeding season. Though comparatively rare on the British coast, it is pretty frequently seen in the Orkneys. Under the article AUK will be found figures of the Great and Little Auks.

ROTHE, RICHARD, one of the first speculative divines of Germany, was born at Posen in 1799, and became successively member, professor, director, and ephorus of the Theological Seminary of Wittenberg. In 1837, he was nominated Professor of Theology at the university of Heidelberg, which in 1849 he exchanged for Posen. In 1854, however, he removed again to Heidelberg. Vigorous grasp and independence of thought were his chief characteristics, but he never formed a school, in the strict sense of the term. One of his well-known works is the *System of Theological Ethics, or Moral Theology*—a complete system of speculative theology or theosophy. This work is to show that religious truth is not a series of disputable propositions, but a divine morality; in a word, to translate the scholastic dialect of the creeds back into the living language of the Sermon on the Mount. Another remarkable book of his is the *Beginnings of the Christian Church*, which, by the peculiarity of 'stand-point' assumed by the author regarding church and state, evoked many fierce counter-treatises, like Baur's *On the Origin of Episcopacy*. R. died at Heidelberg in 1867. His lectures on *Dogmatik* were published in 1870; *Sermons*, in 1872; and *Quiet Hours* (*Stille Stunden*), the same year.

RO'THENBURG AN DER TAU'BER, a small ancient town of Bavaria, on the Tauber, 31 miles south-south-east of Würzburg. Pop. (1880) 6504, who manufacture woollen cloth, paper, and gunpowder, and trade in corn and cattle.

RO'THERHAM, a market-town in the West Riding of Yorkshire, 6 miles east-north-east of Sheffield, is situated on the slope of a hill on the right bank of the Don, immediately below the junction of that river with the Rother. On the middle of the ancient stone bridge that crosses the Don is a Gothic chapel formerly used as a prison. The Free Grammar School, founded in 1584, and restored in 1858, and the court-house, are handsome buildings. In the neighborhood are numerous coal and iron-mines, which furnish materials for the manufactures, the chief of which are stoves, grates, nails, and engines. Pop. (1871) 25,892; (1881) 34,782. The Union Poorhouse is a spacious structure, capable of holding 314 inmates. The Union comprises 27 townships or parishes.

In the vicinity of R. are Roche Abbey, erected in 1147, and the masonry of which is still in a perfect state; and Conisborough Castle, a massive ancient stronghold, which is still in a good state of preservation, but which will survive its natural decay in Scott's *Ivanhoe*.

RO'THESAY, a royal burgh, seaport, and favorite watering-place of Scotland, capital of the county of Bute, is beautifully situated on the north-east shore of the island of that name, at the head of a deep bay, 40 miles west of Glasgow by the river Clyde. The bay offers safe anchorage in any wind, and is spacious enough to contain the largest fleet. Owing to its numerous excellent schools and seminaries, hotels, shops, and warehouses, R. presents all the advantages of a town, while the beautiful bay, and the charming scenery of the island, render it a favorite resort for sea-bathing and summer residence. The sheltered position, and the extreme mildness of the climate, have made it the resort of large numbers of invalids, especially such as are affected with pulmonary disease. Fishing is the employment of a number of the inhabitants, and shipbuilding is carried on to a small extent, and at the pier nearly all the Clyde steamers to and from the West Highlands regularly touch. The harbor is commodious and solidly built. Pop. (1881) 8329, which increases indefinitely during the bathing season. Within recent years, a very handsome promenade has been constructed. There is an excellent hydropathic establishment, and also an aquarium. In the middle of the town are the ruins of Rothesay Castle, which first receives historical mention in 1263. It has remained in ruins since 1685. The Marquis of Bute has done a great deal to render this ruin a picturesque object to visit, and has cleared away some of the old houses which were too near it.

ROTHSCHILD, MEYER ANSELM, baron of the Austrian empire, was born in the Jews' Alley, Frankfürt-on-the-Main, in 1743, and died in 1812. He was brought up to be a priest of the Hebrew faith. Being a man of good character, he was employed by the senate to raise a loan in order to save Frankfurt from pillage by the French republican army. He obtained a loan from the Landgrave (afterwards elector) of Hesse Cassel. The Landgrave acquired immense sums by selling his subjects to fight for England and France. Napoleon, after the battle of Jena, pronounced the forfeiture of his estates, and a French army was on the march to his capital. He had accumulated in his palace vaults about a million sterling in silver, and sending for R. to Cassel, he offered him the free use of the treasure, without interest, if he would convey it to a place of safety. With the aid of his Jewish friends, R. succeeded in secreting the money, and thus saved it from the hands of the French. At this time he had five sons, three of whom—Anselm, Nathan, and Solomon—being grown up, he associated with himself in business. ANSELM remained with him at Frankfurt. NATHAN came to England in 1800, where he acted as agent for his father, first at Manchester, in the purchase of Manchester goods for the Continent. He then removed to London, where by the agency of his father large sums of money were placed at his disposal, and invested by him with so much judgment, that his capital multiplied with great rapidity. He was appointed, by the interest of the landgrave, agent for the payment of the £12,000,000 sterling, which, by the treaty of Toeplitz, Great Britain stipulated to pay to her German allies. A large profit accrued to the house by this transaction.

Previous to R.'s death (which occurred in September, 1812), he saw his five sons securely established as the monarchs of European finance—Anselm in Frankfurt, Nathan in London, Solomon in Vienna, James in Paris, and Charles in Naples; all united in the wealthiest co-partnership of the present, or probably any other age. Nathan, in London, is said to have known the result of the battle of Waterloo several hours before the English government, and the knowledge is said to have been worth £200,000 to him. The loans contracted by the firm during the great war with France were not more remarkable for their magnitude than their success. They never took a bad loan in hand, and hardly any good loans fell into other hands. In addition to their five principal establishments they have agencies in many other cities both of the Old and New World. On two or three occasions the Rothschilds have successfully exerted themselves to preserve the peace of Europe. Their losses from the French revolution in 1848, and from the depreciation in the funds and securities which followed the subsequent disturbances in various capitals of Europe, were estimated at the enormous figure of £8,000,000 sterling—a wild estimate, but proving the popular belief in the immense resources of the firm. Nathan, after his father's death, was considered the chief of the family. The emperor of Austria made him a baron of the Empire in 1822. He died in 1836, at Frankfurt, whither he had been called by the marriage of his eldest son, Lionel, to his cousin Charlotte, daughter of the Baron Charles.

Anselm, Solomon, and Charles all died in 1855, the first-named dying childless at Frankfurt, and leaving a fortune valued at from 40,000,0000 to 50,000,000 florins. James died in 1868.—Baron LIONEL DE R., eldest son of Nathan, and head of the London house, was born in London in 1808, and educated at Göttingen. He was early initiated by his father into the business of the firm, and successfully applied himself to extend its colossal operations. He was elected for London in 1847, 1849, 1852, and 1857, and at each election claimed to take the oaths and his seat in the House of Commons. The latter words of the oath—'on the true faith of a Christian'—he insisted upon omitting, 'as not being binding on his conscience.' He was then desired to withdraw from the House, and patiently awaited the fate of the bill of Jewish Emancipation, which usually passed the Commons, and was rejected by the Upper House. In 1858 he was placed on a committee which was to hold a conference with the House of Lords, and this was virtually the means of establishing Jewish emancipation. The Commons sent up another bill, and a general belief prevailed that if it were, like the rest, thrown out by the lords, Jewish members would be admitted by resolution of their own House, instead of by act of parliament. The lords gave way, merely taking measures to prevent the admission of Jews into the upper chamber. Baron R. thereupon (July 1858) took the oaths and his seat. He sat till 1868, when he was rejected, but was re-elected in 1869; and lost his seat in 1874. He died 3d June 1879. His brother NATHAN, his son NATHANIEL, and other members of the Hebrew faith, have also been elected to the House of Commons.

As the members of each successive generation are received into the copartnership, and the cousins usually intermarry, and as their immense wealth is being continually augmented by a profitable business, the name and operations of the firm, as public-loan contractors, dealers in bullion, and bill-discounters, promise to last as long as some royal dynasties. It was this firm that, in 1875, supplied the £4,000,000 necessary for the purchase of the Suez Canal shares.

ROTIFERA. See ROTATORIA.

RO'TTENBURG, a town in Würtemberg, seven miles south-west from Tübingen, is situated on the Neckar. Pop. (1880) 7018. The castle, built in 1216, is now the House of Correction. In the neighborhood are extensive hop-fields, orchards, and vineyards. The Roman station Sumelocennis stood on the site of R., and remains of roads and viaducts have been found. R. is the seat of a bishop.

RO'TTENSTONE, a mineral consisting chiefly of alumina, with about ten per cent. of carbonaceous matter, and a little silica. It is supposed to be formed by decomposition of shale. It is found in Derbyshire, England, in Wales, and near Albany, in the state of New York. It is brown; either grayish, reddish, or blackish. It is soft, and easily scraped to powder, and is well-known to housewives, being much used for cleaning and polishing brass and other metals.

RO'TTERDAM (*dam* or dike of the *rotte*), after Amsterdam, the largest city in the Netherlands, and a place of great commercial activity, is situated at the confluence of the Rotte with the Maas, in the province of South Holland. It forms a triangle with the apex to the north, and the base stretching along the river, ships from all parts of the world discharging their cargoes in front of the Boompjes, a splendid row of houses shaded with trees. The Hoog Straat, built on the dam or dike formed to repel inundations, divides the city into the Binnenstad and Buitenstad, the former being north of that line, the latter extending southward to the Maas. Broad canals or havens, full of shipping, cut the Buitenstad into islands, and lofty houses face the quays on either side. The largest canals are the Leuvenhaven and Oudehaven, which trend inward from the Maas, and the Scheepmakershaven, Wijnhaven, Blaak, Haringvliet, and Nieuwhaven, parallel with the river. R. is rapidly extending in all directions. The population has more than doubled within 50 years, and in 1872 it amounted to 123,677, or 58,411 males and 65,266 females. In 1881, the number had risen to 157,270. About two-thirds are Protestants, nearly one-third Roman Catholics, and 4500 Jews.

The industries are varied, including sugar-refining, gin-distilling, the making of liqueurs, beer-brewing, iron-founding, soap-boiling, the manufacture of vinegar, cigars, patent oil, sail and hair cloths, articles of gold and silver, shipbuilding, &c. The works of the Netherland Steamboat Co., at Feijnoord, employ 700 men. The shipping trade is extensive. There is a shipping line to New York and Java, and several lines to various ports in the Baltic. For the large transit-trade, chiefly with Germany, there are about 30 steam lines to England, 5 to Scotland, and 2 to Ireland. Between 1870 and 1880, about four-fifths of the steamers and one-third of the sailing-vessels that entered the port were from Britain or her colonies.

Refined sugar is extensively exported. Large quantities of butter, cheese, yeast, madder, flax, and fruits are annually sent to Great Britain; also immense numbers of cattle, calves, swine, and sheep.

R. has railway communication with the other cities of the Netherlands, Germany, and Belgium. It is about 20 miles from the mouth of the Maas, the great commercial highway between the open sea and the Rhine provinces of Prussia. The municipal government consists of a burgomaster, 4 wethouders (aldermen or bailies), and 34 councillors. R. has 4 Dutch Reformed churches, 1 French Protestant, 1 English Episcopal, 1 Scotch church, 6 Roman Catholic chapels, and 1 Jewish synagogue. The schools are good, and subsidized by the municipality. There are 3 for gymnastics; a normal school; one for training boys for sea; a medical school; an institute for the deaf and dumb, at which 93 boys and 52 girls are educated by 15 teachers, 64 of the pupils being admitted free; a grammar school called the Erasmus; and several institutions for arts, sciences, architectural drawing, and music. The medical school has an anatomical museum; the Batavian Society possesses a good collection of philosophical instruments, books, and models. The Museum Boijmans, with many valuable paintings and works of art, was destroyed by fire in 1863. The Exchange, built in 1722, is a plain rectangular building of hewn stone. The hospital, on the Coolsingel, a handsome erection, with excellent internal arrangements, can receive 250 patients. R. has also a children's hospital, which is a great boon to the poor.

The St. Laurence Church, built at the end of the 15th c., is a spacious building, resting on 14 Gothic pillars, and ornamented with a high truncated tower, the top of which is reached by 326 steps. It has a splendid organ, and several beautiful marble monuments, in honor of De Witt, Admiral Kortenaar, and other distinguished men. A bronze statue of Erasmus stands on the Great Market, and the house in which he was born is pointed out in the Breede Kerk Straat, which leads to the Great Church. The city has been added to and improved, and the water-way to the sea deepened and altered (the works completed in 1872), so as to avoid, as far as possible, the hindrances to the navigation which are caused by the sand-banks at the mouth of the Maas.

RO'TTI, an island in the Indian Archipelago, belonging to the Dutch, lies to the south-west of Timor, between 10° 39′—10° 56′ S. lat., and 122° 57′—123° 29′ E. long.; pop. 75,000. Its greatest length, from east to west, is 36 miles, and the breadth from Termano, on the north, to Tilly, on the south, about 11 miles. The surface, though hilly, is nowhere more than 600 feet above the sea, and the fertile soil produces a rich vegetation.

The most valuable product is the Lontar palm, the wine or juice of which, either used fresh or thickened by boiling and preserved in pots, forms a leading article of food. Next in importance is the Gabang tree, which bears large quantities of fruit, in size and shape like apricots, the fibre yielding a good tow, and the pith a sort of sago. Coco-nut, plantain, banana, and mango-trees are abundant. There is a great variety of timber trees, as beautiful ebony, mahogany, and several sorts well adapted for ship-building. R. is famed for a small but hardy race of horses, and has buffaloes, sheep, goats, swine, and deer. Edible nests, trepang, tortoise-shell, and wax, also horses, swine, palm-wine, syrup, sugar, and native sail-cloth are exported to Timor; and cotton fabrics, cotton, beads, iron, iron-work, powder, guns, and arrack received in exchange.

RO'TTLERA, a genus of trees of the natural order *Euphorbiaceæ*, with a 3—5 parted calyx, no corolla, 30—40 stamens springing from the convex receptacle, and a 2—4 coccous capsule, each portion having one seed. The species are rather small trees, found in India and other tropical parts of Asia. *R. tetracocca* grows in Sylhet, and yields a hard and valuable timber. *R. tinctoria* is a native of India, from the Coromandal coast to the northern forests. Its capsules are covered with short stiff hairs, which, when rubbed off, have the appearance of a fine red powder, are used in India for dyeing silks scarlet and orange, and form an article of commerce in that country. Professor Anderson of Glasgow has examined this dye-stuff, and in the *Edinburgh Philosophical Journal* for April 1855, has stated his opinion that it merits the attention of silk-dyers. The color which it yields is of great beauty and great stability.

RO'TTWEIL, a small town of Würtemberg, on the Neckar, 38 miles east-north-east of Freiburg in Baden. It contains a beautiful exchange, and a number of interesting churches. Its manufactures are gunpowder, silk, cotton, and woollen fabrics, and its corn-market is one of the most important in the kingdom. Pop. (1880) 6047.

R. is the site of an ancient Roman colony, among the ruins of which was discovered, besides a large number of other valuable antiquities, now preserved in the buildings of the gymnasium, a now well-known piece of mosaic work, upon which, among others, are an excellent drawing of Orpheus, and a number of profile drawings of the larger kinds of game, of chariot-races, and of gladiatorial encounters.

ROTUMA, a small island in the South Pacific, formally annexed to the Fiji Islands by Great Britain in 1880, is distant about 250 miles N.N.W. from the nearest island of that group. It is about 13 miles in length and about 5 in breadth. The soil is fertile, and readily produces sugar, coffee, cotton, yams, taro, bananas, &c. R. is well peopled, and the natives are friendly to the white man. R. was discovered by Captain Edwards in his search for the mutineers of the *Bounty* in 1791.

ROTU'NDA, a building with circular exterior and interior, such as the Pantheon of Rome.

ROTURIER (according to Duncange, from *rupturarius*, a peasant; *ab agrum rumpendo*), one of the ignoble classes, who, during the early period of the feudal system, were separated from the high-born by almost as broad a line of demarcation as that which divided liberty from servitude. When the feudal theory of knight's-service came to be recognized as the only principle of gentle tenure, the term roturier came to be applied to the part of the population who continued to hold by the older or allodial tenure.

ROUBAIX, a flourishing manufacturing town in the north of France, in the dep. of Nord, and six miles north-east of Lille. It has risen into importance only in the present century. Numerous mills and factories, as well as dye-works and tanneries, are in operation. R. rivals Elbeuf and Louviers for woollen cloths and carpets, and vies with Laval and the rest of Flanders in linen manufactures. Pop. (1876) 74,946; (1881) 91,757.

ROUBLE, RUBLE, or RUBEL, the unit of the Russian money system. Pieces of peltry formed, in early times, the ordinary medium of exchange in Russia; but about the beginning of the 15th c., silver bars came more and more into use for larger payments, and to make up intermediate sums, pieces of the bars were cut off. It was in this cutting off, in Russian, *rubat*, that the name rouble originated. The present silver rouble is equivalent to 3*s*. 2½*d*. sterling, nearly. Half, quarter, fifth, tenth, and twen-

tieth parts of a rouble are also coined in silver; and gold coins of nominally five roubles (demi-imperials) and three roubles (imperial ducats) are also in circulation. In 1877 the paper rouble had fallen from 3*s.*, its nominal value, to 1*s.* 10*d.* The R. is divided into 100 kopeks.

ROUEN (Lat. *Rotomagus*), one of the principal manufacturing and trading cities of France, and the capital of the dep. of Seine-Inférieure, is situated on the right bank of the Seine, 87 miles north-west of Paris by railway. The ramparts have been converted into spacious boulevards, which, as well as the quays that line the river-banks, are little if anything inferior to the boulevards and quays of Paris. The deep waters of the Seine form a commodious port, which is generally crowded with ships of all nations, from vessels of 300 tons to the smallest river-craft. A stone-bridge and a suspension-bridge connect the Faubourg St. Sever, on the left bank of the river, with the city, which is at once one of the most picturesque and one of the busiest and liveliest places in France. Some of the streets are well and regularly built, with fine modern stone houses; but the greater part of R. consists of old, ill-built, but picturesque streets and squares, with tall, narrow, quaintly-carved, wooden-bound, and gabled houses. Among the many beautiful Gothic churches for which it is noted, the finest are the cathedral and the church of St. Ouen. The former, one of the noblest metropolitan churches of France, is a remarkably fine specimen of Gothic architecture. It is built in a cruciform shape, and has two towers at the sides of the west entrance, and a lofty tower (464 feet high) terminating in a cast-iron spire, which was erected after the destruction by fire in 1822 of the old wooden belfry, which bore the date of 1544. It was erected by Philippe-Auguste between 1200 and 1220, and contains, in its 25 highly-ornamented chapels, numerous monuments of great interest—among others, those of Duke Rollo of Normandy, and his son, William Long-Sword. The heart of Richard Cœur de Lion, buried in this church, is now preserved in the extensive Museum of Antiquities.

The church of St. Ouen, as large as the cathedral, is one of the most interesting buildings in R.; and in its present restored state, presents a pure and elegant specimen of Gothic architecture. Among the other buildings of R., the finest are the Palais de Justice, belonging to the 15th c. and built for the parliament of the province; the Hôtel de Ville, with its public library of 110,000 volumes, and its gallery of pictures; and the Hôtel Dieu, one of the largest of its kind. R. has numerous benevolent, educational and scientific institutions; and next to Lyon, is perhaps the most important manufacturing town in the empire. The principal branches of industry are cotton manufactures, including the checked and striped cottons specially designated as *Rouenneries*, nankeens, dimity, lace, cotton-velvets, shawls, &c. R. has also extensive manufactories of hosiery, mixed silk and wool fabrics, blankets, flannels, hats, cordage, cotton and linen yarns, shot, steel, lead, chemicals, paper, &c. Among other branches of industry, we may mention ship-building, and machinery in various departments. R. is the seat of an archbishop, a High Court of Justice for the department, a Tribunal of First Instance and of Commerce, &c. Pop. (1881) 105,906.

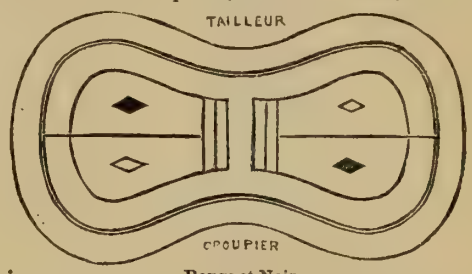
History.—As the original capital in France, of the Northmen, who took possession of it in 842, and settled there in accordance with the agreement which Charles the Simple was compelled to make with their leader Rollo, R. presents special points of interest to Englishmen. It was the residence of the Dukes of Normandy till Duke William, in 1066, on his conquest of England, transferred the seat of his court to London; and till the time of Richard Cœur de Lion, it continued to be the capital of Normandy, and was the seat of government of the Norman possessions of William the Conqueror's successors; but in 1204, it was taken by siege by the French king, Philippe Auguste, and annexed with main part of the duchy to the French crown. During the wars of Henry V. and Henry VI. of England, it was under the power of the English from 1419 to 1449, when it was retaken by the French under Charles VII. It was during this occupation by the English, that Joan d'Arc was burned alive (1431) as a witch in the square of the city, in which stands her statue, and which is called, in memory of her, Place de la Pucelle. R. was occupied by German troops in the war of 1870–1871.

ROUGE, a preparation of safflower, used to give an artificial color to the cheeks, and, when properly prepared, said to be perfectly innocuous to those who use it. The color is obtained through a long and elaborate process, by precipitating it from the safflower, by means of citric acid or lemon-juice, on to prepared cotton. It is then washed out of the cotton with a solution of soda, and again precipitated with citric acid; but previous to adding the acid, finely-powdered French chalk is added to the solution, which becomes colored, and falls down when the precipitation takes place, giving the necessary body, and a peculiarly silky lustre to the coloring matter. *Jeweller's rouge* is a preparation of iron formed by calcining sulphate of iron or green vitriol, until the water of crystallization is expelled; it is then roasted in a strong heat, and afterwards washed with water, until it no longer affects litmus paper. *Liquid rouge* is the red liquid left in making carmine.

ROGUE CROIX, one of the pursuivants belonging to the heraldic establishment of England, generally allowed to be the most ancient, although the period of institution is uncertain. The title is derived from the red cross of St. George, the patron saint of England.

ROUGE DRAGON, the title of a pursuivancy founded by Henry VII., on the day before his coronation. The name is taken from the supposed ensign of Cadwaladyr, the last king of the Britons, ancestor of that monarch. The red dragon was also sometimes used by Henry VII. as a supporter.

ROUGE ET NOIR (Fr. 'red and black'), TRENTE-UN ('thirty-one'), or TRENTE ET QUARANTE ('thirty and forty'), is a modern game of chance, which is played by the aid of packs of cards on a table covered with green cloth. The table is of a form similar to that shown in the figure. It is divided into four portions, each marked in the center with a diamond, the diamonds being alternately red and black; and these quarters are further separated, two and two, by bands which cross the table at its narrowest part. At the end of the table are a series of concentric bands painted of a yellow color (not represented in the figure). The game is played as follows: one of the *tailleurs* (or dealers, who manage the table, take charge of the bank, and keep an eye on the players) takes up his position at one side of the table, opposite to the *croupier* (another tailleur), and unseals, in



Rouge et Noir.

the presence of the players, six packs of cards, which are first counted, then shuffled by several tailleurs, and returned to the first tailleur, who presents them to one of the players to be cut. This is performed by the insertion of a blank card in any part of the pack, which is then adjusted, and the game proceeds. Each player must stake his money on some one of the four chances, denominated *noir*, *rouge*, *couleur*, and *l'inverse*, which will be afterwards explained.

After the stakes have been laid on the table (those for the noir being laid on either of the quarters marked with a *black;* and those for the rouge, on either of the quarters marked with a *red* diamond; those for the 'couleur' on one of the transverse bands; and those for the 'inverse' on one of the yellow circles at the end of the table), the tailleur takes a handful of cards from the top of the pack, and deals first for the noir, taking one card after another from the top of the handful and placing them on the table side by side, till the number of pips on them amounts to more than 30, when he stops. He then deals out another row in a similar manner for the rouge, till, as before, the number of pips amounts to more than 30. In reckoning the number of pips, the ace is counted as one, the other plain cards according to the number of pips, and the court-cards 10 each. It will thus be seen that the number to which each of the two rows of cards amounts, must be more than 30 and not more than 40. If the value of the first row is nearer 31 than that of the second, then the first row, or noir, wins, if the contrary is the case, then the second row, or rouge wins. Couleur wins if the first card tabled by the tailleur is of the winning color; thus, for instance, if the first card laid down is a 'spade' or 'club,' noir wins; but if the first card dealt be not of the winning color, then inverse wins, and couleur loses. Two (and no more) of the four chances can be winning chances at one time; and the winning players have their stakes increased by an equal sum from the bank, and then withdraw their stake and winnings, while the stakes of the losers are raked by the tailleurs to the bank in the center of the table. When the value of the first, or noir-row, is equal to that of the second, or rouge-row, it is a *refait*, and the dealer must commence to deal anew from the cards remaining in his hand; when the refait occurs, the player may either withdraw his stake, or stake on a different chance, with the same or more or less money as he thinks proper.

The game of Rouge et Noir would be an even one between the players and the bank, were it not for the following regulation: When the points dealt for the noir and the rouge each amount to

31 (' un refait de Trente-et-un ') the half of all the stakes on each of the chances belongs to the bank, and this the players may either pay or have their stakes ' put in prison,' the next deal determining whether they shall belong to the bank or be restored to the player. If a second doublet of 31 occurs in the deal immediately succeeding, the stakes which were in prison are diminished by one half, which goes to the bank, and the other half is ' put into the second prison,' from which it requires two successive winnings of the player to regain them. The chance of ' un refait de trente-et-un ' is about once in 64 deals.

This game superseded *Faro* (q. v.), and *Biribi* in France about 1789, but along with Roulette (q. v.), was forbidden by law in 1838.

ROUGH-CAST, a kind 'of coarse plaster mixed with gravel, which is applied to the exterior of walls to protect them from the weather. It is also called *Harling* in Scotland, where it is much used.

ROUHER, EUGENE, a very eminent French statesman, was born at Riom, on November 30, 1814. He first distinguished himself as an advocate at the bar of his native town, at which he practised up to 1848. The attention of the country was first drawn to him by the ability he showed in a press prosecution, in which he was engaged for the defence. In 1848, he was returned by the department of Puy-de-Dôme to the Constituent Assembly, which was summoned after the revolution of that year, and in the following year he was returned to the Corps Législatif by the same department. On the break-up of Odillon Barrot's cabinet, the first ministry of Louis Napoleon, towards the end of 1849, R. was appointed Minister of Justice; and with slight interruptions, he has been since then a member of the French government. In the Corps Législatif, he showed himself a moderate politician; and he never affected to consider the Republic an improvement on the constitutional system which had preceded it. In 1852, he was appointed Vice-president of the Council of State, with the oversight of the departments of Legislation, Justice, and Foreign Affairs. In 1855, he was appointed Minister of Agriculture, Commerce, and Public Works, and in this office he found extraordinary opportunities for the exercise of his administrative ability. In the negotiation of the Treaty of Commerce with England, which—much decried both in France and in England at first—is now admitted to have conferred immense advantages upon both countries, the negotiations were conducted by M. R. and M. Baroche on the part of France, by Lord Cowley and Mr. Cobden on the part of England; the treaty was signed on January 22, 1860.

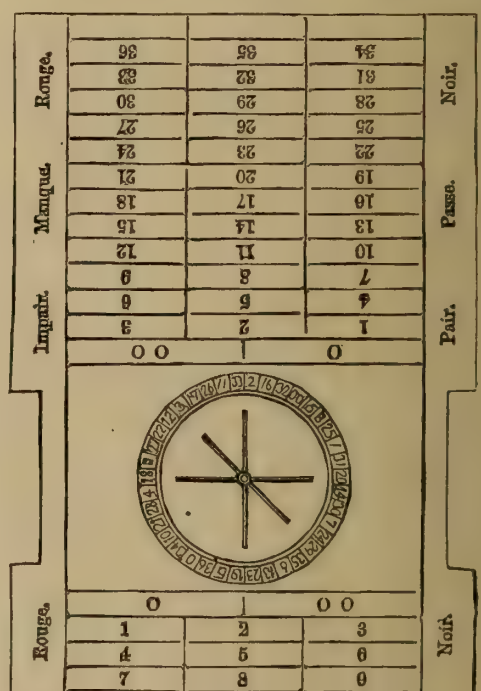
The arrangements consequent upon the treaty involved immense labor and manipulation of details, and the chief part in adjusting them devolved upon M. R. and Mr. Cobden. In 1863, he negotiated a Treaty of Commerce between France and Italy, receiving from the king of Italy, in acknowledgment of his merits, the Orders of St. Maurice and St. Lazaire He has thus been the chief instrument in the introduction, or in preparing the way for the introduction, of free trade as the commercial policy of France and the neighboring continental countries.

In June 1863, M. R. retired from the ministry of Agriculture and Commerce, and was appointed President of the Council of State in succession to M. Baroche. Soon after, he took the office of Minister of the Interior; and in October 1863, on the death of M. Billault, he was appointed Minister of State. In this office, he had to represent the government as ' talking-minister ' in the Corps Législatif; and it is admitted that he had no superior as a debater among the great orators trained under the constitutional system, and these were able rivals. His reputation as a debater stands as high as his reputation as an administrator; and it may safely be said that he has no superior, if any equal, for ability among the French politicians of the time. In January 1867, when the late emperor, by a decree, introduced certain modifications of the privileges of the Corps Législatif, and of the relations between that body and the ministers, M. R., with the other members of the cabinet, resigned office, but he was immediately reinstated in it. He was appointed a member of the French Senate on the 18th of June 1856. He became Grand Officer of the Legion of Honor in 1856, and gained the Grand Cross in January 1860. He was returned to the National Assembly for Corsica in 1872.

ROULERS, a town of West Flanders, Belgium, 19 m. S.S.W. of Bruges. In the vicinity flax is extensively grown, and in the town linen is largely bleached and manufactured. Pop. (1870) about 14,200.

ROULETTE (Fr. 'a little wheel'), a game of chance which, from the end of last century till the beginning of 1838, reigned supreme over all others in Paris. It continued to be played at German watering-places till 1872, when it ceased in terms of an act passed four years before. R. is still played at Monaco, in Italy. As much as £8000 a year used to be spent in the papers of Paris alone advertising this game, which is purely one of chance, and is played on a table (see fig.) of an oblong form, covered with green cloth, which has in its center a cavity, of a little more than two feet in diameter, in the shape of a punch-bowl. This cavity, which has several copper bands round its sides at equal distances from each other, has its sides fixed, but the bottom is movable round an axis placed in the center of the cavity; the handle by which motion is communicated being a species of cross or capstan of copper fixed on the upper extremity of the axis. Round the circumference of this movable bottom are 38 holes, painted in black and red alternately, with the first 36 numbers, and a single and double zero, as shown in the figure; and these 38 symbols are also figured at each end of the table in order that the players may place their stakes on the chance they select. Along the margin of the table and at each end of it are painted six words, *pair, passe, noir, impair, manque, rouge,* which will be afterwards explained.

Those who manage the table and keep the bank are called *tailleurs.* The game is played as follows: One of the tailleurs puts the movable bottom in motion by turning the cross with his forefinger, and at the same instant throws into the cavity an ivory ball in a direction opposite to the motion of the bottom; the ball makes several revolutions, and at last falls into one of the 38 holes above mentioned, the hole into which it falls determining the gain or loss of the players. A player may stake his money on 1, 2, or any of the 38 numbers (including the zeros), and shows what number or numbers he selects by placing his stake upon them; if he has selected a number or zero corresponding to the one into which the ball falls, he receives from one of the tailleurs 36 times



Roulette Table.

his stake—viz., his stake and 35 times more—if he selected only 1 number, 18 times if 2 numbers, 12 times if 3 numbers, &c. The blank rectangles at the bottom of each of the 3 columns of numbers figured on the table, are for the reception of the stake of that player who selects a column (12 numbers) as his chance, and if the ball enters a hole the number of which is found in his column, he is paid 3 times his stake. Those who prefer staking their money on any of the chances marked on the edge of the table, if they win, receive double their stake (their stake and as much more), and under the following circumstances: The ' pair ' wins when the ball falls into a hole marked by an *even* number; the ' impair,' if the hole is marked *odd;* the ' manque,' if the hole is numbered from 1 to 18 *inclusive;* the ' passe,' if it is num-

bered from 19 to 36 *inclusive;* the 'rouge,' if it is colored *red;* and the 'noir,' if it is colored *black.*

If the ball should fall into either of the holes marked with the single or the double zero, the stakes of those players who venture upon the 6 chances last described are either equally divided between the bank and the players, or as is more commonly the case, they are 'put in prison,' as it is called, and the succeeding trial determines whether they are to be restored to the players or gained by the bank. Should it so happen that at this trial the ball again falls into one of the two holes (the chance against its occurring is 360 to 1) marked with zeros, then half of the stakes in prison are taken by the bank, and the remainder are 'put into the second prison,' and so on. The tailleurs thus have an advantage over the players in the proportion of 19 to 18. The player who bets upon the numbers labors under a similar disadvantage, for although the two zero-points do not affect him in the same way as the player who stakes upon one of the other 6 chances, still (supposing him to bet upon a single number) as the chances are 37 to 1 against him, he ought to receive 37 times his stake (besides the stake) when he does win, whereas he only receives 35 times that amount, a manifest advantage in favor of the bank in the proportion of 37 to 35.

ROUMA'NIA. See MOLDAVIA.

ROUME'LIA (Turkish *Rumili*), a name used to denote an important portion of European Turkey, differing widely in area at various times, but most generally applied to the region between the Balkans and the Ægean, corresponding to the ancient Thrace and part of Macedonia.

ROUMELIA, EASTERN, a province of the Ottoman empire, lying immediately to the south of the Balkans. Pop. 816,000, of whom 575,000 are Bulgarians. Though remaining under the military and political authority of the Sultan, it had administrative autonomy conferred on it by the Berlin Congress of 1878. Internal order is maintained by a native gendarmerie and a local militia, the officers of which are appointed by the Sultan; and the Porte retains the right of defending the frontiers by fortresses garrisoned by Turkish troops. The governor-general, nominated by the Porte, must be a Christian, and the constitution is settled by a European commission.

ROUND, in Music, a short vocal composition, generally of a humorous character, in three or more parts, all written on the same clef. Each voice takes up the subject at a certain distance after the first has begun. The second voice begins the first part when the first begins the second part, and the third takes up the first part when the second begins the second part, the whole ending together at the mark of a pause, 𝄐, or a signal agreed on.

ROUND-FISH (*Coregonus quadrilateralis;* see COREGONUS), a fish found in the western parts of North America, from Vancouver's Island northwards, in the rivers on the western side of the Rocky Mountains, and in the Mackenzie and Coppermine rivers. It ascends the rivers in summer to spawn, spending part of its life, like the salmon, in the sea. It is a beautiful fish; seldom more than two pounds in weight, of a yellowish-brown color, paler on the sides and belly than on the back, with bright and glittering scales, each of which is edged with a narrow band of dark gray; the mouth very small, no teeth perceptible. Before spawning, it is loaded with fat, which, on the shoulders, almost amounts to a hump; but after spawning, it becomes thin, and its flesh watery and insipid. In a good state, it is a very delicious fish, rivalling in excellence its congener, the Whitefish (q. v.). This fish is an important article of food to the Indians of North-western America, and vast numbers are caught in the rivers as they ascend from the sea. They ascend in such numbers that no ordinary contrivances for fishing are necessary, but the fish are bailed out by baskets, little nets, wooden bowls, or even by the hand. They are cured by splitting and drying, like salmon. The R. readily takes a rough gaudy fly.

ROU'NDHEADS, a name given by the adherents of Charles I., during the English Civil War, to the Puritans, or friends of the parliament, who distinguished themselves by having their hair closely cut, while the Cavaliers wore theirs in long ringlets.

ROUNDLE, or ROUNDLET, in Heraldry, a general name given to charges of a circular form, which, in English heraldry, have more special names indicative of their tinctures; the R. or being, for example, called a *Bezant;* and the R. gules, a *Torteaux.*



Roundle.

ROUND ROBIN, a name given to a protest or remonstrance signed by a number of persons in a circular form, so that no one shall be obliged to head the list. The round robin originated in France, and the name is derived from the words *rond,* round, and *ruban,* a ribbon.

ROUND TABLE, KNIGHTS OF THE. See ARTHUR and NOVELS.

ROUND TOWERS. Tall narrow towers tapering gradually from the base to the summit, and found abundantly in Ireland, and occasionally in Scotland, are among the earliest and most remarkable relics of the ecclesiastical architecture of the British islands. They have been the subject of endless conjecture and speculation among antiquaries, who have connected them with pagan times and pagan rites; but the controversies regarding them have to a certain extent been set at rest by the investigations of Dr. Petrie; and there can be now no doubt that they are the work of Christian architects, and built for religious purposes. They seem to have been in all cases attached to the immediate neighborhood of a church or monastery, and like other early church-towers (an older invention than bells), they served as symbols of dignity and power—while they were also capable of being used as strongholds, into which, in times of danger, the ecclesiastics, and perhaps the inhabitants of the country around, could retreat with their valuables.

After the introduction of bells, they were also probably used as bell-towers. About 118 towers of this description are yet to be seen in Ireland—20 of which are entire or nearly so; and Scotland possesses three similar towers, at Brechin, Abernethy, and



Round Tower, Devenish, Ireland.
From Fergusson's (*Hand-Book of Architecture.*)

St. Eglishay in Orkney. They are usually capped by a conical roof, and divided into storeys, sometimes by yet existing floors of masonry, though oftener the floors have been of wood. Ladders were the means of communication from story to story. There is generally a small window on each story, and four windows immediately below the conical roof. The door is in nearly all cases a considerable height from the ground. The subjoined woodcut represents the tower at Devenish, in Ireland, which may be considered as a typical example of the class. It is 82 feet in height, and furnished with a conical cap. A battlemented crown occasionally supplies the place of the conical roof, and in one instance the base of the tower is octagonal. Dr. Petrie is inclined to think that a few of these remarkable structures may be as old as the 6th c.; but this great antiquity has been questioned by later writers, particularly Dr. Daniel Wilson, who considers it not borne out by the character of the architectural details, and would assign them all to a period ranging from the 9th to the 12th centuries. The source whence this form of tower was derived, and the cause why it was so long persisted in by the Irish architects, are points which have not yet been cleared up. Two round towers, similar to the Irish type, are to be seen in the yet extant plan of the monastery of St. Gall in Switzerland, of the first half of the 9th c.; and, in the Latin description attached to the plan, they are said to be *ad universa superspicienda.*

The church and towers as rebuilt at that date are no longer in existence; but the latter were probably introduced in honor of the founder of the monastery, who was the leader of a colony of Irish monks, who, early in the 6th c., carried civilization and religion into the fastnesses of the Alps. The form thus introduced became traditional in West Germany in the succeeding Romanesque style, where we have it reproduced with but little modification at Worms Cathedral and elsewhere. See Dr. George Petrie's *Ecclesiastical Architecture of Ireland anterior to the Anglo-*

Norman Invasion (Dublin, 1845); Dr. Daniel Wilson's *Prehistoric Annals of Scotland*.

ROUP, a Scotch legal term synonymous with Auction (q. v.).

ROU'SAY, or ROWSA, one of the Orkney Islands, between the island of Westray on the north, and Pomona on the south. It is 4 miles long, 3 miles broad, is hilly, and covered with heath in the center, but has a margin of fertile land along the shore. Pop. (1871) 860.

ROUSSEAU, JEAN JACQUES, a French author, celebrated not less for the singularities of his character, and the misfortunes of his life, than for the brilliancy and sentimental enthusiasm of his writings, was born at Geneva, 28th June, 1712. The family to which he belonged, was of French origin, but had been settled for more than a century and a half in the little republican city, where his father Isaac Rousseau was a watchmaker. Deprived of his mother a few days after his birth, R. was in infancy tenderly cared for by a sister of his father's. At the age of ten he was placed, along with a cousin, under the charge of a M. Lambercier, Protestant pastor of Bossey, near Geneva, with whom he remained two years. At fifteen, a profession was chosen for him after considerable deliberation—that of *procureur* ('attorney'), and he was sent to a M. Masseron, to acquire a knowledge of engrossing, but that gentleman quickly dismissed him as a hopeless subject. In 1725, he was apprenticed to an engraver of Geneva, named Abel Ducommun, a harsh and violent man, from whose vulgar tyranny the sensitive and impulsive youth took refuge in flight (1728).

Henceforth, to the end of his harassed and melancholy career, he was a wanderer; resting for a brief space in many homes, and making many friends, but always driven from the former, and robbed (or thinking himself robbed) of the latter. His first protector was a Madame de Warens, in Savoy, by whose exertions he was placed at a charity-school in Turin. Here, however, he felt himself so miserable that he ran off, lived ambiguously for some time with the wife of a merchant, but in spite of his 'innocent passion' was very properly kicked out of doors by the irritated husband on his return; after which he became a lackey in the house of the Countess of Vercelli, where (as stated by himself in his *Confessions*) he stole a silk ribbon and then accused a maid of the theft—in consequence of which both were dismissed. Finally, after certain vagabond adventures he returned to his protectress, but again fell into irregular courses, whereupon Madame de Warens conceived the amazing idea of rescuing the youth (who was now in his 21st year) from the temptations of vice by becoming his mistress herself. To preserve appearances, however, R. always addressed her as *Mamma*. In 1736, the two went to live at Charmettes, near Chamberry. Here R. fell into a state of hypochondria, and went to Montpellier to place himself under medical treatment, but on his way thither fell in with a young lady whose charms quite dissipated all his morbid delusions. On his return he found that Madame de Warens had consoled herself during his absence by another lover, whereupon he betook himself to Lyon, and lived as a house-tutor for three years. Thence he proceeded to Paris in the autumn of 1741—under the conviction that he had made certain grand improvements in musical notation (of which in fact he hardly knew the elements), and read a paper on the subject before the *Académie des Sciences*, but was told that his 'improvements' were 'neither new nor practicable.' However, he managed to live here in an obscure way until he got the appointment of secretary to M. de Montaigu, French ambassador at Venice.

After a stay of 18 months in the city of islands, he returned to Paris, and finding his superior intolerable, became intimate with Diderot, Grimm, D'Holbach, and Madame d'Epinay, the last of whom, in 1756, provided a charming retreat for him in the vicinity of Paris, called the *Hermitage*, where he lived with a young girl of low origin, named Thérèse le Vasseur, who bore him five children, all of whom were sent by him to the Foundling Hospital—perhaps the most scandalous act of his strange life. R. afterwards married Thérèse, who seems to have been a faithful and affectionate creature of small capacity. The causes of his rupture with the clique of Parisian philosophers and fine women, have been the subject of envenomed misrepresentation in France, but from the thorough and accurate researches of M. Morin (see *Essai sur la Vie et le Caractère de J. J. Rousseau*, Paris, 1851), it turns out that R. was really the victim of an elaborate and odious conspiracy on the part of men who betrayed the confidence that he reposed in them. The conduct of Grimm was especially shocking. Driven from the Hermitage in 1757, he again found a temporary asylum, with the Duke and Duchess of Luxembourg; but, in 1762, he found it necessary to retire to Switzerland, and fixed himself at Motiers-Travers in Neuchatel, enjoying the protection of Lord Keith (Earl Marischal), then governor of that Prussian province. The intrigues of his enemies pursued him even thither, and after certain paltry persecutions, lay and clerical, he accepted the offer of David Hume to visit England, where he arrived in 1766. Misunderstandings, however, ensued with the Scotch philosopher, and in the following year he returned to France, and was installed in the castle of Trye by the prince of Conti. He did not remain long there, nor did he enjoy peace. Calumnies of the grossest kind were circulated against him, and once more he sought security in precipitate flight. In 1770, he reappeared in Paris, where he lived in obscurity, but not in tranquillity, for eight years, when M. de Girardin offered him a refuge at his estate of Ermenonville, near the capital, in the beginning of 1778, and here the unhappy R. died on the 2d July of the same year.

R.'s personal character is a puzzle to moralists. There is no denying the vices and meannesses which stained it: these rest on the most unimpeachable testimony—his own. They are set forth with copious and melancholy sincerity in his *Confessions*, and the very incidents that lead us to condemn him most severely would never have been known to the world had he not chosen to reveal them. But he does not exculpate himself (as many suppose); on the contrary, he covers himself often with bitter and sad reproaches. On the whole, we are inclined to believe that he was, at bottom, an honest, warm-hearted, humane creature—free from guile, but full of a feminine jealousy, aggravated by long persecutions into a species of insanity; volatile, but not faithless; an erring, but withal a lovable mortal. His grand defect was in strength of will. 'A man in convulsions,' says Carlyle, speaking of R. (*Heroes and Hero-worship*), 'is not strong, though six men cannot hold him;' and all through his spasmodic life, and the splendid sentimentalism of his writings, we are conscious of a 'forcible feebleness,' a want of genuine intellectual power and insight. His opinions in a philosophical point of view are valueless; men of any vigor or acuteness care nothing for his notions about the social contract—influential though they once were during that period of crazy enthusiasm and sham speculation, the French Revolution—nor for his shallow panegyrics on the 'Savage State;' but when he paints the emotions of a tender and voluptuous love, the rose-colored charm of his genius is irresistible. The most famous of his productions are *Discours sur l'Origine et les Fondements de l'Inegalité parmi les Hommes* (Amst. 1755); *Julie, ou la Nouvelle Héloise* (1760); *Du Contrat Social, ou Principes du Droit Politique* (Amst. 1762); *Emile, ou de l'Education* (Amst. 1764); and *Les Confessions, suivies des Réveries d'un Promeneur Solitaire* (Geneva, 1782; posthumous); but besides these he wrote a vast number of miscellaneous essays, letters, and treatises. His *Œuvres Complètes* have gone through innumerable editions. See Morley's monograph (1873).

ROUSSE'TTE. See KALONG.

ROUSSILLON, formerly a province of France, was bounded on the N. by Languedoc, on the E. by the Mediterranean, on the S. by the Pyrenees, and on the W. by the county of Foix. It now forms the French department of the Pyrénées Orientales. In ancient times the capital was *Ruscino*, which stood in the vicinity of Perpignan.

ROUT, one of the absurd names given to a fashionable evening assembly in London towards the end of the 18th and early part of the 19th centuries. At these entertainments, as many as 2000 to 3000 ladies and gentlemen were invited, and when the apartments were not sufficiently spacious for the company, temporary rooms were erected in the rear of the house, and elegantly fitted up. Crowded assemblies of this kind are now known as 'soirées,' or 'at homes.' For an amusing account of them, we refer to Mrs. Stone's *Chronicles of Fashion*, vol. ii. p. 262.

ROUX. The name of a material used by cooks to thicken soups and gravies; it is made either white or brown. The former is prepared by putting a quantity of butter into a well-tinned stew-pan, and dissolving it gently over the fire. It is kept over the fire until it begins to simmer, when fine flour is dusted in with a dredge, and carefully incorporated, the flour being added until it is sufficiently thickened. It is then poured into a jar, and is ready for use. The brown is made in the same way, except that it is kept a longer time over the fire, which gradually gives it a rich brown color.

ROVE BEETLE, or COCKTAIL (*Staphylinus*), a genus of coleopterous insects, the type of a family, *Staphylinidæ*, to very many of which the same English names are often extended; belonging to the section *Coleoptera Pentamera*, and tribe *Brachelytra*, of which a chief characteristic is the short square elytra, which leave the greater part of the abdomen exposed. The abdomen is soft and flexible, and these insects have a habit of turning up the point of it, particularly when annoyed, whence the name *Cocktail*. They feed on carrion; their larvæ, however, not unfrequently choose vegetable food, as young wheat, cutting the stem underground with their strong mandibles. The bite of some of the species is apt to cause bad sores. The species are numerous. Many of them have a fetid odor; a few have odors resembling those of fruits and flowers.

ROVERE'DO, a city of Austria, in the Tyrol, occupies a most beautiful and picturesque site in the Lagerthal, on the banks of the Leno, and close to the left bank of the Adige, 12 miles south of Trient by railway. R., one of the most flourishing towns in the Tyrol, is the center of the silk-trade. It contains 60 factories, in which 2300 hands are employed, and carries on besides some trade in wine and an active transit-trade. Pop. (1880) 8864. R. was the scene of a battle between the French and Austrians on the 3d and 4th of September 1796, in which the latter were defeated.

ROVI'GNO, a trading-town and seaport of Istria, stands on a rocky promontory which forms a double harbor 45 miles south of Trieste. The best Istrian wine is grown in the vicinity, which is also abundantly productive in oil. 30,000 casks of olive oil are exported annually; and shipbuilding, the usual manufactures to which a seaport gives rise, and the tunny and sardine fisheries, are the chief branches of industry. Pop. (1880) 9522.

ROVI'GO, a city in Italy, capital of the province of the same name, on the Adigetto, 38 m. S.W. of Venice. It is a handsome fortified city; has a cathedral, which contains some fine paintings, and a picture-gallery. Pop. 7500.

ROVING. See SPINNING.

ROVU'MA, a river of South-east Africa, which enters the Indian Ocean by a spacious bay north of Cape Delgado. Only a small portion near its mouth was known to Europeans till 1861, when Drs. Livingstone and Kirk attempted its ascent in the small steamer *Pioneer*, drawing five feet water. The river was then in flood, and had a strong current. After an ascent of 30 miles the difficulties of the passage induced the explorers to return. Another ascent was made by the same party during the dry season of 1862. With two ships' boats, they reached the rapids which limit the navigation, above 100 miles from the coast, and half-way to the Nyassa Lake.

Passing through gloomy, unhealthy forests of mangroves, they entered a healthy plain, covered with heavy timber and brilliantly flaming tropical plants; but the country was infested by the 'tsetse fly,' a serious obstacle to its development. The river abounded with hippopotami. The travelers came within two days of the town of N'gomano, where all the caravans cross the R., but could not leave the boats in order to reach it. Here the R. is joined by the Niende, a large affluent from the hills on the south-west; while the main stream comes from the west and north-west. As the R. is navigable for only a few months of the year, it offers little advantage for commerce; but it affords an excellent entrance by which to explore the regions between the Nyassa and Tanganyika lakes. During his last African journey, Dr. Livingstone and his party, leaving Zanzibar, in 1866, followed the course of the R. from a point not far from its mouth to where it is joined by the Leonde from the mountains on the south-west. From N'gomano, a town at that point, Livingstone went up the stream a considerable distance on his way towards Nyassa. In 1878 the Sultan of Zanzibar sent an expedition to the Upper R. to settle some disputes between the tribes there; and at the same time he succeeded in establishing a station on the river. Both Dr. Livingstone and Dr. Kirk, who were unable to pass the rapids which obstruct it, concluded that water-carriage to the Indian Ocean by the R. was impossible. At the request of the Sultan, Mr. Joseph Thomson examined the reported coal-fields of the R. in 1881, only to find that the coal consisted of a bituminous shale of no commercial value.

ROW'AN TREE, MOUNTAIN ASH, or QUICKEN TREE



Rowan, or Mountain Ash (*Pyrus aucuparia*).

(*Pyrus aucuparia*; *Sorbus aucuparia* of many botanists), a tree abundant in Britain, especially in the Highlands of Scotland, and in many parts of continental Europe. It does not attain a great size, has in general a very straight erect stem, and is distinguished from the other species of Pyrus (q. v.) by pinnated glabrous leaves, terminated by a single leaflet, serrated leaflets, corymbs of small flowers, and small globose fruit. The wood is valued for its compactness. The inner bark and sapwood have a very peculiar smell. In the superstitions of the Scottish Highlands, and also of the Lowlands, a peculiar importance was assigned to the rowan tree, a mere twig of which was supposed to have great efficacy in scaring away evil spirits. It is very ornamental, especially when in fruit. The fruit (*Rowan berries*) is sometimes used for preserves. It has much acidity, and a peculiar bitterness. It is generally red; but there is a variety with yellow fruit; and a very nearly allied species, *P. Americana*, a native of North America, has purple fruit.

ROWE, NICHOLAS, a dramatic poet and translator, the contemporary and friend of Congreve, Addison, Steele, and the other wits of the Queen Anne period, was the son of a serjeant-at-law, and was born at Little Barford, in Derbyshire, in 1673. He was educated at Westminster, and studied law in the Middle Temple; but inheriting a small competency by the death of his father, he devoted himself to literature. Between 1700 and 1714, he produced eight plays, of which three were long popular, viz.—*Tamerlane*, 1702; *The Fair Penitent*, 1703; and *Jane Shore*, 1714. The character of Lothario in the *Fair Penitent* was the prototype of Lovelace in Richardson's *Clarissa Harlowe*, and the name is still the synonym for an accomplished rake. R. translated Lucan's *Pharsalia*, and his translation was so highly valued, that after his death his widow received a pension expressly on account of this service to literature rendered by her husband. He was also the first editor of Shakspeare, 1709. The popular talents and engaging manners of R. procured him many friends, and he was appointed to several lucrative offices. The Duke of Queensberry made him his Under-secretary of State. In 1715, he succeeded Tate as poet-laureate; and the same year he was appointed one of the land-surveyors of the customs of the port of London; the Prince of Wales made him Clerk of his Council; and the Lord Chancellor Parker created him Clerk of the Presentations. He died Dec. 6, 1718, and was buried in Westminster Abbey. As a dramatist, R. is characterized by an easy and elegant style of diction and versification, but is destitute of originality, subtlety, or force in the delineation of character or passion. In the construction of his dramas, 'there is not,' as Johnson remarks, 'much art;' but there is no gross violation of taste or decorum, and he excels in scenes of domestic tenderness.

ROW'ING. See BOATING.

RO'XBURGH, a county in Scotland, comprising the districts of Teviotdale and Liddesdale, with part of Tweeddale, extending in length about 40 miles, and in breadth 28 to 30 miles, is bounded on the E. and S. by Northumberland and Cumberland; on the S.-W. by Dumfriesshire; on the W. by Selkirk; and on the N. by Berwickshire. The physical aspect of the county is varied and picturesque, having the Cheviot and Lauriston hills bounding a considerable portion of its borders. The Cheviots do not rise to any great height, the highest attaining a height of 2685 feet. The herbage is green to the summit, and affords valuable pasture to sheep. The interior of the county is generally composed of good soil; and the farms being mostly large, and held by men of capital and skill, it is farmed to the greatest advantage. Hawick is noted for its hosiery and woollen manufactures. The chief river is the Tweed, which flows through the northern districts of the county. The Teviot runs through the county a distance of 40 miles, and falls into the Tweed at Kelso. There are several other streams of note, the Allan, the Slitrig, the Jed, the Gala, &c. R. possesses an interesting history in connection with border feuds of former days; and it has many magnificent remains of monastic life and institutions, which, with its many legends and traditional stories, render it of much interest. The proprietors are not numerous—the Dukes of Roxburghe and Buccleuch, the Marquis of Lothian, the Earl of Minto, and a few others holding a great proportion of it. The area is 670 sq. m., or 428,494 acres. To the eye of a traveler, R. is the county of Perth in miniature. The valued rent of it in 1674 was £26,222 sterling; the new valuation for 1881—1882 was £427,951, including railways. In 1881, the total acreage under all kinds of crops, bare fallow, and grass, was 181,608; there was of wheat, 1448 acres; of barley, 15,533; of oats, 33,684; rye, 91; beans, 645; peas, 85. The total number of acres under corn crops was 51,486. The parliamentary constituency in 1881—1882 was 2031. Pop. (1861) 54,119; (1871) 49,407; (1881) 53,445. The county town is Jedburgh.

ROXBURGHE CLUB, a society of very considerable literary interest, called after John, Duke of Roxburghe, the celebrated collector of ancient literature. After the death of the duke, who died in 1805, his valuable library, rich in the old romances of chivalry and early English poetry—a very fine treasury in its way

—was, in 1812, brought to that hammer which almost always in an unmerciful manner scatters the gatherings of book-collectors, and the large prices realized for some of the books were unprecedented. As a specimen, it may be stated that a copy of the first work printed by Caxton in 1471, the *Recuyell of the Historyes of Troye*, sold for £1050, 10*s*. The largest sum, however (and perhaps the greatest ever paid for a single printed volume up till that time), was given by the Marquis of Blandford (afterwards Duke of Marlborough) for the first edition of Boccaccio's *Decameron*, which fetched £2260. In commemoration of the interest which the sale of this collection occasioned among literary antiquaries, the R. C. was instituted, for the purpose of printing a limited number of impressions of MSS. and rare works for the use of its members, to whom they are strictly limited. The R. C. has in this way issued upwards of 80 very curious and interesting works, which are only, however, to be found in the collections of the members, or in a few of the larger public libraries. On the anniversary (June 17) of the sale of the copy of Boccaccio's *Decameron* above referred to, the Club holds a symposium in London.

The R. C. may be regarded as the parent of many literary societies subsequently founded for similar purposes, among which may be mentioned the Camden, Percy, Shakspeare, Cheetham, Wharton, and Surtees Societies, in England; the Bannatyne, Maitland, Abbotsford, and Spalding Clubs, in Scotland; and the Celtic Society in Ireland. The labors of these bodies in printing MSS. and fugitive black-letter tracts have added many important contributions to British literature.

ROXBURGHIA'CEÆ, a natural order of plants, belonging to the Dictyogens (q. v.) of Lindley, twining shrubs with reticulated leathery leaves; and large, showy, solitary, fœtid flowers; the perianth of four divisions, the stamens four, hypogynous, the ovary one-eelled, the ovules numerous; the pericarp one-celled, 2-valved, with two clusters of seeds at the base; the seeds attached to long cords. The species are very few, natives of the hotter parts of the East Indies. The stems of *Roxburghia viridiflora*, a native of Chittagong, the Malayan Islands, &c., are sometimes 100 fathoms long. The roots are boiled and soaked in lime-water, to remove their acridity, and are then preserved in syrup, and eaten.

RO'XBURY, formerly a separate city of Massachusetts, U. S., but now incorporated with Boston, built upon hills, and in hollows, which give it fine building sites and attractive scenery. Besides numerous elegant residences, churches, schools, banks, and newspapers, it contains many forges, steam-engine, and boiler factories, cordage-mills, and manufactories of cotton, wool, carpets, flax-cotton, organs, starch, glue, &c. Pop. (1870) 34,772.

ROY, WILLIAM, major-general in the British army, was born May 4, 1706, at Milton head, in the parish of Carluke, Lanarkshire. His early history is quite unknown, and the incidents of his professional career comparatively unimportant, but his name will always be remembered by succeeding generations as that of the first of British geodesists. After the great rebellion in 1745, he was employed in preparing for government a map of the Highlands, and finally of the whole mainland, which, however, owing to imperfect instruments, and the hurried nature of the survey, was only, to use R.'s own words, 'a magnificent military sketch.' R.'s next important operation was the measuring a base line (see ORDNANCE SURVEY) on Hounslow Heath, of 27,404⅘ feet, or about 5⅕ miles, which, though the first measurement of the kind in Britain which pretended to accuracy, was executed with such care, that, on being remeasured after R.'s death, the difference between the two results was found to be only 2⅘ inches. For this splendid labor, R. received the Royal Society's Copley medal. R.'s labors connected with the survey extended from July 1787 till September 1788, when he returned to London in ill health, which necessitated his removal to the warmer latitude of Lisbon in the winter of 1789; but he returned to London in the following April, and died there 1st July 1790. In 1767, R. was elected a Fellow of the Royal Society, to whose *Transactions* he contributed, in 1777, a paper entitled 'Experiments and Observations made in Britain, in order to obtain a Rule for Measuring Heights with the Barometer.' He had also, during his survey of Scotland, paid particular attention to the camps and other Roman remains in that country, and had completed an elaborate work on this subject, illustrated by drawings and plans, and by a copy of his map of the country. This work was published (1793) by the Society of Antiquaries (of which R. had been a member), to whom it had been presented by R.'s executors. R. was also surveyor-general of the coasts of Great Britain.

ROYAL ACADEMY OF MUSIC, an institution founded in 1823, by a number of musical amateurs, headed by the Earl of Westmoreland, for the purpose of affording to a certain number of pupils the opportunity of obtaining a first-rate musical education, and of enabling those who make music a pursuit to provide themselves with the means of honorable livelihood. The Academy is chiefly supported by contributions and subscriptions, the subscribers and contributors being divided into four classes, of whom the first three recommend and elect the students. A small sum is voted yearly by parliament for its maintenance. Of the scholars, some are boarders and some out-door pupils. The pupils are placed under the tuition of chosen instructors in every branch of musical education. The Academy was incorporated by royal charter in 1830. Since its foundation, a number of its pupils have gone forth to the world as musicians of eminence, including among others Sir W. Sterndale Bennett, Messrs. G. A. Macfarren, A. Sullivan, Brinley Richards, Madame Sainton-Dolby, &c. Concerts are given by the pupils, to which the public are admitted. See Cazalet's *History of the R. A. of M.* (1854). The Royal College of Music, chartered and endowed, is a distinct institution, promoted in 1882.

ROYAL ASSENT. See PARLIAMENT.

ROYAL FAMILY. In its more restricted signification, the royal family of Great Britain only includes the Queen-consort and Queen-dowager, and the children or other descendants of the sovereign. In a larger sense, it comprehends all the British descendants of the royal house, or perhaps, more properly, as indicated by Blackstone, all who may by possibility succeed to the throne. With regard to the position and rights of a Queen-consort and Queen-dowager, see QUEEN. The husband of the Queen-regnant is not as such a member of the royal family; but the style of Royal Highness, and a precedence next to Her Majesty, were conferred on the late Prince-consort by statute. The Prince of Wales (q. v.), or heir-apparent to the throne, and the Princess of Wales, are distinguished by law from the rest of the royal family. By the statute 25 Edw. III., to compass the death of the Prince of Wales, or violate the chastity of the Princess of Wales, is high treason. The eldest daughter of the sovereign is styled the Princess Royal, and the violation of her chastity is, by the same statute, high treason. The heir-presumptive to the throne has no special rank or precedence as such, as his position may be altered by the birth of an heir-apparent.

The younger sons and daughters of the sovereign are entitled to a peculiar place in the House of Lords; statute 31 Henry VIII. c. 10 enacts that no person except the king's children shall presume to sit or have place at the side of the cloth of estate in the parliament chamber. On a reference by George II. to the House of Lords regarding the position and precedence of Edward, Duke of York, second son of his son Frederick, Prince of Wales, it was held that, under the description of the king's children, grandsons are included.

On a reference made to all the judges by George I., it was resolved that the education and care of the king's grandchildren, when minors, and also the approval of their marriages, belongs to the king, even during their father's lifetime. This care and approval has more recently been held to extend to the heir-presumptive, and it is difficult to say how far it comprises also the remoter branches of the royal house. There are frequent instances of the crown's interposition in the case of nephews and nieces, and a few in the case of more distant collaterals. Questions regarding the marriages of the royal family are now further regulated by the Royal Marriage Act (q. v.). The Prince of Wales, besides the revenues of the Duchy of Cornwall, has settled on him, by 26 Vict. c. 1, an annuity of £40,000, and the Princess of Wales £10,000 to be increased to £30,000, in case of her widowhood.

On the consolidated fund are charged £25,000 to the Duke of Edinburgh, £25,000 to the Duke of Connaught, £25,000 to Prince Leopold, £8000 to the Crown Princess of Prussia (till 1879, £6000 to the Grand-Duchess of Hesse), £6000 to Princess Christian of Slesvig-Holstein, £6000 to the Marchioness of Lorne, £6000 to the Duchess of Cambridge, £3000 to her daughter the Grand-Duchess of Mecklenburg-Strelitz, £12,000 to the Duke of Cambridge, and £5000 to Princess Teck, formerly Princess Mary of Cambridge.

ROYAL GEORGE, a British man-of-war, of 108 guns, the sudden sinking of which in Portsmouth harbor with all on board, 29th August, 1782, created a widespread feeling of sorrow and commiseration. The R. G. was the principal vessel of Lord Howe's fleet, and while she was undergoing repairs near the keel, she was too much heeled over, so that the water rushing through the port-holes of the depressed side, speedily filled her and she sank with all on board, including the admiral, Kempenfeldt, the captain, officers, crew, and about 300 women and children, who happened to be on board at the time—1100 in all. Of these, however, 200 were saved; but a small vessel, which happened to be anchored near, was drawn into the vortex occasioned by the R. G.'s descent, and swallowed up; and other vessels were also placed in imminent danger. Captain Waghorn, who escaped, was subsequently tried by court-martial for negligence and carelessness in the careening operation, but was acquitted. This calamitous event has been celebrated in an elegy by Cowper. Many of the guns were fished up soon afterwards, and several

schemes were projected for the raising of the ship bodily, but without success, until, in 1839, the mass was blown to pieces by the explosion of large metal cases filled with gunpowder. Most of the valuables which had been in the ship were brought up, and the brass guns which were recovered sufficed to defray the cost of the operation.

ROYAL MARRIAGE ACT. Act 12 Geo. III. c. 2 enacts that no descendant of the body of Geo. II., other than the issue of princesses married into foreign families, shall be capable of contracting marriage without the previous consent of the sovereign, signified under the Great Seal; and any marriage contracted without such consent is declared void. But such descendants, if above the age of 25, may, after twelve months' notice given to the Privy Council, contract and solemnize marriage without consent of the crown, unless both Houses of Parliament shall, before the expiration of the year, expressly declare their disapproval of such intended marriage. The penalties of Præmunire (q. v.) are attached to all persons who shall solemnize, assist, or be present at any such marriage. This act was passed in consequence of the marriage of the Duke of Gloucester, brother of George III., with the Countess Dowager of Waldegrave, and of the Duke of Cumberland with the widow of Colonel Horton and daughter of Lord Irnham. The marriage of the late Duke of Sussex in 1793 to Lady Augusta Murray, daughter of the Earl of Dunmore, was declared by the Prerogative Court to be a violation of the Royal Marriage Act, and therefore null and void, in August 1794; and the claims of their son, Sir Augustus d'Este, were declared invalid by the House of Lords in 1844. The Royal Marriage Act is heartily disapproved by many as impolitic and despotic, and as tending to immorality and scandalous conduct, and was not passed without great resistance in parliament. But the influence of the government was then too strong for public opinion.

ROYAL-MAST, the fourth mast from the deck, and usually the highest carried. It is most commonly made in one piece with the top-gallant-mast. It carries the royal-yard, which bears a sail called the 'royal.' The royal-mast is surmounted by the truck, at which the pendant or other flag is displayed when necessary.

ROYAL SOCIETY (OF LONDON). The origin of this Society may be traced back to those stirring years of civil strife that brought in the Commonwealth. Clubs for political, theological, and sectarian purposes were then numerous and active; and in the year 1645, 'divers worthy persons, inquisitive into natural philosophy, and other parts of human learning, did, by agreements, meet weekly in London on a certain day, to treat and discourse of such affairs.' Among these worthy persons were certain medical men, Dr. Wilkins, afterwards bishop of Chester; Foster, professor of astronomy in Gresham College; Wallis, the mathematician; and others, including a learned German from the Palatinate; and out of their meetings arose the now world-famous Royal Society. Wallis records that the subjects discoursed of were 'the circulation of the blood; the valves in the veins; the venæ lacteæ; the lymphatic vessels; the Copernican hypothesis; the nature of comets and new stars; the satellites of Jupiter; the oval shape of Saturn; the spots in the sun, and its turning on its own axis; the inequalities and selenography of the moon; the several phases of Venus and Mercury; the improvement of telescopes, and grinding of glasses for that purpose; the weight of air; the possibility or impossibility of vacuities, and nature's abhorrence thereof; the Torricellian experiment in quicksilver; the descent of heavy bodies, and the degrees of acceleration therein; and divers other things of like nature.'

In 1662, the persevering philosophers were, through the 'grace and favor' of Charles II., incorporated by charter, in which they were described as the Royal Society of London for the promotion of Natural Knowledge. The king gave them also a mace, and subsequently granted two other charters conferring additional powers and privileges. They are inscribed in a handsome volume known as the Charter Book, which, containing, as it does, the sign-manual of the founder, of other royal personages, and of nearly every Fellow elected into the Society, presents a collection of autographs unequalled in the world.

Through many difficulties, the young society pursued their way. Their meetings were interrupted by the great fire and the plague; but in March 1664—1665, they published the first number of the *Philosophical Transactions*, and thus commenced a record of their labors and researches, and at the same time a history of science of the highest value, comprising upwards of one hundred and seventy quarto volumes. Besides this, the Society publish an octavo serial entitled *Proceedings*, in which an account of the ordinary meetings is set forth. This serial was commenced in 1800, and now fills about thirty volumes. Another publication, in eight large quarto volumes, is the *Catalogue of Scientific Papers*, containing the titles of scientific papers published in all parts of the world from 1800 to 1873. This great work, invaluable for purposes of reference, was compiled at the cost of the Society, and gives in methodical form a record of the scientific progress of seventy-three years of the century. These works are not restricted to the Fellows, but are sold to the general public.

By increase of numbers—including scientific men on the continent, who were elected as foreign members—the Society widened their sphere of usefulness. They promoted the publication of Newton's *Principia* and optical works; they lent instruments to Greenwich Observatory in its early days, and were appointed visitors of that establishment by Queen Anne—a function which they still exercise; they aided travelers and scientific investigators; through force of circumstances, they became the advisers of the government on scientific subjects; Cook's celebrated voyage to observe the transit of Venus was undertaken at their instance; and from the voyage of the *Endeavour* down to the voyage of the *Challenger*, it would be difficult to specify a scientific expedition, which had not been equipped under the advice of the Royal Society.

In 1710, the Society removed to a house which they bought in Crane Court, Fleet Street. In 1780, by order of George III., quarters were assigned to them in the then new palatial building, Somerset House. There they abode until 1857, when, at the request of the government, they migrated westward to Burlington House, a wing of which they now occupy.

The Society's session commences on the third Thursday in November, and ends on the third Thursday in June. During this period, meetings are held weekly at 4.30 P.M. for the reading and discussion of papers, and these papers are for the most part afterwards published in the *Proceedings* or the *Philosophical Transactions*. The anniversary meeting is held on November 30. At that meeting, the Society elect a Council to carry on their work through the ensuing year. This council, comprising president, treasurer, and secretaries, numbers twenty-one persons.

The number of candidates for election into the Society averages between fifty and sixty every year. From these the council select fifteen, whose names are printed and sent to every Fellow, and in June the annual meeting takes place at which the fifteen are elected; but any Fellow is at liberty to alter the list of names. There are in all about 550 Fellows, including 50 foreign members.

The Society's income is derived from funded and landed property, and the annual contributions of the Fellows. Each Fellow contributed £4 yearly, or paid a life-composition of £60, with an admission fee of £10; till, recently, a fund was raised to abolish admission fees and reduce the annual contribution to £3. Each Fellow is entitled to the *Philosophical Transactions* and *Proceedings*, and to the use of the library of 30,000 volumes.

The Society formerly undertook the administration of the £1000 annually voted by parliament for scientific purposes, and also assisted in the administration of an additional grant. In 1882 a single grant of £4000 was substituted for the fund and grant of past years. The Society also assists in the naming of the Meteorological Council, which receives a government grant. The President is a trustee of the British Museum. In fulfilment of trusts, the Society award annually, in recognition of scientific work and discoveries, the Copley medal and two Royal medals; the Rumford medal every two years for researches in light or heat; and the Davy medal for chemical investigations.

Some of the most illustrious names in the annals of science appear on the roll of presidents of the Royal Society.

ROYAL SOCIETY (OF EDINBURGH) was incorporated by royal charter in 1783. It owed its origin to Principal Robertson the historian, who successfully labored to found in Edinburgh a Society on the model of the Berlin Academy, for the investigation and discussion of subjects in every branch of science, erudition, and taste. The Society was formally constituted at a meeting held in the College Library on the 23d June 1783, where the subsequent meetings were held till 1810, when the Society purchased a house in George Street. In 1826, the Society removed to its present apartments, leased from government, in the Royal Institution building in Princes Street. The original list of members included the names of most of the literati of Scotland. The first president was Henry Duke of Buccleuch. He was succeeded in 1812 by Sir James Hall, who, resigning in 1820, was succeeded by Sir Walter Scott. On the death of Sir Walter in 1832, Sir Thomas M'Dougall Brisbrane was appointed president; and was succeeded in 1860 by the Duke of Argyle. In 1864, Sir David Brewster, K.H., became successor to the duke, on whose death, in 1868, Sir R. Christison was elected. In 1873, Sir William Thomson was elected, and was followed by other eminent men.

The meetings of the Society are held on the 1st and 3d Mondays of every month from December to July. The admission fee of resident Fellows is £2, 2*s*., and the annual contribution is £3, 3*s*., which, after ten years, is reduced to £2, 2*s*., and ceases after 25 years' membership. The Society is also assisted by an annual grant of £300 voted by parliament. The papers read before this learned body are published in its *Transactions*, of which about 30 volumes have been published in quarto. Abstracts of the papers

also appear in its *Proceedings*, of which ten volumes have appeared in octavo.

The number of *ordinary* Fellows is upwards of 400; and of *honorary* Fellows, near 60.

The Society has the disposal of some valuable prizes, which are bestowed on the authors of the best communications on scientific and other subjects. These are the Keith Prize, founded by Alexander Keith of Dunnottar; the M'Dougall Brisbane Prize, founded by Sir Thomas M. Brisbane; and the Neill Prize, founded by Patrick Neill, Esq., LL.D.

ROYER-COLLARD, PIERRE-PAUL, a French statesman, born 21st June 1763, at Sompuis (Marne). The childhood of R. was spent at his father's house, under the severe surveillance of his mother, who belonged to a family ardently devoted to Jansenism. He was sent to college at Chaumont, and afterwards at Saint-Omer, which was superintended by one of his uncles, the Abbé Collard. Having passed as advocate at an early age, he pleaded several times before the old parliament; but from the first days of the Revolution he was involved in the events of that time, having been elected one of the representatives of the commune of Paris. From 1790 to 1792, he acted as joint-secretary of the municipality. It was then that he was connected with Pétion and Danton. The events of the 31st May obliged him to remove from Paris. He then returned to Sompuis, and lived in obscurity during the whole time of the Reign of Terror, studying and following the plough himself, to evade the suspicions of the Jacobins. Three years afterwards, in 1797, the electors of this department chose him to represent them in the Council of the Five Hundred. R. took an active part in the work of that assembly. He was one of those honest men who, preferring monarchy, but fearing a violent counter-revolution, consented to try the republic with a moderate government, cherishing the hope, in the meantime, of an ultimate restoration.

The 18th Fructidor completely opened his eyes and dispelled his illusions. It was then that he turned his thoughts to what he believed to be the only hope of France, and that he began a correspondence with Louis XVIII., which, however, ceased towards the epoch of the establishment of the Empire. For some years afterwards, he ceased to have anything to do with politics, and entered on another career. He was offered the chair of Philosophy (1809) by Napoleon, in the recently created University of France, which he accepted after great hesitation. Applying himself vigorously to study for it, he was soon highly qualified to fulfil his duties. In the few years he occupied this chair, he exercised an immense influence on the philosophy of France. Rejecting the purely sensuous system of Condillac, he proceeded eclectically, giving special prominence to the principles of the Scottish school of Reid and Stewart. He originated the 'Doctrinaire' school, of which Jouffroy and Cousin were the chief representatives.

The Restoretion deprived the cause of education of the services of Royer-Collard. The Bourbons did not overlook the man who had not ceased, since 1798, to maintain their cause; but R., who had all along dreamed of the union of hereditary monarchy with an enlightened liberty, was ill fitted to act with the royalist fanatics now dominant in France.

R. was appointed President of the Commission of Public Instruction (15th August 1815), which office he held, with the title of Councillor of State, till July 1820. He gave in his resignation at that time, not wishing to associate himself with the politics of the ministry. In 1815, the electors of Marne chose him to represent them in the famous 'Chambre Introuvable' (q. v.). He took part in all the business of the Chamber, remaining steadfastly attached to the king, but energetically opposing the *ultra* party. In the next parliament, he rejected, with great energy, the idea of confiding public instruction to the clergy. 'The university', he exclaimed, 'has the monopoly of education, nearly as much as the courts have that of justice, and the army that of the public force.

At the end of the session 1817, R. for the first time, withdrew from the government, at least from the course pursued by the ministry. He once more supported it in a new discussion against the predominance of the Catholic Church; but dating from 1819, the rupture was complete. He presented then the singular spectacle of a devoted royalist seconding the efforts of the Liberals. The French Academy opened its doors to him in 1827; and in 1828, he was named President of the Chamber of Representatives. As president, R. had to present the famous address of the 221 deputies (March, 1830) refusing their support to the government, which the king refused to hear read. Next day, the Chamber was prorogued. R. departed for Châteauvieux, his country-seat, where he went to conceal fears and regrets which the revolution of July was to justify. He was re-elected in June, 1830, and he accepted this mandate. In 1842, he withdrew from parliamentary life, and after that lived in great retirement.

Although R. had a considerable fortune, he never departed from the greatest simplicity, excepting for three things—the purchase of books, charity, and the receptions which his official position imposed on him. He received with politeness, but with a certain coldness which he could never lay aside. His salon was very much frequented by the political world. Every Sunday, the principal leaders of the moderate opposition assembled there: it was a large room, serving as a study, the walls of which were hidden from top to bottom by shelves loaded with books; not a single ornament—no fine furniture—what was strictly necessary, and no more. There assembled Cousin, the most eminent of his pupils; Guizot, the Duke de Broglie, Casimir Périer, De Barante, Villemain, Ampère, Andral, De Rémusat, De Barthélemy, Gabriel, and many others. There was little conversation, properly so called; the slow and sonorous voice of R. was dominant in the room. The subjects were almost always the political events and the debates in parliament; the acts of the government were not spared. This salon was the echo of the Liberal world.

From 1842, R. had completely withdrawn from public life, his health, in fact, not allowing him to occupy himself with public matters. He spent only the winter in Paris, returning in summer to his estate of Châteauvieux, where he died 4th September 1845.

R. is undoubtedly one of the most noted men of the 19th century. He exercised on his contemporaries a powerful influence, owing more, perhaps, to the uprightness, firmness, and extreme earnestness of his character, than to intellectual power or genius. Excepting his political speeches, published in the *Moniteur*, R. left few published works. A lecture on External Perception appeared in 1813; some of his minor articles are given in Jouffroy's translation of Reid. See the biographies by Philippe (1857), and Barante (new ed. 1878).

RSHEW, or RJEV, a town of European Russia, in the government of Tver, and 80 miles south-west from Tver, on the Volga, which passes through it. It is a place of much commerce, has salt and corn magazines, and two great annual fairs. Pop. (1880) 18,732.

RUATA'N, or RATTAN, an island situated in the Bay of Honduras, in the Caribbean Sea, in lat. 16° 30′ N., long. 86° 30′ W. It is 30 miles long by 9 broad in its widest part; and its dependencies are Bonacca, Utilla, Helena, Barbarette, and Morat. The whole comprise the colony of the Bay Islands, and were formerly part of the British dominions, but they were surrendered in 1860 to the republican government of Honduras. The island has a fine climate, with a prolific soil. The population, estimated at about 2000 souls, of whom about 200 are whites, including nearly 100 Spaniards, are principally emigrants from the Caymans.

RUBA'SSE, a mineral much prized for ornamental uses, is rock crystal, limpid or slightly amethystine, filled internally with minute brown spangles of specular iron, which reflect a bright red, equal to that of the most brilliant ruby. There is an artificial R., made by heating very pure rock crystal red hot, and repeatedly plunging it into a colored liquid.

RUBA'TO, TEMPO (Ital. stolen time), in Music, a capricious style of performance in which some notes are prolonged beyond their legitimate time, while others are curtailed, the aggregate value of the bar remaining unaltered. It is a style of performance which is very apt to be abused by inferior players and singers.

RU'BBLE, a common kind of masonry, in which the stones are irregular in size and shape. Walls faced with ashlar are generally packed with rubble at the back. Rubble is of various kinds, according to the amount of dressing given to the stones. Common rubble is built with stones left almost as they come from the quarry. Hammer-dressed rubble is so called when the stones are squared with the mason's hammer; coursed rubble, when the stones are squared and equal in height, &c.

RUBEFA'CIENTS are external agents employed in medicine for the purpose of stimulating, and consequently reddening, the part to which they are applied. All agents which, after a certain period act as blisters, may be made to act as rubefacients, if their time of action is shortened. The mildest rubefacients are hot poultices, cloths soaked in very hot water, moderately stimulating liniments—as, for example, soap-liniment, with various proportions of liniment of ammonia, or chloroform, &c. Spanish fly, in the form of *Emplastrum Califaciens*, or warm plaster, in which the active ingredient is blunted by the free admixture of soap-plaster, resin-plaster, &c., is a good form of this class of agents. Capsicum or Cayenne pepper, in the form of a poultice, is an excellent rubefacient; it is much used in the West Indies, but is seldom employed in this country. Mustard, in the form *Cataplasma Sinapis*, or mustard poultice, and oil of turpentine, are perhaps the best of the ordinary rubefacients. The former is applied to the soles of the feet and the calves of the legs in the low stage of typhus fever, in apoplexy and coma, in narcotic

poisoning, &c. It is also applied to the chest, with much advantage, in many cases of pulmonary and cardiac disease, and to the surface of the abdomen in various affections, of the abdominal viscera. The best method of employing turpentine is to sprinkle it freely on three or four folds of clean flannel, wrung out of boiling water. The sprinkled surface of this pad is placed upon the skin, and a warm dry towel is laid over the flannel. Two or three such applications will produce a powerful rubefacient effect. Turpentine thus applied is serviceable in all the cases mentioned in the remarks on Mustard, as well as in sore throat, chronic rheumatism, neuralgia, &c.

RUBENS, Peter Paul, one of the greatest of Flemish painters, was born probably at Siegen, in Westphalia, 29th June 1577. His parents settled in Cologne in 1578, where they remained till 1587, when R.'s father died, and his mother removed with her family to Antwerp. He was first placed under Verhaagt, a landscape painter; however, inclining more to historical painting, he became a pupil of Van Noort, but soon quitted his school for that of Otho Van Veen, or Venius, who then enjoyed a high reputation; and after studying four years with that painter, went to Italy in 1600. Recommended to Vincenzo Gonzago, Duke of Mantua, he was sent on a mission by the duke to Philip III. of Spain, and on that occasion painted several portraits of Spanish noblemen. He also spent a considerable time at Venice and Rome making copies for the duke, and executing independent works, which added largely to his reputation. In 1608, after an absence of eight years, R. returned to Antwerp on account of the illness of his mother, but she died before he had accomplished the journey. He intended to return to Mantua, but was induced to remain by the Archduke Albert, governor of the Netherlands. In 1621, he visited Paris by invitation of Maria de' Medici; and in 1625, completed the series of sketches for the pictures destined to adorn the palace of the Luxembourg. R. was sent by the Infanta Isabella, widow of the Archduke Albert, on a diplomatic mission to Philip IV. of Spain, in 1628; and in the following year, on a similar mission to Charles I. of England, by whom he was knighted in 1630. R.'s success as a political diplomatist is worth noting, and seems to indicate a large, solid, and practical nature, such as painters in general do not possess. He died, very rich, in 1640. R. is the acknowledged head of the Flemish school.

By the expression of powerful and energetic action, and strongly marked character—by great breadth and brilliant coloring, he successfully embodied the tendencies of the age in which he lived, to pleasures of sense, strong passion, and stirring action; and while admitting the coarseness, and almost grossness of his subjects, especially where the nude figure is introduced, we are in a manner carried away by the spirit of joyousness and an animal vigor conspicuous in his works, and the truthful manner in which he viewed nature. His portraits rank with the highest efforts in that walk of art. He painted animals admirably; and his landscapes possess great brilliancy and natural effect. He was perhaps the greatest master in the mechanical part of the art. His style has had great influence on the English school. The tercentenary of R.'s birth was celebrated at Antwerp in 1877 with great enthusiasm and with elaborate and splendid festivities.

RUBE'OLA. See Measles.

RUBIA'CEÆ, a natural order of exogenous plants, in which, according to many botanists, the *Cinchonaceæ* are included as a suborder; but which, as restricted by others (*Stellatæ* of Ray, *Galiaceæ* of Lindley), consists entirely of herbaceous plants, with whorled leaves, angular stems, and numerous very small flowers; the calyx superior, with 4, 5, or 6 lobes, or almost wanting; the corolla wheel-shaped, or tubular, regular, inserted into the calyx, and with the same number of divisions as the calyx; the stamens equal in number with the lobes of the corolla; two styles; the fruit a dry pericarp wich two cells, and one seed in each cell. There are between 300 and 400 known species, chiefly abounding in the northern parts of the northern hemisphere, and on the mountains of tropical regions. The most important plant of the order is Madder (q. v.). To this order belong also Bedstraw (q. v.) and Woodruff (q. v.).

RU'BICON, a stream of Central Italy, falling into the Adriatic, has obtained a proverbial celebrity from the well-known story of its passage by Cæsar, who, by crossing this river—which, at the outbreak of the civil war between him and Pompey, formed the southern boundary of his province—virtually declared war against the Republic. Hence the phrase, 'to cross the Rubicon,' has come to mean, to take an irrevocable step. The modern Luso, called by the peasants on its banks *Il Rubicone*, has claims to being the ancient R.; but arguments preponderate in favor of the *Fiumicino*.

RUBI'DIUM (sym. Rb, eq. 85·4) and CÆSIUM (sym. Cs, eq. 133) are two alkaline metals, discovered in 1860—1861, by Bunsen and Kirchhoff, by means of spectrum analysis. They resemble potassium more nearly than any other substance, and their names are derived from *rubidus*, dark red, and *cæsius*, sky-colored, in consequence of two red lines of remarkably low refrangibility being present in the spectrum of the former, and two characteristic blue lines in that of the latter. They are widely diffused in nature, but always occur in very small quantities. They have been detected in many mineral waters, and in certain minerals; as, for example, lithia-mica, lepidolite, petolite, and felspar; and they have been found in the alkaline ashes of the beet-root. The best material for the preparation of R. is lepidolite, which will sometimes yield as much as 0·2 per cent. of the metal, while the principal source of cæsium is the brine of Dürkheim, in which both these metals were originally found; every ton of the water containing about three grains of chloride of cæsium, and rather less than four grains of chloride of rubidium. It has, however, been recently asserted that the mineral *Pollux* contains no less than 34·07 per cent. of oxide of cæsium.

Both metals are so analogous to potassium, that they cannot be distinguished either from it or from one another by reagents, or before the blow-pipe. Like potassium, they form double salts with bichloride of platinum, which are much more insoluble than the corresponding potassium salt; and it is on this property that the separation of these metals from potassium is based. It is unnecessary to enter into any details regarding the compounds of these metals. It is worthy of remark that R. is electro-positive towards potassium, and that cæsium is electro-positive towards R. and potassium, and is thus the most electro-positive of the known elements.

The notice of Cæsium is included in this article, because its recent discovery prevented it from being considered in its proper alphabetical place in the original edition of this work. For the same reason, we may here briefly notice another metal, Indium, discovered by Reich and Richter in the Freiburg arsenical ores. Its most striking property, and that which led to its discovery, is the indigo-blue line which all its compounds (in so far as they have been investigated) show in the spectroscope. Its eq. is 37—new system 113; its sp. gr. varies from 7·1 to 7·3; its color is between those of tin and silver; it is exceedingly soft and very ductile; and its fusing-point is about that of lead.

RU'BRICS (Lat. *rubrica*, from *ruber*, red), in classic use, meant the titles or headings of chapters in certain law-books, and is derived from the red color of the ink in which these titles were written, in order to distinguish them from the text. In medieval and modern use, the name is restricted to the directions which are found in the service-books of the church, as to the ordering of the several prayers, and the performance of the sometimes complicated ceremonial by which they were accompanied. The same name, together with the usage itself, is retained in the Church of England Prayer-book; and in all these, even where the direction has ceased to be printed in red ink, the name rubric is still retained. Where red ink is not employed, the rubric is distinguished from the text by italics, or some other variety of print. In the Catholic Church, considerable controversy exists as to whether the rubrics of the missal, the ritual, and the breviary, are to be considered preceptive, or only directive—a question into which it would be out of place to enter. A similar controversy has existed at various times in the English Church. The science of rubrics is with Catholics a special branch of study, the chief authorities on which are Gavanti, Merati, Cavalieri, and other more compendious writers.

RUBRUQUIS, William de, one of the most distinguished of medieval travelers, was born early in the 13th c.—probably about 1228. He entered while very young, into the Franciscan order, and being hindered in his favorite scheme of missionary labor in the Holy Land, he was sent by Louis IX. of France into Central Asia, for the purpose of forming an alliance with Sartsch, the son of Batû Khan of Kiptchak, a supposed Christian sovereign, against the infidels who held the Holy Land. Taking Constantinople as the starting point, R., with two companions, also Franciscans, sailed for Soldaia—now Soujac—near Cherson, made his way across the steppes between the Dnieper and the Don, and crossing the latter river, reached, August 2, 1253, the camp of Sartach who was now discovered not to be a Christian, and by whom they were sent forward to his father Batû. When they reached the encampment of Batû, on the Volga, near its mouth, that prince refused to treat with them, and sent them forward to the Tartar emperor, Mangû Khan, whom they reached on the 27th December. At this rude court they remained for several months, and accompanied it about Easter to Kara-korum, where they found a few Europeans. Some time afterwards, R., being charged with having spoken of the emperor as an infidel, although he defended himself courageously, was compelled to return, but was treated with a certain degree of rude consideration. Proceeding along the banks of the Volga, he penetrated the difficult defiles of the Caucasus, proceeded through Armenia, Persia, and Asia Minor, to Syria, arriving at Tripoli in August 1255, having spent two years and a half in his eastern travel.

As King Louis, by whom the mission had been accredited, had

meanwhile returned to France, R. requested permission to follow him, in order to report the result; but fortunately for science, the Franciscan provincial refused to permit him to leave the East, and directed him to report in writing. To this fortunate severity we owe the interesting and curious account which he drew up, and of which a lucid summary will be found in Lardner's Cyclopædia, *Inland and Maritime Discovery*, vol. i. p. 261, and following. Of the later history of R., the only fact known is, that he was still living in 1293, when Marco Polo was returning from the East. His narrative is among the most plain and sober in its tone of all that have come down to us from the adventurous voyagers of the 13th century.

RU'BUS, a genus of plants of the natural order *Rosaceæ*, sub-order *Potentilleæ*, distinguished by a 5-lobed calyx without bracts, and the fruit formed by an aggregation of small drupes adhering to each other upon a long *torus*. The fruit is eatable in all, or almost all, the species, which are very numerous, and natives chiefly of the colder parts of the northern hemisphere, although some are natives of warm climates, and are occasionally to be seen in our hothouses. Some of them are herbs with perennial roots, some are shrubs with subligneous—often only biennial—stems, and they have digitate, pinnate, or lobed leaves. They cause great difficulty to botanists, the varieties being extremely numerous, and the specific distinctions very uncertain. The RASPBERRY (q. v.) and BRAMBLE (q. v.) are well-known fruits. The CLOUDBERRY (q. v.) also belongs to this genus. Besides these, and the species most nearly resembling them, and which have been described along with them, notice may be taken of *R. spectabilis*, a shrubby species, with leaves of three leaflets, and fine large dark purple fragrant flowers, produced singly on long terminal flower-stalks, a native of the banks of the Columbia River.

The fruit is about the size of a raspberry, dark yellow, acid, and somewhat astringent, making excellent tarts —*R. saxatilis*, sometimes called the *Stone Bramble*, is a perennial herbaceous plant, with slender stem, leaves of three leaflets, small greenish-yellow flowers, and pleasant fruit of very few rather large drupes. It is a native of stony places, in mountainous parts of Britain.—*R. arcticus* is a small herbaceous plant with creeping roots, slender stems 2—6 inches high, each with three or four leaves, which have three leaflets; the flowers large and of deep rose color, and a purplish red fruit of exquisite flavor. This interesting plant is a very doubtful native of the Highlands of Scotland, but is very abundant in Norway and Sweden, Siberia, and other arctic countries. In Siberia, it is known by a name signifying *Prince-berry*. A syrup, a jelly, and a wine are made of it. The fruit is highly esteemed; but although the plant grows very well in our gardens, it seldom bears fruit.

RUBY, a gem much prized, and only inferior in value to the diamond, or perhaps also to the sapphire. It is regarded by mineralogists not as a distinct species, but as a mere red-colored variety of Sapphire (q. v.) or of Spinel. The *Balas R.* is rose-red. The Almandine R. is tinged with violet or brown. The finest red rubies are generally known as *oriental rubies*, and are indeed brought from the East, chiefly from Ceylon and the Burman empire. The best generally come from the neighborhood of Syriam, in Pegu. In Ceylon, rubies are found in remarkable abundance in alluvial deposits, which have been searched for them for ages, whilst the natives seem never to have thought of digging in the rock of the mountains; but Dr. Gygax found innumerable small rubies, in a state of decomposition, falling to powder, in a stratum of gray granite with iron pyrites and molybdena; and Sir James E. Tennent thinks that mines might be opened with confidence of success.

Sir Alexander Burnes describes a ruby-mine at Badakshan, in Bactria. Tavernier states that the throne of the Great Mogul was adorned with 108 rubies, of from 100 to 200 carats each. The king of Arracan is said to have possessed a R., in the form of a six-sided prism, about an inch in diameter, terminated by a six-sided pyramid. But the greatest R. ever heard of was that possessed by the king of Ceylon, which, according to Marco Polo, was a span in length, as thick as a man's arm, and without a flaw. Kublaï Khan sent an ambassador to demand this R., offering the value of a city as its price; but the Ceylonese monarch refused to sell it. What has become of it is not known.

RÜCKERT, FRIEDRICH, a German lyric poet, was born May 16, 1789, at Schweinfurt, and died in January 1866. He received his education at the gymnasium of his native town, and studied at Jena University. In 1826, he was nominated Professor of Oriental Languages at Erlangen; went in 1840 to Berlin, as professor and privy-councillor, but resigned that position in 1849, and lived on his estate of Neuses in Coburg. R. began his literary career under the pseudonym of Freimund Raimar with his *Deutsche Gedichte* (German Poems, Heidelb. 1814); and *Napoleon, eine politische Komödie in drei Stücken* (Napoleon, a Political Comedy in three Parts, Stuttg. 1816). Under his own name he published: *Kranz der Zeit* (A Wreath of the Time, Stuttg. 1817); *Oestliche Rosen* (Eastern Roses, Leip. 1822); *Gesammelte Gedichte* (Collected Poems, 6 vols., Erl. 1834—1838).

As fruits of his oriental studies are to be considered his translations of Hariri's *Makamen*, under the title *Die Verwandelungen des Abu-Seid* (The Transformations of Abu-Seid, 2 vols. Stuttg. 1826); of the Indian tale, *Nal und Demajanti* (Frank. 1828), *Hamasa, oder die Aelteste Arabische Volkslieder* (Hamasa, or the oldest Arabic Ballads, 2 vols. Stuttg. 1846), and *Amrilkais der Dichter und König* (Amrilkais, the Poet and the King, Stuttg. 1847). Original poems of R., also relating to the East, are: *Morgenländ, Sagen und Geschichten* (Eastern Tales and Stories, 2 vols. Stuttg. 1837); *Erbauliches und Beschauliches aus dem Morgenländ* (2 vols. Berl. 1837); *Rostem und Suhrab* (Erl. 1838); *Brahmansche Erzählungen* (Brahmanic Tales, Leip. 1839); *Die Weisheit des Brahmanen, ein Lehrgedicht in Bruchstücken* (The Wisdom of the Brahman, a Didactic Poem in Fragments, 6 vols. Leip. 1836—1839); *Leben Jesu* (The Life of Jesus, Stuttg. and Tüb. 1839). The titles of his dramas are: *Saul und David* (Erl. 1843); *Herodes der Grosse* (2 vols. Stuttg. 1844); *Kaiser Heinrich IV.* (2 vols. Frank. 1845); *Cristoforo Colombo* (2 vols. Frank. 1845). R. was one of the most learned, versatile, and sprightly lyrists of modern times. He tried all sorts of metres, the Greek hendecasyllabic, the old Norse alliterative verse, the old German couplet, the *Nibelungen* strophe, the popular ballad, the delicate yet stately measure of the eastern gazelle (sonnets), and every kind of European quatrains, distiches, &c.; and he succeeded in all. Perhaps his fancy and wit were more remarkable than his depth of lyric feeling, yet the simple pathos of such pieces as the *Aus der Jugendzeit* could hardly be surpassed.

RUDD. See RED-EYE.

RUDDER, in a ship or boat, is that part of the steering apparatus which is in immediate contact with the water. It is shaped as at A (fig. 1), hung to the stern-post by pintle and brace hinges (fig. 2), and the upper end passing into the vessel, is acted on by the tiller. So long as the rudder, AB (fig. 3), is in a straight line

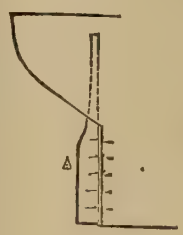


Fig. 1.


Fig. 2.—A, brace; B, pintle.

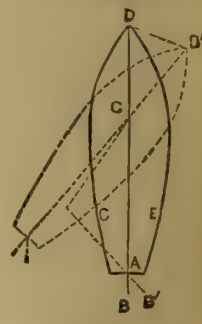


Fig. 3.

with the keel, the water which glides past the vessel acts equally on both sides, producing equilibrium; but if the rudder be turned, as AB', it will be relieved from the pressure on the side DC, while that on the side DE will act with greater force, and cause the ship to revolve round the center of gravity, G. When the head has turned sufficiently, as to D', the rudder is again put in line with the keel. See HELM.

RUDDIMAN, THOMAS, the greatest of Scottish grammarians, was born in Banffshire, at a place called Raggel, in the parish of Boyndie, October 1674. He received the rudiments of his classical education at the parish school, where he already gave promise of his future proficiency. At 16 years of age, he went to King's College, Aberdeen, where he took his degree of M.A. four years later.

On leaving the university, he was engaged as tutor in a private family, in which capacity he remained a year, and thereafter became parish schoolmaster of Laurencekirk. Here he accidentally made the acquaintance of the celebrated physician and Latinist, Dr. Archibald Pitcairne, who was so impressed with R.'s learning and sagacity, that he exerted his influence, and succeeded in getting him appointed assistant-keeper of the Advocates' Library, Edinburgh. His new office gave him ample opportunity for prosecuting his favorite studies, but the remuneration was so small, that, in 1707, he was compelled to commence business as an auctioneer. It was at this time that he began his career as an editor by publishing an edition of Volusenus's (Florence Wilson's) *Dialogue on the Tranquillity of the Mind*, to which he prefixed a life of the author. In 1709, he published Arthur Johnston's *Poetical Paraphrase of the Song of Solomon*, and the same author's *Cantica*—both in Latin. In 1714 appeared his well-known work —by which his name will always be honorably perpetuated among Scotchmen—*Rudiments of the Latin Tongue*, a text-book from which, under a great variety of forms, his countrymen still continue to be initiated into classical literature. In 1715, he published

his great edition of Buchanan's works (2 vols. folio); and in that year, exchanged the calling of an auctioneer for the more congenial one of a printer. In this capacity he was assisted by his brother, who became his partner, and had been originally bred to the business. Some years afterwards, he was appointed printer to the university of Edinburgh.

In 1725, he published the first part of his great grammatical work, his *Grammaticæ Latinæ Institutiones*, which is devoted to the Etymology of the language; and in 1732, the second part which treats of the Syntax. His philological reputation rests mainly on this work, which has been re-edited in Germany by Stallbaum, and is repeatedly referred to in the Latin Lexicon of Freund. He also prepared an elaborate treatise on Prosody, of which, however, he published only an abridgment. His next appointment was that of principal keeper of the Advocates' Library. While in this post, he completed Anderson's magnificent *Diplomata et Numismata Scotiæ* (folio, 1739), writing the learned Latin introduction, and supplying appendices. Controversy with men such as Benson, who contrasted the Latin verse of Johnston unfavorably with that of Buchanan, and with Logan on the hereditary right of the kings of Scotland to the crown, consumed a great part of his time, but did not so pre-occupy his thoughts as to prevent him from publishing, in 1751, an edition of Livy in 4 vols. 12mo, a gem of typography, and still known as the 'immaculate' edition, from its entire exemption from errors of the press. R. died in Edinburgh, January 19, 1757, in his 83d year. In politics, he was, like his friend Pitcairne, an ardent Tory and Jacobite; and in private life, a most upright and estimable man. Besides the publications already noted, he edited the translation of Virgil's *Æneid* by Bishop Gawain Douglas, and appended a very valuable glossary (folio, 1710). He also founded the *Caledonian Mercury* newspaper, and published or edited a multitude of minor tracts and books. His life has been written by George Chalmers, the antiquary (1 vol. 8vo., 1794).

RU'DENTURE, the moulding, in form like a rope or staff, filling the flutings of columns, usually one-third of the height. It is sometimes plain, and sometimes ornamental.

RÜ'DESHEIM, a small town of Prussia, in Hessen-Nassau, on the right bank of the Rhine, opposite Bingen, and 16 miles west of Mainz. In the vicinity is grown one of the most aromatic and fiery of the Rhine-wines (q. v.) called the *Rüdesheimer;* about 650 casks are produced yearly. Pop. 2500.

RUDOLF, or RODOLF, of Hapsburg, the founder of the imperial dynasty of Austria, which for a time was that of Germany, was born in 1218, and was the son of Albert Count of Hapsburg and Hedwig of Kyburg-Zäringen. R. early exhibited great personal daring and military skill, and acquired celebrity in his native canton of Aargau for the prowess and ability with which he repulsed the many bands of banditti who infested the district. The death, in 1264, of his uncle, Hartmann of Kyburg, to whose rich heritage he succeeded, raised him from the condition of a poor noble to the rank of an influential lord of extended territories, which included the greater part of Aargau, and various domains in the cantons of Bern, Lucerne, Zug, and Zürich. The able manner in which he governed these dominions, and exercised the functions of Protector of the Waldstätter or Forest Cantons, attracted the notice of some of the great electoral princes of Germany; and on the death of the Emperor Albert in 1273, R. was elected his successor, chiefly through the instrumentality of his powerful friend, the Archbishop of Mainz.

The ratification by Pope Gregory XI. of R.'s title was obtained at the cost of various concessions, as for instance, the renunciation of all jurisdiction in Rome, and of all feudal superiority over Spoleto and the Marches of Ancona; together with the cession of all right on the part of the emperor and his successors to interfere in ecclesiastical elections, or in the internal administration and management of the German Church. By this agreement, the feuds were appeased which had existed for nearly 200 years between the empire and the see of Rome, and R. was able to turn his attention to the settlement of the internal disturbances of Germany. His chief enemy was Ottocar, king of Bohemia, under whom he had once served against the Prussians and Hungarians, and who now refused to do homage to him. Fortune, however, favored R. in the war with the Bohemian king, who, after a first defeat, again rose in arms against the empire, but was ultimately defeated and killed in battle (1278), when the emperor seized all the Austrian territories which Ottocar had possessed. Wenceslaus, the son of the slain king, having lost no time in tendering homage for the kingdoms of Bohemia and Moravia, the cause of the war was at an end, and peace being restored, R. thenceforth devoted himself to the organization of the state. His great merit was in breaking the arbitrary power of the nobles, by compelling them to demolish the fortresses and strongholds, by means of which they carried on plundering expeditions against one another, and defended themselves from the power of the law; and we are told that in one year he condemned to death 30 refractory nobles, who had long disturbed the public peace, and razed to the ground double that number of strongholds. He also granted charters to many trading towns and municipalities, and thus gave considerable impetus to trade. The policy of his rule generally was indeed so greatly to favor the burgher and working classes, and to repress the tyranny of the powerful nobles, that his reign presented in this respect a favorable contrast to those of his predecessors, and the respect in which he was held by all ranks, bears the strongest testimony to his admirable qualities as a ruler. R. died in 1291, and was succeeded in Austria by his son, Albert I., Duke of Austria. See Schönhuth, Huber, Lorenz; also Hirn, *R. von Habsburg* (1874).

RUDOLF or RODOLF II., eldest son of the Emperor Maximilian II. of Germany, was born in 1552, and educated at the Spanish court by the Jesuits. On the death of his father in 1576, he succeeded to the imperial crown, after having, during the lifetime of his father, been proclaimed king of the Romans. This first reigning namesake of the great progenitor of the Austrian dynasty did not add to the dignity or greatness of the Hapsburg family; and the whole of his reign of 36 years was marked by persecutions and intolerance on his side, and by discontent and even insurrection on that of his subjects. His bigotry and intolerance in forbidding Protestants the free exercise of their religion, led them to ally themselves with their co-religionists in the Low Lands and in France (1608), and by implicating the empire in foreign wars, augmented taxation, and increased the monetary difficulties of the state. R., who was gloomy, taciturn, and bigoted, had not the qualities necessary to secure the good-will of those around him, and he died, unregretted by his subjects, 20th January 1612, leaving no issue, and bequeathing to his brother Matthias, who succeeded him, an impoverished and distracted state. R.'s taste for astrology and the occult sciences, and his anxious desire to discover the philosopher's stone, led him to extend his patronage to Kepler and Tycho Brahé, whose study of astronomy was thought specially to qualify them for that much-coveted discovery; and the patronage which R. extended to the Danish discoverer, when the latter was obliged to leave his own country, through the jealousy of his brother-nobles, has proved one of the few claims possessed by R. to the grateful remembrance of late times. The important astronomical calculations begun by Tycho, and continued by Kepler, which are known as *The Rudolphine Tables*, derive their name from this emperor, who originally undertook, but subsequently failed, for want of means, to defray the expenses incidental to the undertaking. See Gindely, *R. II. und Seine Zeit* (1865).

RU'DOLSTADT, the chief town of the principality of Schwarzburg-Rudolstadt, is charmingly situated in a hill-girt valley, on the left bank of the Saale, 18 miles south of Weimar. Pop. (1875) 7638.

RUDRA is, in Vedic Mythology, a collective name of the gods of the tempest, or Maruts, Rudra (in the singular) being the name of their father. (See John Muir's *Contributions to a Knowledge of the Vedic Theogony and Mythology*, in the *Journal of the Royal Asiatic Society*, new series, vol. i. part 4, London, 1864.) In later and Puranic mythology (see HINDU RELIGION and PURANA), Rudra (the terrible) is a name of S'iva, and the Rudras are his offspring. 'From Brahmâ's forehead,' the *Vishn'u-Purân'a* relates, 'darkened with angry frowns, sprang Rudra, radiant as the noontide sun, fierce and of vast bulk, and of a figure which was half male, half female. "Separate yourself," Brahmâ said to him, and having so spoken, disappeared: obedient to which command, Rudra became twofold, disjoining his male and female natures. This male being he again divided into eleven persons, of whom some were agreeable, some hideous, some fierce, some mild; and he multiplied his female nature manifold, of complexions black or white.' See Wilson's *Vishn'u-Purân'a*.—The word *rudra* apparently comes from the Sanscrit *rud*, weep; but as the sense of this radical does not yield any satisfactory clue to the meaning of the deity called Rudra, the *Purân'as* invented a legend, according to which Rudra received this name from Brahmâ, because, when a youth, he *ran about crying aloud;* and when asked by Brahmâ why he wept, replied that he wanted a name. 'Rudra be thy name,' rejoined Brahmâ: be composed; desist from tears. In this legendary etymology there is, moreover, a punning on the similarity between *rud*, cry, and *dru*, run —an illustration of one of the sources whence the later mythology of India derived some of its boundless stock of absurd myths.

RUE (*Ruta*), a genus of plants, of the natural order *Rutaceæ*, having a short 4—5-parted calyx, 4 or 5 concave petals, affixed by a claw, 8 or 10 stamens, and a 4—5-lobed germen, with 8 or 10 nectariferous pores at the base. The species are natives of the south of Europe, the north of Africa, the Canary Isles, and the temperate parts of Asia. They are half shrubby; and have alternate, stalked, repeatedly pinnate leaves with translucent dots, the flowers small, and in terminal corymbs. COMMON R., or GARDEN

R. (*R. graveolens*), grows in sunny stony places in the countries near the Mediterranean. It has greenish-yellow flowers, and glaucous evergreen leaves with small oblong leaflets, the terminal leaflets obovate. It is not a native of Britain, but is frequently cultivated in gardens. It was formerly called *Herb of Grace* (see *Hamlet*, act iv. scene 5), because it was used for sprinkling the people with holy water. It was in great repute among the ancients, having been hung about the neck as an amulet against witchcraft in the time of Aristotle. It is the *Peganon* of Hippocrates. R. is still employed in medicine as a powerful stimulant, but the leaves must be used fresh, as they lose their virtues by drying. The smell of R., when fresh, is very strong, and to



Common Rue (*Ruta graveolens*).

many very disagreeable; yet the Roman used it much for flavoring food, and it is still so used in some parts of Europe. The leaves chopped small are also eaten with bread and butter as a stomachic, but they must be used sparingly, as they are acrid enough to blister the skin if much handled, and in large doses act as a narcotic poison. All their properties depend on an acrid volatile oil, which is itself used for making *Syrup of Rue*, eight or ten drops of oil to a pint of syrup; and this, in doses of a teaspoonful or two, is found a useful medicine in flatulent colic of children. The expressed juice of R., mixed with water, and employed as a wash, promotes the growth of the hair.—Some of the species found in the north of India resemble Common R. in their properties, and are used for the same purposes.

RUE'LLIA, a genus of plants of the natural order *Acanthaceæ*, natives of tropical and sub-tropical parts of Asia and Australia. Some of them are very beautiful, and are common ornaments of our hothouses. In some parts of China, especially in the province of Che-kiang, and on the mountains to the west of Ning-po, a species of this genus, *R. indigofera*, is much cultivated for the excellent indigo which it yields. It is also a native of Assam, and is cultivated there.—See Fortune's *Residence among the Chinese*.

RUFF (*Machetes pugnax*), the only known species of its genus, is a bird of the family *Scolopacidæ*, and like snipes and many others of the family, an inhabitant of marshy places. It is found in most of the northern parts of the world, migrating southwards

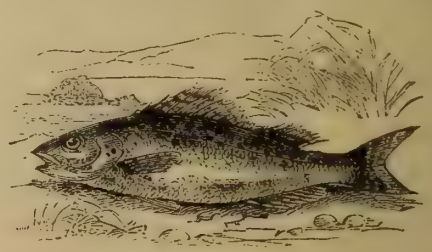


Ruff and Reeve (*Machetes pugnax*).

in autumn, and northwards in spring. It is found in England and in Ireland, but not in Scotland, probably because there are few localities in that country suitable to it. In size, the R. is considerably larger than a snipe, and is about a foot in entire length, from the point of the bill to the tip of the tail. The tail is short and pointed. The wings are long and pointed. The legs are long and slender, the *tibia* naked for some distance above the tarsal joint. The bill is straight, rather slender, as long as the head. The neck of the male is surrounded, in the breeding season, with a *ruff* of numerous long feathers, whence probably the English name. The males are remarkable for diversity of colors, no two specimens being ever similar; but ash-brown prevails, spotted or mottled with black; the head, ruff, and shoulders are black, glossed with purple, and variously barred with chestnut.

The female (the *Reeve*) is mostly ash-brown, with spots of dark-brown, much more uniform in color than the male. Their nest is usually situated on a tussock in a moist, swampy place, and is formed of the coarse grass which surrounds it. The eggs are four in number. The R. is taken for the table in spring, but the young birds taken in autumn are very preferable. They are often fattened after being taken, and are fed on bread and milk with bruised hemp-seed. After being fattened, they are sent to market. They feed readily when quite newly caught, and fight desperately for ther food, unless supplied in separate dishes, which is therefore the regular practice of the feeders, who find it also advantageous to keep them in darkened apartments. The R. is gradually becoming scarcer in England, owing to the destruction of its favorite haunts, the fens, by drainage.

RUFFE, or POPE (*Acerina cernua*), a very pretty little fish of the Perch family (*Percidæ*), abundant in the lakes, slow rivers, and ditches of many parts of the middle of Europe and of England. It is not found in Scotland. It is never more than



Ruffe or Pope (*Acerina cernua*).

five or six inches long. In shape, it resembles the common perch, but has only a single dorsal fin. The R. is highly esteemed for the table. It is very easily caught, a small red worm being used as bait.

RUFFLE is a low vibrating sound, less loud than a roll, produced by drummers. It is used as a compliment to general officers and at military funerals.

RU'GBY, a market-town of England, in the county of Warwick, and 15 miles north-east of the town of that name, is pleasantly situated on a rising ground on the left bank of the Avon, and is reached by five different railways. It derives its importance and celebrity wholly from its grammar-school, founded by Lawrence Sheriff, a London shop keeper, in 1567. The buildings of the school, consisting of a fine Elizabethan quadrangle, with cloisters, and an elegant detached chapel, are of brick, with stone-work round the windows and at the angles and cornices. The chapel contains among other monuments of head-masters, that of the late Dr. Arnold. The school is generally attended by about 500 pupils. The endowment of the school produces about £5000 a year, and it offers 20 exhibitions of values varying from £40 to £80 a year, and tenable for four years. A park of eleven acres is set aside for foot-ball, cricket, and other games. The railways and the school give rise to almost all the trade of the town. Pop. (1881) 9890.

RU'GELEY, a market-town in the county of Stafford, on the right bank of the Trent. There are iron-works in the town, and collieries in the vicinity. Pop. (1871) 3375; (1881) 4249.

RÜ'GEN, the largest of the islands of Germany, belongs to Prussia, and lies in the Baltic, off the coast of Pomerania. Greatest length, 33 miles; greatest breadth, 28 miles; area, 360 square miles. Pop. 45,699. It is separated from the mainland, with which at one time it was probably connected, by a strait, about a mile in width. The island is so deeply indented on all sides by the sea, that it seems to be formed of several narrow tongues of land attached to each other, and to which the name of peninsulas has been given. On the peninsula of Jasmund is the precipitous cliff called the Stubbenkammer, the highest point of which (420 feet) is called the King's Seat, because Charles XII. witnessed from this spot a sea-fight between the Swedes and Danes, August 8, 1715. R., which until 1815 had remained Swedish territory, was in that year transferred to Prussia. Hertha Lake, in this island, is believed to be the place where, according to Tacitus, the goddess Hertha (Earth) was worshiped. The soil of the island is productive, cattle are reared, and the fisheries around the island are carried on with profit. The scenery of R., which is everywhere pleasing, and is frequently grotesque and romantic, together with the facilities for sea-bathing, attract numerous vis-

itors. Chief town, Bergen, in the middle of the island, with (1875) 3591 inhabitants.

RUHNKEN, DAVID, born 2d January 1723 at Stolpe, in Pomerania, received his academical education first at the Königsberg gymnasium, where he distinguished himself not only in classical learning, but even in music and drawing, and afterwards at Wittenberg University, where he spent two years in the assiduous study of ancient literature, history, and jurisprudence. He graduated 1743; after which he went to Leyden, where for six years he prosecuted his classical studies under the guidance of Hemsterhuis, and bestowed particular attention on the Greek writers, nearly all of whom he read. He devised a new edition of Plato, collected the scholia of that author, and published an excellent edition of Timæus's *Lexicon Vocum Platonicarum* (Leyd. 1754; re-edited in a much improved form, 1789). He went in 1755 to Paris' where, for a whole year, he examined the MSS. of the Royal Library and of the Library of St. Germain. Hemsterhuis then got him appointed as lector (reader) in the university of Leyden, in which capacity he was the assistant and colleague of his great master. In October 1757, he introduced his series of lectures by a discourse, *De Græcia Artium et Doctrinarum Inventrice* (Leyd. 1757). For four years he discharged the duties of his office with a skill and success that raised him in public esteem, as one of the most learned men in Holland. In 1761, he succeeded Oudendorp in the chair of Eloquence and History. In 1767, he lost his friend and master Hemsterhuis; and in his capacity as rector of the university, delivered a splendid tribute to the deceased in his *Elogium Tiberii Hemsterhusii* (Leyd. 1768). In 1774, he succeeded Gronovius as librarian to the university, which he enriched with a multitude of valuable books and MSS. He died 14th May 1798, and in gratitude to his memory, the city of Leyden purchased his great library, and gave his widow an annuity of 500 florins

R. will long be remembered as one of the best scholars and critics of the 18th century. His fine taste and sagacity, aided by an astonishing memory and vast learning, enabled him to illustrate the authors of antiquity with wonderful success. He was also a brilliant prælector, for which he was no doubt indebted to the extreme lucidity and grace of his Latin style. A list of his works would occupy much space. In addition to those already noted, we may mention his edition of vol. ii. of Alberti's Hesychius; his edition of Rutilius Lupus; of Velleius Paterculus; of Muretus, &c. He contributed to the editions of the classics by other scholars, such as Ernesti and Schweighäuser, and thereby accumulated a vast amount of valuable material in the shape of correspondence and miscellanea. His life has been written by his famous pupil Wyttenbach (Leyd. 1799; new and improved edition, Leips. 1822, and Freiberg, 1846).

RUHR, a river of Prussia, an affluent of the Rhine, rises about a mile from Winterberg, in the east of Westphalia, and flowing in a west-north-west direction, enters the plain of the Rhine at Mühlheim, and joins the great river at Ruhrort, two miles north-west of Duisburg. Entire length 143 miles.

RU'HRORT, a small town of Rhenish Prussia, on the right bank of the Rhine, 63 miles north-east of Aix-la-Chapelle by railway. It has the best harbor on the Lower Rhine, possesses many large ship-building docks, is the seat of an immense coal-trade with Holland—the coal being derived from large beds of the mineral on the banks of the Ruhr—and carries on a large carrying-trade in corn, timber, and wool, and in miscellaneous articles. A large fleet of steamers, with passengers and traffic, ply from R. up to Strasburg, and down to Holland. A railway crosses the Rhine here, and passengers and goods are carried across the river in the carriages, and without being put to the trouble of shifting their seats, by means of a large steamer, the deck of which is fitted with rails. On each side of the river is a tower, 120 feet high, connected with the railway, and furnished with a powerful engine, by means of which the railway carriages are lowered to the water on one side, and lifted to the railway on the other. Pop. (1875) 9053.

'RULE BRITANNIA,' one of the national anthems of Great Britain, which has been described by Southey as 'the political hymn of this country as long as she maintains her political power.' Its original appearance was in a masque entitled *Alfred*, the words by James Thomson the poet, and David Mallet, and the music by Dr. Arne, which was performed for the first time on August 1, 1740, before Frederick, Prince of Wales, at his residence at Cliefden. The words of the ode are believed to be the composition of Mallet. *Alfred* was altered by Mallet in 1751, when three stanzas of *Rule Britannia* were omitted, and three others, by Lord Bolingbroke, substituted for them; but it is the ode in its original form that has taken root.

RULE NISI, in the English and Irish courts of law, is a technical term denoting the first step in an interlocutory application to the court, such as an application for a new trial. The usual course is for the party who takes the initiative to move, *ex parte*, for a rule nisi, i. e., an order of the court that something shall be done, *unless* the opposite party, within a certain time, usually three or six days, show cause, i. e., some good reason why the thing proposed should not be done. When the party obtains a rule nisi, he sends a copy of it to the other party, who must then, at the time appointed, show cause, and if the cause is deemed sufficient, the rule is discharged, i. e., the application is refused; if the cause is insufficient, the rule is made absolute, i. e., the opposite party is bound to do the thing asked, otherwise he will be liable to some disadvantage or to imprisonment, according to the nature of the subject matter.

RULE OF FAITH, the name given in polemical theology to what is regarded as the code from which the faith of Christians is to be drawn. One of the most vital of modern religious controversies is that which turns upon the question: What is the Christian rule of faith? We can but undertake to state the conflicting views. The Reformers, as a body, laid it down as a first principle, that the Word of God alone, by which they meant the written word, or the Scriptures, could safely be accepted as a rule of faith. If the Fathers could be received at all, it is only in the light of witnesses, and fallible witnesses, to the ancient interpretation of the Scriptures. This doctrine appears to be much modified in the English Church of the Laudian period, and by the successors of that school, the modern Tractarians, who admit the 'consent' of the Fathers as an authoritative interpretation of the Scriptures. Roman Catholics, on the contrary, while they admit that God's word alone is the rule of faith, yet contend that the Scriptures are not to be considered as the only depository of God's word. Much of our Lord's teaching to his apostles was not committed to writing in these authentic Scriptures; and as the teaching of Christ, wherever found, is God's word, even as much as what is written in the Scriptures, they hold that if it be possible to find such teaching elsewhere than in the Bible, the teaching so found is to be held as part of the rule of faith. Now they hold that the traditions of the church, contained in the writings of the Fathers, the decrees of councils, the decretals of popes, are a depository of Christ's teaching, less accessible, it is true, but when unanimous, not less certain than the Scripture itself; and of this certainty of such unanimous interpretation, they regard the church as at all times the authoritative expositor.

Protestants acknowledge the authority of the oral teaching of Christ himself, and of his apostles, or others speaking by inspiration; but in respect of the want of any authoritative or trustworthy record, they deny that any such teaching, not recorded in the Scriptures, is of any value to us. As to the right of the church to expound authoritatively, they deny it altogether.

RULE OF THE ROAD. This phrase includes the regulations to be observed in the movements of conveyances either on land or at sea.—*On land:* Drivers and riders keep the side of the road next their left hand when meeting, and that next their right when overtaking and passing other horses or conveyances. The person neglecting this rule is liable for any damage that may happen through such neglect. A man riding against a horse or a conveyance driving against another that is standing still, is answerable for any damage that may ensue.—*At Sea:* Vssels meeting from opposite directions *port their helms* and pass one another on their left sides. A vessel overtaking another shall keep clear of that overtaken. When two sailing-vessels are crossing one another, the one that has the wind on its *port* (left) side has to keep clear of that which has the wind on the *starboard* (right) side, except when the former is *close-hauled*, and the latter free. If they have the wind on the same side, the ship that is to windward must keep clear of that to leeward. A steamer having another on her starboard side has to keep out of its way. Steamers have to keep out of the way of sailing ships, and to slacken speed when nearing other vessels. When one vessel has to get out of the way, the other keeps her course; but safety being the first consideration, these rules are not to be acted upon at all hazards, when their observance incurs obvious risk of danger. The Board of Trade sanctioned some new regulations for ships in 1880. See De Horsey's *Rule of the Road at Sea*.

RULE OF THREE is the technical term for that rule in arithmetic, otherwise called Proportion (q. v.), which teaches the finding of a fourth number proportional to *three given numbers*. The term 'rule of three' has been in use from the commencement of the 16th c.; and from the great utility of the operation in commercial transactions, it received, almost from the commencement, the name of the GOLDEN RULE (q. v.). To the ordinary 'rule of three' was added the *backer rule*, or 'rule of three inverse' (corresponding to inverse or Reciprocal [q. v.] proportion), and the 'double rule of three, in which two or more ratios are given as determining the number to be found.

RUM, a mountainous island of Argyleshire, belongs to the group of the Inner Hebrides, 15 miles north-north-west of Ardnamurchan Point. It is 8 miles long, about 7½ miles broad; area upwards of 30,000 acres, only about 6 per cent. of which is under

cultivation. Pop. (1851) 162; (1871) 81; (1881) 89. The island is a mass of high sharp-peaked mountains, rising in Ben More to the height of 2320 feet.

RUM, a kind of spirit made by fermenting and distilling the 'sweets' that accrue in making sugar from cane-juice. The scummings from the sugar-pans give the best rum that any particular plantation can produce; scummings and molasses, the next quality; and molasses the lowest. Before fermentation water is added, till the 'sett' or wort is of the strength of about 12 per cent. of sugar; and every ten gallons yields one gallon of rum, or rather more. The flavor of rum depends mainly on soil and climate, and is not good where canes grow rankly. Pine apples and guavas are at times thrown into the still, but on the great scale, no attempt is made to influence flavor artificially. The finest-flavored rums are produced by the old-fashioned small stills. The modern stills, which produce a strong spirit at one operation, are unfavorable to flavor. The color of rum is imparted after distillation by adding a certain proportion (varying with the varying taste of the market) of caramel, or sugar melted without water, and thus slightly charred. Rum is greatly improved by age, and old rum is often very highly prized; at a sale in Carlisle in 1865, rum known to be 140 years old sold for three guineas per bottle. It forms a very important part of our colonial produce: the quantity imported into Britain in 1875 was 8,815,681 gallons; in 1881, 4,816,887 gallons (value £485,685). Rum is distilled both in the E. and W. Indies.

RU'MA, a small town of Austria, in Slavonia, on an affluent of the Save, 35 miles north-west of Belgrade. The chief industry is wine-culture, and the rearing of horses. Pop. (1880) 7800.

RUMA'NIA (often written ROUMANIA). See the article MOLDAVIA AND WALACHIA, to which this short notice serves as a continuation and conclusion. A military revolt took place in February 1866, which resulted in the deposition of Prince Couza —Alexander John I. The Count of Flanders, younger brother of Leopold II. of Belgium, was unanimously chosen Hospodar; but he at once declined the perilous honor. Upon this, the choice of the Rumanians fell upon Prince Charles of Hohenzollern-Sigmaringen, who was proclaimed Prince of R. on April 20, 1866. The existing constitution was then adopted. When war broke out between Russia and Turkey in April 1877, R. signed a convention with Russia, guaranteeing the Russian troops a free passage through Rumanian territory; and on May 21 the Chamber of Deputies at Bucharest decreed the independence of R. War was declared with Turkey; and the Rumanian army bore a creditable part in several battles, especially before Plevna. The Berlin Congress of 1878, which revised the treaty of San Stefano, concluded between Russia and Turkey, and has attempted the most recent solution of the 'Eastern Question,' agreed to recognize the independence of R. It resolved, however, much against the will of the government and people of R., to restore to Russia the portions of Bessarabia (q. v.) touching the Pruth and Danube, which were given by the treaty of Paris to Moldavia in 1856; and, by a rough sort of compensation, R. received the Dobrudscha (q. v.). It was stipulated that religious dissent should not exclude from civil rights. On 27th March 1881, the Senate and Chamber unanimously resolved that R. should be proclaimed a kingdom.

RUMFORD, BENJAMIN THOMPSON, COUNT, an American inventor, was born at Woburn, Massachusetts, March 26, 1753. Having received the rudiments of education at a common school, he entered a merchant's office at Salem, at the age of 13, and got his living as a clerk and school teacher, while he studied medicine and physics. In 1770, he was engaged as teacher of an academy at Rumford, now Concord, the capital of New Hampshire; and in 1772, married a rich widow of that place, and was made major of militia by the English governor. The jealousy of officers over whom he had been promoted, and charges of disaffection to the royal cause, at this period of the outbreak of the American revolution, drove him from Rumford to Boston, where he became acquainted with General Howe; and when General Washington compelled the surrender of Boston, Thompson was sent to England as bearer of dispatches. In London, he so won the favor of the government by his intelligence, as to be appointed Under-secretary of State in the Colonial Office. On a change of ministry, however, he returned to America, and fought in the royal cause. When it failed, he entered the service of the king of Bavaria, by whom he was knighted; and in 1784, he was settled at Munich as aide-de-camp and chamberlain to the reigning sovereign. In this post he exhibited the energy of his mind and the fertility of his invention. He reorganized the army and improved its tactics. In 1790, he suppressed beggary throughout the kingdom, took measures for improving the breeds of horses and cattle, and laid out a park for Munich. He rapidly rose to the offices of major-general, councillor of state, lieutenant-general, minister of war, and was created Count of the Holy Roman Empire, when he chose Rumford, where his fortunes had begun, as his titular designation. In 1795, he visited London, where he was treated with much attention, and finding that his opinion was sought after on technological subjects, he published the results of his experience and the records of his labors in Bavaria.

Having long and carefully studied the phenomena of heat, he set himself to devise a remedy for the smoky chimneys, which were one of the greatest nuisances at that time in England; and discovered the principles upon which fireplaces and chimneys have since been constructed. Other cases in which greater economy of the application or production of heat could be obtained, as cooking-ranges, stoves, &c., engaged much of his attention. On his return to Bavaria, he was appointed President of the Council of Regency, and soon after, Minister Plenipotentiary to the Court of St. James; but the British government, holding to the doctrine of inalienable allegiance, refused to recognize him in that capacity. He declined an invitation to revisit America, where he was greatly admired, in spite of his loyalty. He finally settled in Paris; devoted himself to improvements in artillery and illumination; founded a professorship, in Harvard College, of the Application of Science to the Arts of Living; married the widow of Lavoisier; and died at Auteuil, near Paris, August 21, 1814, after making many important bequests to the Royal Society of London, the American Academy of Sciences, and Harvard University. See *Memoir* by Ellis (1876).

RU'MILI. See ROUMELIA.

RUMINA'NTIA, a group of animals, in the division *Artiodactyla* (q. v.) of the order of *Ungulata*. Cuvier treated them as a separate order. The R. are an extremely well-defined group, among the individuals of which the habit of *rumination* or chewing the cud is universal and almost peculiar. The R. are all strictly and exclusively herbivorous, and exhibit a great similarity of structure. They have no incisors in the upper jaw, the front of which is occupied by a callous pad. 'The grass is collected and rolled together by means of the long and movable tongue; it is firmly held between the lower cutting teeth and the pad, the cartilaginous upper lip assisting in this; and then, by a sudden nodding motion of the head, the little roll of herbage is either torn or cut off, or partly both torn and cut.'—Youatt.

In the lower jaw, there generally appear to be eight incisors; but the two outer are more properly to be regarded as canines, and in the *Camelidæ*, they assume the ordinary canine form. Some of the R. have canine teeth in the upper jaw, and some are destitute of them. In front of the molar teeth, there is a long vacant space in both jaws. The molars are six on each side in each jaw; their surface exhibits crescent-shaped ridges of enamel. The head is elongated, the neck is always of considerable length, the eyes are placed at the side of the head, and the senses of smell and hearing, as well as of sight, are extremely acute. The head is in many R. armed with horns, which in some are found in both sexes, in some only in the male, whilst in others they are wholly wanting; and the absence of them characterizes varieties of some species, as the sheep and ox, in which they are ordinarily present. The horns differ very much in different families, even in their structure, some being hollow (true *horns*), some solid (*antlers*). All the four limbs are terminated by two large toes, which are hoofed. Behind the hoof are always two small spurs, rudimentary toes. The metacarpal and the metatarsal bones are united into one, called the *cannon* bone. The legs are rather long, and the spinal column is very flexible. The brain of the R. is small, and they do not exhibit much intelligence; nor are they distinguished by any remarkable instincts; and though easily tamed, they are scarcely susceptible of any kind of training or education. Very few, however, of the numerous species of R. have been truly domesticated, and probably much is yet to be done in this way.

The R. are generally gregarious; they are distributed over almost the whole world; but none are natives of Australia. They are found both in the warmest and the coldest regions. The flesh of all the R. is fit to be used for human food; the fat (tallow) hardens more on cooling than the fat of other animals, and even becomes brittle. The fat, hide, horns, hoofs, hair, bones, entrails, blood, and almost all parts are useful to man.

The intestines are long in all the Ruminantia. The cæcum is also long. The complex stomach, adapted to rumination, requires a more particular description. The stomach consists of four distinct bags or cavities. The first of these, into which the gullet or œsophagus enters, is, in the mature animal, by far the largest, and is called the *Paunch* (Lat. *rumen*). Into this the chief part of the food passes. It is lined with a thick membrane, presenting numerous prominent hard papillæ, secreting a fluid in which the food is soaked. The second cavity is the *Honeycomb Bag* (Lat. *reticulum*), so called from its being internally covered with a network of cells, like those of a honeycomb. In Scotland, it is known as the *King's Hood*. This second cavity, or stomach, has also a direct communication with the œsophagus, and fluids seem in gen-

eral to pass immediately into it, but sometimes or partly also into the other cavities; and it is here that the cells for retaining water are chiefly found in the camel. The third cavity, or stomach, is the *Manyplies* (Lat. *psalterium*), so called because its lining membrane forms many deep folds, like the leaves of a book, beset with small hard tubercles. This also communicates directly with the œsophagus, by a sort of prolongation of it. The leaves of the membrane seem to serve for the absorption of superfluous fluid from the food. Finally, the food passes into the fourth cavity, which is of a more elongated form than any of the others, and is next in size to the first. This is called the *Reed* or *Rennet* (Lat. *abomasus*). It may be considered as the true stomach, homologous —if any one of the four parts can be so regarded—to the simple stomach of mammals in general. It is lined with a velvety mucous membrane in longitudinal folds. It is here that the gastric juice is secreted. In young animals, it is the largest of the four cavities, and it is only when they pass from milk to crude vegetable food that the paunch becomes enlarged, and all the parts of the complex stomach come fully into use. It seems to be by a power of what may be called instinctive volition, that the animal directs what passes through the gullet into the first cavity, the second, or even the third. It has been found by M. Flourens, who made many experiments on this subject, that the food consumed by ruminants passed chiefly into the first cavity, but part of it also at once into the second, and even, when it was given in a *mashed* or in a much comminuted state, into the third.

The particular means by which hastily swallowed food is brought from the paunch, formed into pellets at the base of the œsophagus, and brought up into the mouth for rumination, or second and more thorough mastication, are not yet very thoroughly understood, notwithstanding the patient investigations of M. Flourens. He ascribes the formation of the pellets, however, to the action of the muscular duct which connects the œsophagus with the second and third stomachs, and the power which the animal has of closing or opening at will the orifices of these cavities.

Chewing of the cud is very generally performed in an attitude of repose, and evidently affords great pleasure to the animal.

The R. are arranged by naturalists in seven families, all very natural—*Camelidæ* (see CAMEL), *Moschidæ* (see MUSK), *Cervidæ* (see DEER), *Camelopardidæ* (see GIRAFFE), *Antelopidæ* (see ANTELOPE), *Bovidæ* (q. v.), and *Capridæ* (q. v.). The most important genera and species are separately noticed.

RUMP PARLIAMENT. In order to bring about the condemnation of Charles I., Oliver Cromwell, on 6th December 1648, sent two regiments, under the command of Colonel Pride, to coerce the House of Commons. Forty-one members of the Long Parliament who were favorable to accommodation were imprisoned in a lower room of the house, 160 were ordered to go home, and only 60 of the most violent of the Independents were admitted. The clearance was called *Pride's Purge*, and the privileged members ever afterwards passed by the name of the *Rump*, forming, as it were, the fag-end of the Long Parliament. This assembly, in conjunction with the army, brought about the arraignment, trial, and condemnation of Charles I. Five years later, the Rump Parliament, forgetting that it was but the creature of the army, attempted to make a stand against certain demands on the part of the soldiers. The result was that Cromwell filled the House with armed men; the Speaker was pulled out of the chair, the mace taken from the table, the room cleared, the door locked, and the parliament declared to be dissolved.

Supreme in the three kingdoms, Cromwell convoked an assembly which assumed the title of Parliament, and acquired from the name of one of its most prominent members, a leather-seller, called Praisegod Barebones, the name of the. *Barebones Parliament*. The Barebones Parliament, after subsisting five months, was dissolved, and Cromwell, raised to the dignity of Protector, convoked two parliaments, and dissolved them for refusing to sanction his measures. On Oliver Cromwell's death, and Richard's succession to the Protectorate, the military malcontents coalescing with the Independents in Richard's parliament, declared the expulsion of the Rump illegal, and restored that assembly to its functions. With the revival of the Rump, its quarrel with the army revived; and the troops, again surrounding Westminster Hall, expelled it on 13th October 1659, a provisional government of officers assuming the direction of affairs. But the general dissatisfaction having led to a coalition between the Presbyterians and Royalists, the army, unable to carry on the government, was reduced to the necessity of once more restoring the Rump, which had been twice ignominiously expelled. The advance of Monk, however, with the army of Scotland led to a general cry throughout the country for a free parliament. A number of the members who had been excluded by Pride's Purge reappearing in the House, placed the Independents in the minority; and on 16th March 1660, the despised and derided Rump at last solemnly decreed its own dissolution. The most prominent members of the Rump Parliament were Vane and Hazlerig.

RUM SHRUB, a liqueur in which the alcoholic base is rum, and the other materials are sugar, lime or lemon juice, and the rind of these fruits added to give flavor. Almost every maker has his own receipt, and much credit is assumed by each for his own especial mixture.

RU'NCORN, a thriving market and manufacturing town and river-port of Cheshire, on the left bank of the Mersey, 12 miles south-east of Liverpool. There is a station of the North-western Railway on the Lancashire side of the river, and the town is the terminus for the Bridgewater and the Mersey and Irwell Canals. It is a free port, has a custom-house, and contains iron-foundries, soap and chemical works, ship-building yards, &c.; and in the vicinity are collieries, and slate and freestone quarries, large quantities of freestone are shipped for distant ports. In 1880, 2861 vessels, of 237,000 tons, entered the port. Pop. (1851) 8049; (1871) 12,443; (1881) 15,113.

RUNES, the earliest alphabet in use among the Teutonic and Gothic nations of Northern Europe. The exact period of their origin is not known. The name is derived from the Teutonic *rún*, a mystery, whence *runa*, a whisper, and *helrún*, divination; and the original use of these characters seems to have been for purposes of secrecy and divination. The resemblance which some of the runic characters bear to the Phœnician alphabet and others derived from it, has led to the supposition that they were first introduced by Phœnician merchants who traded with the coasts of the Baltic; and while the mass of the people were allowed to possess but a very partial acquaintance with them, the priests systematized them, and retained a full knowledge of them in their own hands, no doubt finding them useful in establishing a reputation for superior power and intelligence. Scandinavian and Anglo-Saxon tradition agree in ascribing the invention of runic writing to Odin or Wodin. The countries in which traces of the use of runes exist include Denmark, Norway, Sweden, Iceland, Germany, Britain, France, and Spain; and they are found engraved on rocks, crosses, monumental stones, coins, medals, rings, brooches, and the hilts and blades of swords. Runic letters were also often cut on smooth sticks called *rún-stafas*, or mysterious staves, and used for purposes of divination. But there is no reason to believe that they were at any time in the familiar use in which we find the characters of a written language in modern times, nor have we any traces of their being used in books or on parchment. We have an explanation of the runic alphabet in various MSS. of the early middle ages, prior to the times when runes had altogether ceased to be understood.

The systems of runes in use among the different branches of the Teutonic stock were not identical, though they have a strong general family likeness, showing their community of origin. The letters are arranged in an order altogether distinct from that of any other alphabetical system, and have a purely Teutonic nomenclature. Each letter is, as in the Hebrew-Phœnician, derived from the name of some well-known familiar object, with whose initial letter it corresponds. Runes being associated in the popular belief with augury and divination, were, to a considerable extent, discouraged by the early Christian priests and missionaries, whose efforts were directed to the supplanting of them by Greek and Roman characters. But it was not easy suddenly to put a stop to their use, and we find runes continuing to be employed in early Christian inscriptions. This was to a remarkable extent the case in the Anglo-Saxon kingdoms of Northumbria, Mercia, and East Anglia, where we have traces of runic writing of dates varying from the middle of the 7th to the middle of the 10th century. Its continued prevalence in this particular district has been accounted for by the fact that, after the death of Edwin and the flight of St. Paulinus, the restoration of Christianity in Northumbria was effected by missionaries of the Irish school, whose predecessors had adopted the policy, not, like Augustine and his brethren, of destroying the monuments of pagan antiquity, but of allowing them to remain, and consecrating them by marking them with the symbols of Christianity. Runes are said to have been laid aside in Sweden by the year 1001, and in Spain they were officially condemned by the Council of Toledo in 1115.

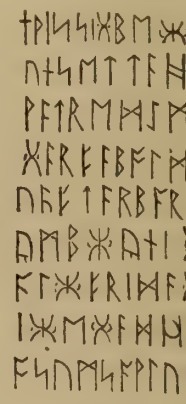
The different systems of runes, all accordant up to a certain point, have been classed as the Anglo-Saxon, the German, and the Norse, each containing different subordinate varieties. The Norse alphabet is generally considered the oldest, and the parent of the rest. It has 16 letters corresponding to our *f, u, th, o, r, k, h, n, i, a, s, t, b, l, m, y*, but has no equivalent for various sounds which existed in the language, in consequence of which the sound of *k* was used for *g*, *d* for *t*, *b* for *p*, and *u* and *y* for *v*: *o* was expressed by *au*, and *e* by *ai*, *i*, or *ia;* and the same letter otherwise was made to serve for more than one sound. Other expedients came, in the course of time, to be employed to obviate the deficiency of the system, as the addition of dots, and the adoption of new characters. But the runic system received a fuller development among the Germans and Anglo-Saxons, particularly the latter, whose alphabet was extended to no fewer than forty

characters, in which seem to have been embraced, more nearly than in any modern alphabets, the actual sounds of a language. Till recently the Norse runes had been most studied; but of late the Anglo-Saxon had become the subject of considerable attention. The following table exhibits the best known forms of the Anglo-Saxon, German, and Norse runic alphabets, with the names, and the power of the several letters:

Anglo-Saxon.			German.		Norse.	
ᚠ	feoh	f	ᚠ	feh	ᚠ	fé
ᚢ ᚣ ᚤ	ur	u (short)	ᚢ	uur	ᚢ	ur
ᚦ	thorn	th	ᚦ	dorn	ᚦ	thurs
ᚩ ᛈ	os	o (short)	ᚬ	oos	ᚬ	os
ᚱ	rad	r	ᚱ	rat	ᚱ	ridr
ᚳ	cæn	k	ᚴ	cen	ᚴ	kaun
ᚷ	gyfu	g	ᚷ	gebo		
ᚹ	wen	w	ᚹ	huun		
ᚻ	hægel	h	ᚺ	hagal	ᚼ	hagl
ᚾ	nyd	n	ᚾ	nod	ᚾ	naud
ᛁ	is	i (short)	ᛁ	iis	ᛁ	is
ᛄ	gear	y (cons.)	ᛄ	ger	ᛅ	ar
ᛇ	eoh	e (long)	ᛇ	ih		
ᛈ ᛸ	peorth	p	ᛈ	perd		
ᛉ	eolhx	x	ᛉ	elix		
ᛋ	sigel	s	ᛋ	sigi	ᛋ	sol
ᛏ	tir	t	ᛏ	ti	ᛏ	tyr
ᛒ	beorc	b	ᛒ	borg	ᛒ	biarkan
ᛖ	eh	e (short)	ᛖ	eh		
ᛗ	man	m	ᛗ ᛘ	man	ᛘ	madr
ᛚ	lagu	l	ᛚ	lago	ᛚ	laugr
ᛜ ᛝ	ing	ng	ᛜ	inc		
ᛞ	dæg	d	ᛞ	tag		
ᛟ	œthel	o (long)	ᛟ	odil		
ᚪ ᚫ	ac	a (long)	ᚪ	ac	ᛦ	yr
ᚫ	æsc	a (short)	ᚫ	asc		
ᚣ ᛡ	yr	y	ᚣ	yur		
ᛠ	ear	au	ᛠ	der		
ᛡ	ior	io				
ᛢ	queorn	q				
ᛣ ᛤ	calc					
ᛥ	stan	st				
ᛧ ᛨ	gar	dzh				
ᛎ		z				
ᛩ						
ᛪ						
᛫						
᛬						
᛭						
ᛮ	vult	v				
ᛯ						
ᛰ						
ᛱ						

The Anglo-Saxon runes, as here given, are derived from a variety of MS. authorities, the most complete containing forty characters, while some only extend as far as the twenty-fifth or twenty-eighth letter. Neither the name nor the power of some of the later letters is thoroughly known, and they are without any equivalents in the Norse runic system. The German runes are given from a MS. in the conventual library of St. Gall in Switzerland. Though the various runic alphabets are not alike copious, the same order of succession among the letters is preserved, excepting that, in the Norse alphabet, *laugr* precedes *madr*, although we have placed them otherwise, with the view of exhibiting the correspondence of the three systems. The number of characters in the Anglo-Saxon alphabet is a multiple of the sacred number eight; and we have the evidence both of a Swedish bracteate containing twenty-four characters, and of the above-mentioned St. Gall MS., that there was a recognized division of the alphabet into classes of eight letters—a classification which forms the basis of a system of secret runes noticed in that MS. Of these secret runes, there are several varieties specified: in particular 1. *Iis-runa* and *Lago-runa* (of which specimens exist in Scandinavia), consisting of groups of repetitions of the character *iis* or *lago*, some shorter and some longer, the number of shorter characters in each group denoting the class to which the letter intended to be indicated belonged; the number of longer ones, its position in the class. 2. *Hahal-runa*, where the letters are indicated by characters with branching stems, the branches to the left denoting the class, and those to the right the position in that class. There is an inscription in secret runes of this description at Hackness in Yorkshire. 3. *Stof-runa*, in which the class is indicated by points placed above, and the position in the class by points below, or the reverse.

The best known inscriptions in the Anglo-Saxon character are those on two gravestones at Hartlepool in Northumberland, on a cross at Bewcastle in Cumberland, and on another cross at Ruthwell in Dumfriesshire. The inscription on the west side of Bewcastle cross, which we give as a specimen of Anglo-Saxon runes, is a memorial of Alcfrid, son of Oswiu, who was associated with his father in the government of the kingdom of Northumbria, in the 7th century.



Runes.

It has been thus deciphered into the Anglo-Saxon dialect of the period:

+ THIS SIGBECUN
SETTÆ HWÆTRED
EM GÆRFÆ BOLDU
ÆFTÆR BARÆ
YMB CYNING ALCFRIDÆ
GICEGÆD HEOSUM SAWLUM.

Or in modern English:

This memorial
Hwætred set
and carved this monument
after the prince
after the king Alcfrid,
pray for their souls.

The inscription on the Ruthwell cross, after being long a puzzle to antiquaries, was first deciphered in 1838 by Mr. John M. Kemble, an eminent Anglo-Saxon scholar. It is written alternately down one side of the stone and up another, and contains a portion of a poem on the subject of the Crucifixion. Mr. Kemble's interpretation received a very satisfactory confirmation by the discovery of a more complete copy of the same poem in a MS. volume of Anglo-Saxon homilies at Vercelli.

Mr. D. H. Haigh, whose researches have added much to our knowledge of Anglo-Saxon runes, has endeavored to set up for them a claim of priority over the Norse characters. Instead of considering the additional Anglo-Saxon letters as a development of the Norse system, he looks on the Norse alphabet of sixteen letters as an abridgment of an earlier system, and finds occasional traces of the existence of the discarded characters in the earliest Norse inscriptions, and in the Scandinavian *Iis-runa* and *Hahal-runa*, where the letters are classified in accordance with the Anglo-Saxon groups of eight.

The Scandinavian kingdoms contain numerous runic monuments, some of them written *boustrophedon*, or with the lines beginning alternately from the right and left, and there are many interesting inscriptions on Swedish gold bracteates, generally having reference to some design which they accompany. The Celtic races, from their connection with the Scandinavians, became acquainted with their alphabet, and made use of it in writing their own language; and hence we have in the Western Islands of Scotland, and in the Isle of Man, runic inscriptions, not in the Anglo-Saxon, but in the Norse character, with, how-

ever, a few peculiarities of their own. Some of the most perfect runic inscriptions are in Man; others of a similar description exist at Holy Island, in Lamlash Bay, Arran, and there is an inscription in the same character on a remarkable brooch dug up at Hunterston in Ayrshire. Dr. D. Wilson considers that the Celtic population of Scotland were as familiar with Norse, as the Northumbrians with Saxon runes.

We sometimes find the Norse runes used to denote numerals, in which case the sixteen characters stand for the numbers from 1 to 16; *ar* combined with *laugr* stands for 17, double *madr* for 18, and double *tyr* for 19. Two or more letters are used to express higher numbers, as *ur ur*, 20; *thurs thurs os*, 34.

See Planta's essay, *On the Runic or Scandinavian Language;* W. C. Grimm, *Ueber Deutsche Runen; Archæologia* vol. 28; Haigh's *Anglo-Saxon Conquest of Britain;* Dr. D. Wilson's *Prehistoric Annals of Scotland;* the Danish works of Worsaae and Wimmer.

The term RUNIC KNOTWORK is often applied loosely and inaccurately to a kind of interlaced ornamentation to be seen in MSS. and on monuments of Anglo-Saxon, Norman, Scandinavian, Scoto-Irish, and Pictish origin, from the 6th to the 12th century.

RUNGPU'R, a British district of India, in the presidency of Bengal, bounded on the E. by the Brahmaputra, and on the N. by the protected state of Cush Behar. Area, 3476 sq. m.; pop. (1871) 2,149,172. The surface is so low, that a large proportion of it is inundated during the rains. Indigo, for the manufacture of which there are numerous large factories in the district, is the great article of export.

RUNJEET-SINGH, maharajah of the Punjab (generally described by English writers as the *king of Lahore*), was born at Gugaranwalla, 2d November, 1780. His father, Maha-Singh, was sirdar of Sukur-Chukeah, one of the twelve missouls or military organizations of the Sikhs, and died when R. was about 12 years old, leaving a full treasury and a well-regulated government. His widow took charge of the administration, and attempted by every means in her power to render her son effeminate, but R.'s character was not capable of being weakened by such treatment. When about 17 years old, his mother died suddenly (poisoned, as it is reported, by her son), and he immediately assumed the government.

R. now showed himself to be a prince of overwhelming ambition, and capable of attaining his object either by policy and address, or by force. In 1799, having rendered important service as an ally to Zemân Shah of Afghanistan, who had invaded the Punjab, he received from that monarch liberty to take possession of Lahore, which he accordingly did, and held it, despite the utmost efforts of his brother sirdars. To these quarrelsome neighbors he next turned his attention, and succeeded in subduing some and rendering others tributary, so that by 1809 he had greatly reduced their number. His successes having alarmed the Sikh chiefs, situated between the Sutlej and the Jumna, they besought the governor-general's interference, and this was the only occasion on which he ever came into collision with the British. Arrangements were amicably made, and Britain gave up all pretension to interference north of the Sutlej, on condition that that boundary should be carefully respected. R., thus freed from the only danger he feared, pursued his schemes of aggrandizement; and in 1812, having compelled all but three of the Punjab sirdars to resign their authority, he organized the whole under one sovereignty, and proclaimed himself *rajah*. His army had for several years previously been organized and disciplined according to the European fashion by English officers who had entered his service, so that the wild and undisciplined troops of the neighboring states had not a chance of successfully opposing him. About this time his capital was resorted to by two of the dispossessed rulers of Afghanistan, one of whom, Shah-Sujah, was the possessor of the celebrated *Koh-i-núr* (q. v.), which prize R. eagerly coveted, and at last obtained as the price of his assistance in recovering the throne of Cabul. In 1813, R. obtained possession of Attock, took Mûltan by storm in 1817, and in 1819 annexed Cashmere, assuming after these exploits the title of *maharajah*.

In 1822, he took into his service Allard and Ventura, two French officers who formerly served under Napoleon, and by their aid he finished the reconstruction of his army, with the view of extending his dominion to the west of the Indus. In pursuance of this scheme, he wrested (1829) from the Afghans the province of Peshawur. He had now an extensive territory, peopled by more than 20,000,000, and a well-trained army of 70,000 men, of whom 36,000 were infantry, thoroughly disciplined, and this numerous host was employed for several years in desultory wars with the Afghans. Between him and the British there was always a mutual distrust, dissembled by the show of extreme cordiality; but as both parties scrupulously abstained from any cause of offence, pacific relations were never interrupted. In 1836, his army was totally defeated by the Afghans, but this reverse seems not in the slightest degree to have affected the stability of his rule, even in the most recently-acquired districts; and, strange to say, his long reign was not disturbed by a single revolt. He died 27th June 1839. R. is one of the most remarkable men in eastern history; in person he was short and slight; his countenance, deeply marked with small-pox (which had deprived him of the sight of one eye), was, however, expressive of strong determination, to which the calm of his brilliant dark eye lent additional effect. He was totally uneducated; could neither read nor write; yet the indefatigable energy of his administration, and his clemency and moderation (rare qualities in an Asiatic despot), are without a parallel in the East. See *English Cyclopædia;* Cuvilier-Fleury, *Notes Historiques sur le Général Allard; Revue Britannique*, vols. x., xiii., xxiii., and xxvii.

RUNNER (*flagellum*, a whip), in Botany, is a long slender branch proceeding from a lateral bud of a herbaceous plant with very short axis, or in popular language, without stem. It extends along the ground, and produces buds as it proceeds, which often take root and form new plants. Strawberries afford a familiar example. Another is found in *Potentilla anserina*. Runners are common in the genus *Ranunculus*.

RUNNERS. See KIDNEY BEAN.

RU'NNIMEDE, a long stretch of green meadow, lying along the right bank of the Thames, from which it is partly concealed by plantations of willows, 20 miles west-south-west of London. It is proposed to derive the name from the Sax. *rhynes*, waterbrooks, which abound in these meadows; others suppose the word to be *Runningmead*, referring to the horse-races which appear to have been held here from time immemorial, and which still take place in the month of August. R. is of great historical interest, from the fact that Magna Charta was signed by King John, June 15, 1215, either on this meadow, or on Charter Island, lying a short distance off the shore. The Great Charter itself professes to have been signed *per manum nostram in prato quod vocatur Runnimede*. See MAGNA CHARTA.

RU'NRIG LANDS, a peculiar species of property known in Scotland, by which alternate ridges of land belong to two individuals respectively. The origin of holding lands in this way is said to have arisen out of the practice of common defence and watching, and the common ploughing and laboring necessary or natural in the occupation of burgh acres and lands near towns. Each party is absolute proprietor of his own ridge; but owing to the obstruction often caused to agricultural improvement, a mode of compulsory division or allotment of the lands was introduced by statute in 1695. This remedy, however, does not apply to burgh acres, or to patches of land less than four acres in extent.

RUPEE' is the name of a silver coin current in India, of the value of 2*s*. English. The word is a corruption of the Sanscrit *rûpya*, from *rûpa*, shape, form, meaning, according to Pân'ini, a coin—not necessarily of silver—on which the shape *of a man*, according to the Kâs'ikâ commentary on this grammarian, is struck; and if this ellipsis of the word *man* is correct, as it very probably is, the word rupee would be of great numismatic interest, inasmuch as it would prove that even as early as at the time of the grammarian Pân'ini (q. v.) coins existed with a *human* figure impressed on them. The coin bearing the name of rupee was first struck by Shir Shah, and was adopted by Akbar and his successors; it was of the weight of 175 grains troy, and was considered to be pure; but in the decline of the Mohammedan empire every petty chief coined his own rupee, varying in weight and value, though usually bearing the name and titles of the reigning emperor. In the reign of Shah Aalam, a great variety of coins bore his name and the years of his succession, until 1773, when they were suppressed in the territories subject to the East India Company, and a rupee was struck, called the Sicca rupee, with an inscription on it, which, translated, runs: 'The king, Shah Aalam, the defender of the faith of Mohammed, the shadow of the grace of God, has struck this coin, to be current through the seven climes;' and on the reverse: 'Struck at Murshidabad, in the 19th year of the auspicious accession.' Though rupees were coined also at Dacca, and finally only at Calcutta, and also at various dates, the place of coinage (the mint of Murshidabad) and the date just named (the 19th of Shah Aalam's reign) remained unaltered, in order to put a stop to the practice which money-changers had introduced, of levying an arbitrary rate of discount on rupees of different places of coinage and of previous dates, without reference to any actual diminution of weight by wear. Although the Dacca rupee was thus the actual medium of exchange, the Company's accounts were for a long time kept in a different valuation, or that of the *Chalani*, or current rupee, 100 Sicca rupees being reckoned as equivalent to 116 Chalani rupees. The Sicca rupee served also as a unit of weigh—80 Sicca weight being equal to one *ser*, and 40 sers to one *man* or *maund* = 82 lbs. Beside the Sicca rupee, two other rupees were current in the Bengal presidency—the Benares rupee, which ceased to be struck in 1819, and the Farakhabad rupee.

At Madras, the rupee of the Nawabs of the Carnatic, originally

struck at Arcot, and at Bombay that of the Nawabs of Surat. became the currency of the Company. In 1818, the standard of the Sicca and Farakhabad rupees was altered, but their intrinsic value was unaffected, as they continued to have the same amount of fine silver. Other changes of these coins took place—of the latter in 1824, of the former in 1833; but in 1835, the coinage of the Company was entirely remodelled, and a coin, thenceforth termed the Company's rupee, with its proportionate sub-divisions, was struck to replace all the former currencies, being of the same weight and fineness throughout, and bearing inscriptions in English, or on one face the head and name of the reigning sovereign of Great Britain and Ireland, and on the reverse the designation of the coin in English and Persian, with the words 'The East India Company' in English. The latter, of course, have disappeared since India has been placed under the direct government of the English crown. The weight, intrinsic purity, and value of the British currency of these several coins were till lately:

		Weight.	Pure Contents.		
		Troy Grains.		*s.*	*d.*
Sicca Rupee	1773	179·666	179·923	2	2
Do	1818	191·916	175·923	2	2
Do	1823	192·000	176·000	2	2
Benares	1806	174·760	167·000	2	0¾
Farakhabad	1803	173·000	165·215	2	0½
Do.	1819	180·234	165·215	2	0½
Do.	1824	180·000	165·000	2	0½
Madras		176·400	166·480	2	0¾
Do	1818	180·000	165·000	2	0½
Bombay	1800	179·000	164·680	2	0¾
Do	1829	180·000	165·000	2	0½
East India Company's	1835	180·000	165·000	2	0½

But as silver is subject, in the London mint, to a seigniorage of nearly 6 per cent., the London mint produce of the rupee, if of full weight (11 dwts. fine), should be 1*s.* 11*d.* Owing to the depreciation of silver, the value of the R. has fallen; the *Sicca* R. is now quoted only at 2*s.*

RUPERT, PRINCE, the son of the Elector-Palatine Frederick V., and Elizabeth, daughter of James I. of England, was born in 1619. In 1642, he received from his uncle, Charles I. of England, a commission to command a regiment of horse at Worcester against the Parliamentarians. The impetuosity with which he charged the enemy there, and in the battle of Edgehill, would have proved of greater use to the Royalists had not his rashness in pursuing the wavering foe nearly counteracted the advantages which he had already gained. Subsequently, at Chalgrove, Newark, and Newberry, he was more successful; but his petulant disregard of orders, and his hasty retreat from the field of battle at Marston Moor, resulted in a signal defeat, the consequences of which had a most disastrous effect upon the fortunes of the Royalist party. His conduct at Naseby, and his hasty surrender of the city of Bristol, irritated the king, who forthwith deprived him of his command, and requested him to leave England without delay. In 1648, however, he was recalled and appointed to the command of the royal fleet. In this new vocation he acquitted himself with much daring and somewhat more caution, and for three years he kept his ships afloat, after escaping the blockade in which he had been held for a twelvemonth off the Irish coast by the great parliamentarian Admiral Blake; but in 1651, the latter attacked the prince's squadron, and burned or sunk most of his ships. With the few vessels still remaining to him, R. escaped to the West Indies, where, in concert with his brother Maurice, he led a buccaneering life, maintaining himself and his men by seizing upon English and other merchantmen. After a few years spent in this manner, R. managed to elude the vigilance of Cromwell's captains, and made good his way to France, where he remained till the restoration of his cousin, Charles II.

R. served with distinction under the Duke of York, and in concert with the Earl of Albemarle, against the Dutch, and died in 1682 in the enjoyment of various offices and dignities, being a privy councillor, a member of the Admiralty, governor of Windsor Castle, &c. The last ten years of his life were spent in retirement in the pursuit of chemical, mechanical, and physical researches, for which he evinced considerable aptitude. Although it is certain that he did not discover the art of engraving in mezzotinto—the real inventor of which appears to have been a German, Von Tregen, whose early works bear the date of 1642—R. no doubt improved the mechanical mode of the art, which he described and illustrated for the Royal Society of London in 1662, after he had completed several interesting engravings on the new principle. The glass bead known as Prince Rupert's Drop (q. v.) derives its name from the prince.

RU'PERT'S LAND, so called from Prince Rupert (q. v.), who was one of the founders of the Hudson's Bay Company, was formerly the official designation of that extensive tract which forms the basin of Hudson's Bay and Strait, and is bounded on the west, south, and north by the water-sheds of the Arctic, St. Lawrence, and Atlantic rivers. The western boundary is from Deer Lake to a point a little to the west of the Red River Settlement (q. v.). In 1870, the territory held by the Hudson's Bay Company was admitted into the Dominion of Canada, a portion of R. L. falling within the province of Manitoba. The whole of the vast territory known as R. L. slopes inwards towards Hudson's Bay, and is well supplied with navigable rivers. The mountains of this region, which are chiefly on the boundaries, are of primitive rock, and a great portion of the country is densely wooded. The soil is rich, but on account of the severity of the climate—which is not only of a generally low temperature, but exceedingly variable in summer and autumn—the cereals and other alimentary plants are not cultivated to any extent; in fact, they are only planted in the neighborhood of the trading posts of the Hudson's Bay Company (q. v.) and in the agricultural settlement on Red River, in the south-west. In the north, the vegetation and climate are those of the polar regions.

The chief dependence of the inhabitants of R. L. for food and clothing is on the animal kingdom, which is here most abundantly represented. Beavers are still found, and bears, otters, martens, and muskrats are abundant, their skins forming the chief commercial product of the country. There are also abundance of foxes of various colors, bears, wolves, Canadian lynxes, &c. Among the animals used for food are the wapiti, reindeer, moose, and other species of deer; the musk-ox, hares, and an immense variety of wood-fowl and other birds. The numerous rivers and lakes are abundantly stocked with fish. The population, which is scanty, is composed of British or Canadians, and aboriginal tribes.

RU'PIA is a somewhat severe form of skin-disease. It is characterized by flattish, distinct *bullæ* or blebs, containing a serous, purulent, or sanious fluid, which become changed into thick scabs. Several varieties of this disease have been established by dermatologists. In its simplest form, the blebs are not preceded by any inflammatory symptoms, are about an inch in diameter, and contain a fluid which is originally thin and transparent, but soon thickens, becomes purulent, and dries into brown ragged scabs, which are elevated in the center. The scabs are easily separated, and leave ulcerated surfaces, on which several successive scabs usually form before healing ensues. In a more severe form, known as *Rupia prominens*, the scab projects so much in the center as to resemble a limpet-shell in form.

Rupia is a chronic disease, and is usually limited to the limbs, the loins, and the nates. It is not contagious, and generally attacks persons debilitated by old age, intemperance, bad living, or previous diseases, especially small-pox, scarlatina, and syphilis. The general treatment consists mainly in the administration of tonics, such as quinia, the mineral acids, ale, wine, animal food, &c. Some writers strongly recommend the tincture of serpentaria; and there is no doubt that certain cases which will not yield to tonics, rapidly improve when treated with iodide of potassium. The local treatment consists in puncturing the blebs as soon as they arise, in removing the scabs by poulticing, and in applying a slightly stimulating application—such as a solution of nitrate of silver—to the subjacent ulcers. The disease is frequently tedious and obstinate, but the patient almost always ultimately recovers.

RUPPI'N, NEU, a town of Prussia, in the province of Brandenburg, on a small lake of the same name, which communicates by water with the Elbe, 38 miles north of Potsdam. It contains a castle, a lunatic asylum, and (1875) 12,501 inhabitants, who are engaged in brewing, spinning, and the manufacture of linen and woollen cloths.

RU'PTURE. See HERNIA.

RURAL DEAN, an official, ordinarily a beneficed clergyman, appointed in a diocese to maintain in a certain district, called a deanery, a supervision over the condition of churches, church furniture, glebe houses, schools, the appliances of public worship and all other things appertaining to the service, and to report on all to the bishop as occasion may arise.

RURIK, who is considered to have been the founder of the Russian monarchy, was, according to most authors, a 'Varangian' of Scandinavian origin, who was invited by the Slaves of Novgorod to come and rule over them; according to others, he was the chief of a tribe of Norse colonists which was located near the Gulf of Finland, and, after a long contest, succeeded in subduing the northern Slaves and some neighboring tribes of Finns; while Kostomarof attempts to prove that he was a Lithuanian. That

he was either a Scandinavian or of Scandinavian origin, there seems to be very little doubt, and it is as generally maintained that, accompanied by his brothers, Sinâf (Sineous) and Truvor, he, at the head of a small army, took possession of the country to the south of the Gulf of Finland, Lakes Ladoga, Onega, and Beloe in 861 or 862, and laid the foundation of a monarchy. His brothers afterwards settled, the one at Bielo-ozero, and the other at Izborsk; but dying without issue, their principalities were united to Novgorod by Rurik. Novgorod was made the seat of government in 864 or 865, and the various insurrections of his Slavic subjects were quenched in blood, Vadim, their leader, whose valor is celebrated by the ancient chroniclers, perishing by R.'s own hand. To secure himself and his descendants in their newly-acquired territory, R. invited various colonies of Varangians to settle in the country, and after reigning peaceably from this time, he died in 879. During his reign, some of the Varangians attempted a land expedition against Constantinople, but renouncing the scheme, settled on the banks of the Dnieper, and founded the little state of Kiev. The family of R reigned in Russia till the death, in 1598, of Feodor, son of Ivan the Terrible, when, after a brief intestine contest, it was succeeded by the nearly allied House of Romanoff (q. v.). Many noble families of Russia, such as Odojefski, Obolenski, Dolgorouki, Lfot, Belosselski-Beloserski, and Gagarin, are legitimately descended in the male line from R.; and the princes of Romodanofski-Ladyshenski are legitimate descendants in the female line.—See Prof. Thomsen's Lectures on this subject (1878).

RU'SA, a genus of *Cervidæ*, or subgenus of *Cervus* (see DEER), containing a number of species of deer, natives of the forests of the East Indies, which may be described as stags with round antlers, a snag projecting in front just above the base of each, and the top forked, but the antlers not otherwise branched. They are generally of large size, and among them are some of the finest kinds of Asiatic deer. The GREAT R. (*R. Hippelaphus*) is supposed by some to be the *Hippelaphus* of Aristotle; but his description is not complete enough to identify the species. It is a native of Java, Sumatra, &c., and is about the size of a large stag, with brown rough hair, the neck with a long mane.—The SAMBUR or SAMBOO (*R. Aristotelis*), of India is a similarly large and powerful animal, and no Indian deer is more sought after by European sportsmen. It also is supposed by some to be the *Hippelaphus* of Aristotle. The color is sooty brown, and the male has a mane. It is solitary in its habits, and delights in low forests where water abounds.—The Axis (q. v.) is very nearly allied to this genus.



Sambur (*Rusa Aristotelis*).

RU'SCUS. See BUTCHER'S BROOM.

RUSH (*Juncus*), a genus of plants of the natural order *Junceæ*, having a glume-like (not colored) perianth, smooth filaments, and a many-seeded, generally 3-celled capsule. The species are numerous, mostly natives of wet or marshy places in the colder parts of the world; some are found in tropical regions. Some are absolutely destitute of leaves, but have barren scapes (flower-stems) resembling leaves; some have leafy stems, the leaves rounded or somewhat compressed, and usually jointed internally; some have plane or grooved leaves on the stems; some have very narrow leaves, all from the root. The name R. perhaps properly belongs to those species which have no proper leaves; the round stems of which, bearing or not bearing small lateral heads of flowers, and popularly known as *Rushes*, are used for plaiting into mats, chair bottoms, toy-baskets, &c.—The SOFT R. (*J. effusus*) is a native of Japan as well as of Britain, and is cultivated in Japan for making mats. In ruder times, when carpets were little known, rushes were much used for covering the floors of rooms; to which many allusions will be found in early English writers. The stems of the true rushes contain a large *pith* or soft central substance, which is sometimes used for wicks of candles.

There are 20 or 22 British species of R., some of which are very rare, some found only on the highest mountains, but some are among the most common of plants. They are often very troublesome weeds to the farmer. Thorough drainage is the best means of getting quit of them. Lime, dry ashes, road scrapings, &c., are also useful. Tufts of rushes in pasture are a sure sign of insufficient drainage. Many marshy and boggy places abound in some of the species having leafy stems and the leaves jointed internally, popularly called *Sprots or Sprits*, as *J. acutiflorus*, *J. lamprocarpus*, and *J. obtusiflorus*. They afford very little nourishment to cattle; but are useful for making coarse ropes for ricks, &c., which are stronger than those made of hay.

RUSH, BENJAMIN, M.D., an American physician, was born near Philadelphia, December 24, 1745, was educated at Princeton College, studied medicine in Philadelphia, London, Edinburgh, and Paris, and in 1769 was made Professor of Chemistry in the Philadelphia Medical College, and became a contributor to medical literature. Elected a member of the Continental Congress, he advocated and signed the Declaration of Independence. In 1777, he was appointed Surgeon-general and Physician-general of the continental army. His duties did not prevent him from writing a series of letters on the constitution of Pennsylvania, which was changed by his influence. He resigned his post in the army, because he could not prevent frauds upon soldiers in the hospital stores. In 1785, he planned the Philadelphia Dispensary, the first in the United States; and was a member of the convention which ratified the Federal constitution. Retiring from politics, he became Professor of the Theory and Practice of Medicine in the Philadelphia Medical College; and was so successful in the treatment of yellow fever in 1793, that he was believed to have saved the lives of 6000 persons. His practice, in consequence, became so large that he prescribed for 100 patients a day, whom he saw even at his meals. Virulently attacked by Cobbett, who published a newspaper in Philadelphia, he prosecuted him for a libel, and recovered 5000 dollars damages. His medical works produced honors from several European sovereigns. The chief of them were *Medical Inquiries and Observations*, *Diseases of the Mind*, *Medical Tracts*, *Health*, *Temperance*, *and Exercise*. In 1779, he was appointed Treasurer of the United States Mint, which post he held until his death in Philadelphia, April 19, 1813.

RUSH-NUT. See CYPERUS.

RUSHWORTH, JOHN, an English author, whose work entitled *Historical Collections of Private Passages of State, Weighty Matters in Law, and Remarkable Proceedings in Parliament*, is a most important contribution to our knowledge of the civil war, and the events that led to it, belonged to an ancient family in Northumberland, and was born there about 1607. He studied at Oxford, but left the university without taking a degree, and settled in London as a barrister. His interest in political affairs was, however, so strong, that he appears to have spent a great deal of his time, for many years, in attending the Star Chamber, the Court of Honor, the Exchequer Chamber, Parliament, &c., and in taking down short-hand notes of the proceedings. When the Long Parliament met in 1640, R. was appointed assistant to Mr. Henry Elsyngne, clerk of the House of Commons, an office which afforded him ample opportunities for adding to his *Collections*. He rendered a variety of important services to his party during the civil war. The restoration of Charles II., in 1660, was fatal to his fortunes. Though not molested, he was one of those to whom the 'cold shoulder' was shown by the triumphant royalists. In 1677, Sir Orlando Bridgman, Lord Keeper of the Great Seal, appointed the old man, now (it is conjectured) in straitened circumstances, his secretary; and curious to say, we find him, two years after, a member of parliament. In 1684, when he had reached the age of 77, he was arrested for debt, and imprisoned in the King's Bench, where he died in 1690. His last years were rendered doubly miserable, partly by the loss of his understanding, and partly by his addicting himself to intemperance. R.'s *Historical Collections* were published in four parts. The first, embracing the period from 1618 to 1629, was published in 1659; the second, embracing the period from 1629 to 1640, in 1680; the third, embracing the next five years, in 1692; and the fourth, extending to 1648, in 1701. The whole was republished in 1721. The work has been violently attacked by royalist and High Church writers, as unfair, and even false, but their charges have not been substantiated.

RUSKIN, JOHN, the most eloquent and original of all writers upon art, was born in London in 1819. He studied at Christ Church, Oxford, where he gained the Newdigate prize for English poetry in 1839, and took his degree in 1842. The year following appeared the first volume of his *Modern Painters*, the primary design of which was to prove the infinite superiority of modern landscape-painters, especially Turner, to the old masters; but in the later volumes (the 5th and last was published in 1860), the work expanded into a vast discursive treatise on the principles of art, interspersed with artistic and symbolical descriptions of nature, more elaborate and imaginative than any writer, prose or poetic, had ever before attempted. *Modern Painters* was essentially revolutionary in its spirit and aim, and naturally excited the aversion and hostility of the conservatives in art. But the

unequalled splendor of its style gave it a place in literature; crowds of admirers and disciples sprang up; the views of art enunciated by R. gradually made way; and have largely determined the course and character of later English art. In 1849 appeared *The Seven Lamps of Architecture;* and in 1851—1853, *The Stones of Venice,* both being efforts to introduce a new and loftier conception of the significance of domestic architecture. They were exquisitely illustrated by the author himself. About this time, *Pre-Raphaelitism* began to develop itself as a distinctive phase of modern art, and R. warmly espoused its cause in letters, pamphlets, and *Notes* on the Academy Exhibitions (1855—1860). In 1854, he published four singularly pithy and ingenious *Lectures on Architecture and Painting;* and in 1858, two *Lectures on the Political Economy of Art.* Of less consequence are his *Notes* on Turner's Pictures and Drawings exhibited in 1857; *Elements of Drawing* (1857); *Elements of Perspective* (1859); *Unto this Last* (1862); *Study of Architecture in our Schools* (1865); *Crown of Wild Olive: Three Lectures* (1866); *The Queen of the Air, being a Study of the Greek Myths of Cloud and Storm* (1869); *Lectures on Art* (1870); *Munera Pulveris: Essays on Political Economy* (1872); *Aratra Pentelici: Lectures on the Elements of Sculpture* (1872); *Arrows of the Chace,* being a selection of his letters (1880); *The Lord's Prayer and the Church* (1880); and *Fors Clavigera,* a periodical pamphlet, which he issued for several years.

All Mr. Ruskin's books are now withdrawn from the usual channels of publication, and those of them still in print are issued by his own agent. From 1869 till 1879 he was Slade Professor of Fine Arts at Oxford; in 1871 he gave £5000 for the endowment of a master of drawing there. In 1871 the degree of LL.D. was bestowed upon him by the university of Cambridge. Since this time he has founded a museum at Sheffield, where he has bestowed part of his own priceless library and art treasures.

RUSSELL, HOUSE OF. The first dukedom of Bedford (q. v.) expired in the person of the great Regent of France (in the time of Henry VI.), with whom the present dukes are unconnected by affinity. The early descent of the Russells, and their derivation from the du Rozels of Normandy, have been traced by Mr. Wiffen in his *Memoirs of the House of Russell.* This great historical family is said to derive its descent from Olaf, the sharp-eyed king of Rerik, in the 6th c., one of whose descendants, Turstain, a Scandinavian jarl, settled in Normandy, on its conquest by the Northmen, and became possessed of the barony of Briquebéc, and the castle of Rozel, near Caen. In a charter of Matilda, wife of the Conquerer, dated 1066, Hugh de Rozel appears as a witness, and is no doubt the same knight who accompanied William in his invasion of England, and assisted at the battle of Hastings. His name, together with that of his brother, are found on the roll of Battle Abbey. They both accompanied Duke Robert of Normandy in the first Crusade, where the elder died. The younger, Hugh de Rozel, upon his return from the Holy Land, established himself in England, and was the progenitor of Sir James Rozel, or Russell (as it had then begun to be called), governor of Corfe Castle in 1221, and of Sir W. Russell, who represented Southampton in the first parliament of Edward II. From the latter Russell directly descended Sir John Russell, one of the most valiant soldiers of the age of chivalry. His son, Sir John Russell, was Speaker of the House of Commons in the time of Henry VI.

The high fortune and eminence of the House of R. date from his grandson, JOHN RUSSELL, one of the most accomplished gentlemen of his time, who, in 1538, was elevated to the peerage, under the title of 'Lord Russell, Baron Russell of Cheyneys, county Buckingham.' His son, the second earl, was a person of eminence in Queen Elizabeth's reign, and was, like his father, a Knight of the Garter. The next notable member of the family was EDWARD RUSSELL, who was bred to the sea, and was groom of the bedchamber to the Duke of York, afterwards James II., but upon William Lord Russell's judicial murder, retired from court. Strenuously supporting the Revolution, he obtained high naval commands from William III., and distinguished himself as one of the most eminent naval heroes of the period, particularly by his victory over the French fleet at La Hogue, in 1692. His cousin was—

LORD WILLIAM RUSSELL, son of William, 5th earl, who has left an unperishable name, as one of the most glorious martyrs of English liberty. He was born September 1639; was educated at Cambridge; passed some years at Augsburg and other places on the continent, and returned to England at the Restoration. In 1678—1679, he was returned to parliament for the county Bedford. His first public act was worthy of his subsequent career. He inveighed against the corruption of the Cabal, the influence of France, the dishonorable commencement of the war with Holland, and the fraud practised upon the bankers. He was ever afterwards found conspicuous wherever the designs of the court could be traversed, or the cause of constitutional liberty befriended. He appeared publicly in the King's Bench at Westminster Hall, June 16, 1680, and presented the Duke of York as a recusant. He also carried up to the House of Lords the bill of exclusion against the duke, at the head of more than 200 members of the Commons. This bill, setting forth that the Duke of York was a papist, declared him incapable of succeeding to the crown. The king and duke determined to be revenged upon Russell and the other leaders of the Whig party. Charged as participators in the Rye House Plot (q. v.), Lord Russell, the Earl of Essex, and Algernon Sidney were arrested. Russell was, July 13, 1683, arraigned at the Old Bailey for high treason.

Infamous witnesses easily satisfied a packed jury. As they were about to withdraw, the prisoner said: 'I call heaven and earth to witness that I never had a design against the king's life.' But the jury pronounced the fiat that condemned Russell to the block, and the horrible sentence of death for high treason was forthwith pronounced. The king and the Duke were determined to have his blood, and to crush the leaders of the Whig party. Some of the Tory ministry ventured to plead in his favor, but in vain. The Earl of Bedford had gained the king's favorite, the Duchess of Portsmouth, to his interest, and offered, through her, £100,000 for the life of his son. To satisfy his aged father, and at the earnest request of his afflicted wife, Russell himself petitioned the king. He solemnly disclaimed the least intention against the king's life, or the least design to change the constitution. There is reason to believe that Charles was disposed to relent, but that the Duke of York insisted upon the prisoner's death, which took place July 21, 1683. The simple relation of his last hours by Bishop Burnet, his intimate friend and companion, is justly considered one of the most pathetic passages in history. The murder of Russell, perpetrated for the most unconstitutional end by the most unconstitutional means, followed by that of Sidney, rendered the despotism of the Stuarts odious, and led, in the next reign, to the overthrow of the family. R. died in the 42d year of his age, leaving a name to be remembered and revered wherever truth has a sanctuary or liberty a shrine. His attainder was annulled after the Revolution. His widow, LADY RACHEL WRIOTHESLEY, second daughter and heiress of Thomas Earl of Southampton, survived her lord more than forty years. She cherished the memory of her lord with the most tender recollections. She died September 29, 1723, at the advanced age of 86. Her eldest son by Lord Russell was WRIOTHESLEY, second Duke of Bedford.

JOHN, fourth duke, was First Lord of the Admiralty in the Pelham administration of 1744. He became, in 1756, Lord-lieutenant of Ireland. In 1762, he was accredited Minister Plenipotentiary to the court of France, and signed at Fontainebleau the preliminaries of peace with France and Spain. He was President of the Council in the administration formed by Mr. Grenville in the autumn of 1763. His concern with public affairs extended over the important term comprised between the fall of the administrations of Walpole and Chatham. When First Lord of the Admiralty (from 1744 to 1748), he shared with Mr. Pelham, the premier, and the Duke of Newcastle, the substantial power of the government. His correspondence, preserved at Woburn Abbey, and given to the world by Earl Russell, contains authentic materials for the illustration of the political history of England from 1744 to 1770. The introduction to the first volume contains a brief but able historical sketch by the noble editor of the period from the administration of Walpole to 1748, and some interesting particulars of the private life and personal character of the duke. He died in 1771, and was succeeded by his grandson—

FRANCIS, fifth duke, born in 1765. He was a steady friend to the cause of popular freedom, and was regarded by his friends, among the most devoted of whom was Charles James Fox, with feelings of attachment amounting to enthusiasm. He died unmarried in 1802, and was succeeded by his brother—

JOHN, sixth duke, born 1766, father of Earl Russell (q. v.). He died October 20, 1839, and was succeeded by his eldest son—

FRANCIS, seventh duke, who, after a short career in the Lower House, was summoned to the House of Lords in his father's barony of Howland. He declined office, but invariably supported the views and measures of the Whig governments, and in the dissensions among the Whig party, the political congresses at Woburn exercised great influence. He was much consulted by his distinguished brother, when First Lord of the Treasury, and on more than one occasion, his advice on political affairs was sought by his sovereign. He was an enthusiastic patron of the turf from early life, and his stud at Newmarket was of princely dimensions. Of late years, he devoted himself to the happiness of his tenantry and the comfort of the laborers on his extensive estate. He died May 14, 1861, and was succeeded by his only son—

WILLIAM, eighth duke, born in 1809. He was M.P. for Tavistock from 1832 to 1841, but was most retired in his habits, and took no active part in political affairs. He died May 26, 1872, and was succeeded by his cousin—

FRANCIS, ninth duke, born 1819, eldest son of the late Major-general Lord George Russell, second son of John, sixth duke.

The heir-apparent to the dukedom is his son George, Marquis of Tavistock.

The Dukes of Bedford have a magnificent mansion and park at Woburn, near Bedford.

RUSSELL, John Russell, Earl, K.G., English minister and statesman, third son of the sixth Duke of Bedford, was born in Hertford Street, Mayfair, London, August 18, 1792, educated at Westminster School, whence he was sent to Edinburgh, at that time preferred to the English universities by the great Whig families. Here he pursued his studies with industry and success, under the care of Professor Dugald Stewart; and here, at the meetings of the Speculative Society, he first exercised his powers of debate. In 1809, he proceeded on a continental tour, and France being closed against English travelers, he directed his steps to Portugal and Spain.

In 1821 appeared his *History of the British Constitution*, and in 1824, *Memoirs of the Affairs of Europe from the Peace of Utrecht*. In more recent years he compiled from the family archives and gave to the world the *Correspondence of John, fourth duke of Bedford*, which throws much light on the secret history of the early part of George III.'s reign; the *Life, Diary, and Letters of Thomas Moore*, in pursuance of a promise made to the poet several years before; the *Correspondence of Charles James Fox*, and *Life and Times* of that great Whig statesman. Having now noticed his career as an author, we may briefly pass in review his long, honorable, and consistent career as a politician. In 1813, he was elected for the family borough of Tavistock, and vigorously but vainly opposed the repeal of the Habeas Corpus Act in 1817. He made his first motion in favor of parliamentary reform in 1819, and continued to bring the subject almost annually before the Lower House, until he stood forward as a minister of the crown to propose the great measure of 1831. He was also the strenuous advocate of the repeal of the Test and Corporation Acts, Roman Catholic Emancipation, and other measures of civil and religious liberty. In 1828, he carried by a large majority his motion for the repeal of the Test and Corporation Acts, although it was opposed by the Duke of Wellington's government. In 1829, he supported the Catholic Emancipation Bill. At the general election of 1830, caused by the death of George IV., the rallying cry of Parliamentary Reform sent many additional Liberals into the House of Commons. The 'Great Duke' was driven from office; and Earl Grey being appointed prime minister, proceeded to form a cabinet pledged to peace, retrenchment, and reform.

R. did not receive a seat in the cabinet, but he was appointed to the lucrative office of Paymaster of the Forces, and was one of the four members of the government to whom Earl Grey intrusted the task of framing the draft of the first Reform Bill. The great and imperishable honor next devolved upon R. of proposing the bill (March 1, 1831). The fortunes of the measure belong to the history of the time; suffice it to say, that on the 4th of June 1832 the bill obtained the royal assent, and that the country was saved from the throes of revolution and civil war, which at one period appeared imminent. R. left office with the Melbourne government (which had succeeded to that of Earl Grey) in November 1834. In March 1835, he brought forward a motion in favor of taking into consideration the temporalities of the Irish Church. It was opposed by the government, but after three nights' debate, was carried by 322 votes against 289. On the 4th April, he carried a resolution in committee in favor of appropriating any surplus which might remain, after fully providing for the spiritual wants of the members of the Irish Church, to the general education of all classes of Christians. The report of the committee having been affirmed by the whole House, the government of Sir Robert Peel was dissolved, and that of Lord Melbourne restored. R. now became Home Secretary, with a seat in the cabinet. On the 5th of June 1835, he brought in an important bill for the reform of the municipalities of England and Wales, which was carried after some mutilation, and secured an effective reform of municipal institutions. Next session, he proposed and carried the government plan for the commutation of tithes in England. Also a bill for a general registration of marriages, births, and deaths, the value of which, in social and statistical inquiries, can scarcely be overrated; and a bill for the amendment of the marriage laws, which enabled dissenters to be married in their own chapels.

He likewise passed an English Church Reform Bill, making a new distribution of episcopal dioceses and incomes. In 1837, he carried a series of bills for further amending the criminal law, by which capital punishment was finally removed from forgery and all offences except seven. An Irish Tithe Bill was also passed, but the 'appropriation clause' being always rejected by the Lords, R. was obliged to accept the bill divested of the clause. He exchanged the seals of the Home for those of the Colonial Office, when the Canadians broke into rebellion in 1839, and sent over Lord Durham, who recognized the right of the Canadians to self-government; and who, with his successor, Lord Sydenham, brought the Canadas into loyal and harmonious relations with the mother-country, which have never since been disturbed.

In 1841, R. proposed a fixed duty of 8*s*. per quarter on foreign corn, and a reduction of the duties on sugar and timber. Being defeated by the opposition, the Melbourne government appealed to the country without success; and R. and his colleagues made way for the administration of Peel. In this general election, he challenged the verdict of the city of London upon the free-trade measures of the government, by boldly leaving Stroud, and standing for the city. He was elected by the narrow majority of nine votes, and continued to represent the city until his elevation to the peerage. In November 1845, R. wrote a letter from Edinburgh to the electors of the city of London, announcing his conversion to the total and immediate repeal of the corn laws. This letter led to the resignation of the Peel cabinet; and R. was commissioned by the Queen (December 11, 1845) to form an administration, which at first he failed to do through the antipathy of Earl Grey to Lord Palmerston, and Sir Robert Peel being recalled to power, had the honor of carrying the repeal of the corn-laws. His Irish Coercion Bill, however, being defeated by the combined Whigs and Protectionists, he resigned; and R. became nominally what he had been really during the greater part of the Melbourne administration—prime minister.

In 1846, a series of assassinations in Ireland compelled him to propose a more stringent coercion act than that of the previous session. In 1847, he had to deal with the Irish famine; and in 1848, with a miniature Irish rebellion. The papal bull, parcelling England into dioceses, extorted from R. an indignant protest, first in the form of a letter to the Bishop of Durham, and next in the Ecclesiastical Titles Bill of 1851, prohibiting the assumption of territorial titles by Roman Catholic prelates. R.'s advice to the Queen to dismiss her Foreign Secretary and his ancient colleague, Lord Palmerston, for communicating, without consultation with his colleagues, his approval of the French *coup d'état*, precipitated the downfall of the R. administration, and in February 1852, he ceased to be First Lord of the Treasury. Lord Derby made an unsuccessful attempt to carry on the government; and in the succeeding cabinet of the Earl of Aberdeen, R. consented, December 1852, to fill the post of Foreign Secretary with the leadership of the House of Commons. In the session of 1854, he brought forward a new Reform Bill, but was most reluctantly compelled to resign it in consequence of the Crimean War. He was next appointed Commissioner to the Congress of Vienna, and incurred so much unpopularity by recommending terms of peace, and a plan of counterpoise suggested by Austria, that he was forced by the pressure of unfavorable opinion to leave the ministry (July 1855). He voted against the government on Mr. Cobden's motion against Lord Palmerston's Chinese policy, which led to a dissolution. When the second administration of Lord Palmerston was formed (June 1859), R. became for the second time Foreign Secretary, which office he held until 1865. He threw the moral influence of his name and the nation he represented into the scale of Italian unity and independence. He uttered warnings and remonstrances against the annexation of Savoy and Nice by France, which gave great offence to the government of the Emperor Napoleon by their frankness and candor. He ably preserved British neutrality in the civil war between the Federal and Confederate States of America. He wrote spirited dispatches expressive of the indignation with which the British government regarded the despotic acts of Russia in Poland; but he incurred many reproaches from the Poles and their sympathizers in France and England, for withdrawing from the Austrian and French alliance when war with Russia appeared imminent.

More recently, he took an active but not a successful part in the Slesvig-Holstein dispute, which the peculiar policy of the French emperor brought to nothing. R. always took a very prominent part in promoting the education of the people, and, with the assistance of Lord Lansdowne, laid the foundation of the present system of national education, supported by parliamentary grants, and administered by the Committee of Privy Council for Education. He brought forward for many years a measure admitting the Jews to parliament, which passed in 1858 upon a compromise suggested by the Earl of Lucan. But the question with which he has ever been identified in the public mind is parliamentary reform. He brought in a Reform Bill in 1852, a second in 1854; moved the resolution which procured the condemnation of the Derby Reform Bill in 1859; and in 1860, brought in another government bill, which failed to pass. In 1861, he was called to the Upper House, and exchanged the courtesy title of 'Lord John,' by which he had been so long known, for that of Earl Russell. On the death of Lord Palmerston in 1865, Earl R. became prime minister for the second time. In 1866 he and Mr. Gladstone introduced a Reform Bill, which was rejected, and the ministry shortly thereafter resigned. Thenceforward, till near the time of his death, 28th May 1878, Earl R. remained an active but un-

official member of the Liberal party in the House of Lords. Though his voice was weak and his delivery affected, Earl R. was an admirable and successful debater; and his speeches sometimes rose to a high order of oratory. His indomitable self-reliance and tenacity of self-assertion were sarcastically painted by the Rev. Sydney Smith, who called him the 'Lycurgus of the Lower House.' Since the works mentioned above, Earl R. published his *Recollections and Suggestions* (1875) besides selections from his speeches and despatches, and various addresses; and, in 1873, the veteran statesman entered fearlessly on a new field, and gave us his *Essays on the Rise and Progress of the Christian Religion in the West of Europe.*

RU'SSIA, EMPIRE OF, extending over a large proportion of the northern regions of the globe, includes the eastern part of Europe, the whole of Northern Asia, and a part of Central Asia. Lat. 38° 30′—78° N.; long. 17° 19′ E.—190° E. (170° W.). The portion of North America which formerly belonged to R. was ceded to the United States in 1867. R. is bounded on the N. by the Arctic Ocean; on the E. by the Pacific Ocean; on the S. by the Chinese empire, Turkestan, Caspian Sea, Persia, Asiatic Turkey, and the Black Sea; and on the W. by Roumania, Austria, Prussia, the Baltic, and Sweden. The area of R. amounts to more than 8,000,000 square miles, and is more than double the entire area of Europe. The empire thus covers nearly $\frac{1}{24}$th of the surface of the globe, and more than $\frac{1}{8}$th of the land superficies of the planet. The population of this vast area, including recent extensions in Bessarabia, Armenia, and Central Asia, was in 1879–80, officially estimated at 98,356,100 (of whom 83,600,000 were in European R., and 14,700,000 in Asiatic R.). The following table gives the figures for 1870:

Name of Government.	Area in Eng. square miles.	Population in 1870.
1. Archangel	286,595	281,112
2. Astrakhan	84,969	601,514
3. Bessarabia	14,006	1,078,932
4. Courland	10,550	619,154
5. Don Army, Province of the	61,900	1,086,264
6. Ekaterinoslav	26,128	1,352,300
7. Esthonia	7,607	323,961
8. Grodno	14,952	1,008,521
9. Jaroslav	13,751	1,000,748
10. Kaluga	11,870	996,252
11. Kazan	23,714	1,704,624
12. Kharkov	21,004	1,698,015
13. Kherson	27,455	1,596,809
14. Kiev	19,671	2,175,132
15. Kostroma	30,796	1,776,097
16. Kovno	15,679	1,156,041
17. Kursk	18,891	1,954,807
18. Livonia	17,793	1,000,876
19. Minsk	35,277	1,182,230
20. Mohilev	18,535	947,628
21. Moscow	12,847	1,772,624
22. Nijni-Novgorod	19,620	1,271,564
23. Novgorod	46,288	1,011,445
24. Olonetz	50,470	296,392
25. Orel	18,024	1,596,881
26. Orenburg	73,947	900,547
27. Penza	15,127	1,173,186
28. Perm	128,151	2,198,666
29. Podolsk	16,233	1,933,188
30. Poltava	19,225	2,102,614
31. Pskov	16,851	775,701
32. Riasan	16,240	1,477,433
33. St. Petersburg	17,056	1,325,471
34. Samara	64,953	1,837,081
35. Saratov	32,596	1,751,268
36. Simbirsk	19,093	1,205,881
37. Smolensk	21,536	1,140,015
38. Tambov	25,514	2,150,971
39. Taurida	23,596	704,997
40. Tchernigov	20,238	1,659,600
41. Toula	11,940	1,167,878
42. Tver	25,781	1,528,881
43. Ufa	46,989	1,364,925
44. Viatka	59,143	2,406,024
45. Vilna	16,398	1,001,909
46. Vitebsk	17,425	888,727
47. Vladimir	18,797	1,259,923
48. Volhynia	27,709	1,704,018
49. Vologda	154,971	1,003,039
50. Voronej	25,427	2,152,696
The 50 Governments	1,823,328	65,704,559
The Russian Lakes and Nova Zemla	53,085	.....
The 10 Polish Governments*	47,090	6,026,421
Grand Duchy of Finland	134,761	1,882,622
Caucasus	169,541	4,893,332
Siberia	4,715,630	3,405,084
Central Asia	1,320,765	4,650,213
Russian Empire	8,264,200	86,586,000

The Russian Sea-board.—The northern shores of the Russian territories, which are washed by the Arctic Ocean, are deeply indented. The White Sea (q. v.), an immense arm of the Arctic Ocean, penetrates 350 miles into the mainland, and is sub-divided into the gulfs of Onega and Archangel or Dwina. The other chief inlets on the north of R. are the Kara See and the gulfs of Obi and Yenisei. Westward from Nova Zemla (usually, but less correctly, spelled Zembla), the Arctic Ocean is navigable for three months of the year; east from that island, the sea, even at the mildest season, is encumbered with floating icebergs. The chief islands in this ocean are the Kolguef, Waigatz, Nova Zemla, and Spitzbergen Isles. The eastern shores of R. are washed by the Pacific, subdivided into the Behring, Okhotsk, and Japan Seas; and the islands belonging to this country in these seas are Sakhalin, and the northern part of the Kuriles. On the south are the Black Sea (q. v.) and the Sea of Azov (q. v.), the latter communicating with the former by the Strait of Kertch, and so shallow that it is navigable for small craft only. Of the Caspian Sea, R. commands the whole, with the exception of the south shore, which belongs to Persia. The northern and eastern banks of the Caspian are the seats of the chief fisheries of the empire. On the north-west of R. are the Baltic Sea, with the gulfs of Riga, Finland, and Bothnia; and in these waters, the islands of Aland, Esel, and Dago belong to the empire. The freezing of the water near the shores of the Baltic renders the navigation of this sea impracticable during five months of the year, although a few ports are accessible throughout the whole year. Possessing means of easy communication with the most fertile governments of the interior, and sustaining chiefly the commerce of the Russian empire with the other parts of Europe and with America, the Baltic is of the highest commercial importance.

Surface, Hydrography, and Soil.—European Russia consists of a vast plain bordered with mountains. On the east are the Ural Mountains (q. v.), forming a broad range of no great elevation, ending on the north on the shores of the Arctic Ocean, and on the south in a range of elevated plains on the left bank of the Volga. On the south-east of the great plain is the lofty range of the Caucasus (q. v.), crossed by the Pass of Derbend and the so-called Military Georgian Road. The Crimean Mountains, a continuation of the Caucasian chain, rise to 5000 feet in their highest summit. The districts in the south-west of R., between the Vistula and the Pruth, are covered by hilly ranges from the Carpathian Mountains (q. v.), which in Poland are known as the Sandomir Mountains. The Finland Mountains, on the north-west, are ranges of granite rocks, embracing numerous lakes, and not rising higher than 600 feet. The Alaunsky tableland, which connects itself with the Ural Mountains by a chain of hills in latitude about 62° N., is the key to the configuration of European Russia. From this table-land, with an elevation of about 1200 feet, the country, with gradually declining slopes, falls away in four directions—north to the Arctic, north-west to the Baltic, south to the Black, and south-east to the Caspian Seas. The sloping country on the north of the Alaunsky heights is called, from its eastern and western limits, the Ural-Baltic table-land; that on the south of the same dividing heights is called, for the same reason, the Ural-Carpathian table-land. The Alaunsky heights form the great water-shed, and regulate the course of all the great rivers of the Russian empire. To the north, they throw off the Petchora, the Northern Dwina, and the Onega; to the south, the Dniester, Bug, Dnieper, Don, and Kouban; to the south-east, the Volga, with its great affluents the Oka and Kama. The Western Dwina, the Niemen, and the Vistula, fall into the Baltic Sea. The important rivers of R. receive separate notice under their own names. At the foot of the north-west slope from the central terrace, is the lake-country of European Russia, and the great lakes (which are noticed separately) are Ladoga, Onega, Ilmen, Peipus, and Pskov.

The plain of European Russia naturally divides itself into three tracts or zones, each of which differs from the others in the nature and quality of its soil. The northern zone extends between the Arctic Ocean and the Ural-Baltic table-land, the middle zone between the Ural-Baltic and the Ural-Carpathian table-lands, and the southern zone between the Ural-Carpathian table-land and the Black and Caspian Seas. The soil of the northern zone is marshy, and the climate inclement. In its middle part, between the rivers Onega and Mezen, and especially along the banks of the Northern Dwina, forests of fir-wood and large tracts of fodder-grass occur. Toward the east of this tract, the woods disap-

pear, and vast marshes, frozen the greater part of the year, cover the country. The middle zone reaches south-west to the government of Volhynia and the south of Poland, and north-east to the Ural Mountains. In the west, it consists of an extensive hollow, covered with woods and with marshes, the chief of which are those of Pinsk (q. v.). In the middle part of this zone, the soil is partly heavy and covered with mould, and toward the north, sandy. Beyond the Oka, luxuriant meadows abound; and on the east, beyond the Volga, this tract forms an extensive valley, covered with a thick layer of mould, abounding in woods, and rising into hills in the vicinity of the Ural range. The southern zone consists of steppes extending along the shores of the Black and Caspian Seas. The steppes of the Black Sea have mostly a mouldy soil, covered with grass, but in the south-east, shifting sands and salt marshes predominate. The steppes of the Caspian consist of sand, salt marshes, and salt lakes—the Elton lake, yielding nearly 4,000,000 puds (about 1,290,000 hundredweights) of salt annually, being the most remarkable.

Constitution and Administration.—The government is an unlimited monarchy, the head of which is the emperor, who unites in himself every authority and power—that is to say, is the head of the military, the legislative, and the judicial systems, and is also the ecclesiastical chief of the orthodox Greek Church. The order of succession is by primogeniture, hereditary in heirs-male, and in females in default of males. The expenses of the imperial house amount to about £1,500,000 annually; the private property of the imperial family, yielding about £1,000,000 annually, is excluded from the budget. Every military or civil officer of the crown is required to take an oath of allegiance. The council of state is the highest branch of the executive, and comprehends the legislative, judicial, and administrative powers. The president and members—among whom are always included the ministers of the crown—are appointed by the emperor. A secretary of state, whose duty it is to report the opinion of the council to the emperor, is attached to this body. The estimates of expenditure and income, and every proposition introducing an addition to, or a modification of, the laws, is considered and revised by this council, which, for the more orderly discharge of its functions, is divided into three sections: 1. Law; 2. Civil and Ecclesiastical; 3. Economy and Finance. The main function of the council is that of superintending the general administration, of watching over the execution of the laws of the realm, and of proposing alterations of the same when necessary. The second of the great boards of government is the senate, whose functions are partly deliberative and partly executive. It is the High Court of Justice for the empire, controlling all the inferior tribunals; and besides its legal duties, it examines into the state of the public revenue and expenditure. The senate is divided into seven committees or departments, of which five sit at St. Petersburg and two at Moscow. The third college is the Holy Synod, superintending the religious affairs of the empire. Its decisions have no force till approved by the emperor.

The fourth great board of government is the Committee of Ministers, the highest administrative body. It is divided into nine departments, which have under their management the Court; Foreign Affairs; War; the Navy; the Interior; Public Instruction; Finances; Crown Domains; Public Works; and has besides a general board of control. All of these great boards center in the private cabinet of the empire. Except the departments of Foreign Affairs and the Imperial Court, all these branches of the central administration are represented in the provinces. European Russia is divided into 50 provinces, over each of which is a governor, appointed by the emperor, and who is the head of the civil administration of the province or government. Some provinces, although administered by governors, are united under the superintendence of a governor-general. This arrangement is rendered necessary owing to the immense extent of the empire, and the governor-generalships are generally remote frontier regions. Of late years (especially since 1862), reforms have been effected throughout all the various branches of the government. Reforms in the municipal and rural administration of the provinces have given increase of self-government. A new legal system, including oral testimony, trial by jury, and publicity of courts, was introduced in 1864. By the Russian law, capital punishments are only inflicted for high treason. The severest punishments inflicted for violations of the law (see KNOUT) are labor in the galleys, in the public works, deportation to the mines of Siberia, &c. The audacity of the revolutionary party known as Nihilists (see NIHILISM) has caused of late increased rigor and frequency of political punishment. Repeated and fatal attempts on the life of high-placed officials, and the acquittal by a jury of one of the most notable assassins, led in 1878 to the withdrawal of trials for political offences from juries; such trials are now conducted by courts-martial.

Distinctive Rank of Classes.—The nobility occupy the highest place in the social scale, enjoy many special privileges, such as freedom from poll-tax, and form in every province a separate body, headed by a marshal, chosen by and from themselves. Till 1871 they were also free from the conscription. Functionaries, officials, artists, and clergy possess almost as many privileges as the nobility. In 1868, a most important measure was passed, by which the clerical character was declared to be no longer hereditary, and the sons of the secular clergy, hitherto bound to some ecclesiastic or monastic service, were set free to choose their own career. The next class is that of the merchants. The burghers and peasants constitute the lowest class, and are subject to claims of service, and to personal taxation. Each class enjoys, to a certain extent, the right of self-administration in its own affairs. Each apportions its taxes, and chooses some of its own functionaries. The recent emancipation gave freedom to 20,000,000 peasants or serfs, who, prior to the year 1861, being governed exclusively by their owners, enjoyed very limited civil rights. Communal government is the fundamental principle of all the rights of the peasant class. In general, the lands allotted to the peasants are not their individual property, but belong to the commune, and are shared among all its members.

National Debt.—The national debt must be regarded as divided into two parts, one of which represents the loans made abroad, and the other the loans made at home. Its total amount was given in 1878 at £350,000,000, about half of which was contracted abroad. Several recent loans have been raised in order to tide over the terrible financial stress produced by the late war with Turkey, the expenditure for which has been officially stated (greatly understated, it is believed) at £130,000,000.

Revenue and Expenditure.—The following table shows the amount and the details of the revenue and expenditure for the year 1872:

REVENUE.

1.	Direct Taxes (including Poll-tax)	£14,887,697
2.	Indirect Taxes (including those derived from Spirits, Salt, Tobacco, Beet-sugar, Customs, and Stamps)	34,118,422
3.	State Monopolies (drawn from Mines, Money, Post-office, Telegraphs)	2,957,611
4.	State Domains	5,458,083
5.	Miscellaneous Receipts	6,327,174
6.	Revenue of the Trans-Caucasus	750,782
7.	'Recettes d'Ordre'	2,690,842
8.	Extraordinary Receipts	948,674
	Total	£68,139,285

EXPENDITURE.

1.	Public Debt	£11,833,092
2.	Superior Institutions of the State	244,842
3.	Holy Synod	1,288,483
4.	Ministry of the Imperial Household	1,226,531
5.	" Foreign Affairs	343,226
6.	" War	21,452,618
7.	" Marine	2,845,105
8.	" Finances	10,623,946
9.	" Imperial Domains	1,313,404
10.	" Interior	5,821,457
11.	" Public Instruction	1,541,863
12.	" Public Works	3,072,153
13.	" Justice	1,449,859
14.	Audit of the Empire	274,063
15.	General Direction of Studs	94,880
16.	Expense of Poland for administration of Justice,	111,222
17.	Civil Government of the Trans-Caucasus	769,955
18.	'Non Valeurs'	136,986
19.	'Dépenses d'Ordre'	2,664,150
20.	Extraordinary Expenses	948,674
	Total	£68,056,509

There is usually a large deficit; though the budget often promises better things. Thus, the budget for 1880 stated revenue at £95,207,500, and the expenditure at a little less. The debt in 1880 was upwards of £350,000,000, besides paper money in forced currency.

Army.—The regular standing army dates from the close of the 17th c. Before that time, military levies were raised for longer or shorter periods. Till lately the army was raised by conscription; but in 1870, an imperial ukase announced the principle of universal liability to military service and another in 1874 reorganized the entire military system. There is an annual conscription to which all men who have completed their 21st year, and are not physically incapacitated, are liable. Substitution is prohibited. The period of service in the army is fifteen years, six in active service, and nine in the army of reserve. During the latter period, the soldier is liable to service only in time of war. To enable the educated classes to free themselves from compulsory conscription, young men, sufficiently educated, may enter

on a short period of service from their 17th year. On the 1st January 1863, the standing army, including the guard, consisted of 31,110 generals, staff, and commissioned officers, and 818,105 privates and non-commissioned officers. This force was divided into 608 battalions of infantry, 313 squadrons of cavalry, and 182 batteries of artillery. Besides this establishment, there were 300,000 irregular troops, consisting of Cossacks, Kirghiz, Circassians, and other contingents, who are liable to military service in lieu of paying taxes. The law of 1874 thoroughly remodelled the whole military organization of the Cossacks, who now form in time of peace a perfectly organized body of men, easily attached to the cavalry division in time of war. In peace they have 21 regiments and 8 horse-batteries, increased in war to 62 and 22 respectively. The grand-duchy of Finland has a military system of its own. The Russian army, on the peace footing, consisted, in 1879, of about 770,000 men, of whom about 470,000 belong to the regular army, and 300,000 to the reserve. In time of war the number can be raised to 1,500,000. (For further details see ARMIES, MODERN.) The expenditure for the army, as set down in the estimates for 1880, was £27,095,900.

Navy.—The Russian boundaries were first advanced to the sea under Peter the Great, and from the genius of that monarch the Russian navy sprang. Besides the naval depôts on the Baltic, the Black, and the Caspian Seas, there are also naval establishments on the shores of the North Pacific and on the Amur. In 1875, Russia had 137 war-vessels in the Baltic Sea, 31 in the Black Sea, and 55 on other waters. In all, there were 223 ships with an aggregate burden of 190,000 tons, 29 being iron-clads. The expenditure for the navy was, in 1880, estimated at £4,078,000.

Religion and Churches.—Toleration of all religions which do not violate public morality or good order, exists in R., and not to profess the orthodox Greek faith, the national religion, does not disqualify for the enjoyment of any civil rights. The law does not allow those who already belong to the established faith to secede from it; and if, in a household, either of the parents be a member of the Greek Church, all the children must be brought up within that communion. The emperor is head of the church, the affairs of which he directs by means of a synod composed of the chief prelates, who are summoned from their dioceses to attend its meetings (see RUSSIAN CHURCH). The direction and regulation of all other religious communities emanates from a department in the offices of the Minister of the Interior. In 1871, there were in European R., exclusive of Finland and Poland, 53,139,247 orthodox Greeks; 922,079 Raskolniks; 37,136 Gregorian Armenians; 2,882,991 Roman Catholics; 2,234,112 Protestants; 1,829,100 Jews; 2,358,766 Mohammedans; and 255,503 heathens. In 1861, there were 614 orthodox convents, 137 of which were occupied by women. There were 5648 monks, and 4879 lay-brothers; 2931 nuns, and 7669 lay-sisters; 50,394 priests and deacons, and 63,421 other persons, who were employed in religious services in the 50,165 orthodox churches. For the education of the clergy, there are 4 academies, 50 seminaries, and 201 schools, in which 54,000 persons are trained. The churches, convents, and the ecclesiastical departments in general, are maintained by government.

Public Instruction.—The department of public instruction in R. is presided over by a ministry, although many of the schools are directed by other departments. The greater number of these establishments are supported out of the imperial treasury. Russia in Europe, excepting Finland, is divided into nine educational districts—namely, St. Petersburg, Moscow, Dorpat, Kiev, Kharkov, Kazan, Odessa, Wilna, and Warsaw—each, Wilna excepted, having a university. Of the students—who do not reside within the universities—the poorest are allowed stipends for their maintenance, and the candidates for admission as students must have passed satisfactory examinations in the courses of instruction gone through at the gymnasia. Degrees are conferred in law, medicine, philology, mathematics, natural history, and the oriental languages. Degrees in theology are granted at Dorpat to students of the Lutheran faith. The professors are appointed and paid by the government. Four institutions, the law school and lyceums of St. Petersburg, Nijni, and Jaroslav, are specially devoted to legal science. The gymnasia, schools of the second class, about 130 in number, are found in the provincial towns. Besides the universities and gymnasia, there are numerous districts schools; but the means of instruction, though rapidly increasing, are very insufficient. In 1853, there were only 3000 village schools; in 1863, the number had enormously increased. There are also numerous special schools for instruction in mining, in wood-craft, civil engineering, navigation, &c. The military schools form a separate system. The cadets are transferred from the military gymnasia to the 'military schools,' in which they qualify to fill the posts of commissioned officers. Three academies, for the staff, the engineers, and the artillery, are devoted to the higher branches of military science. Theological education for the orthodox church is superintended by the clergy. According to the report of the minister of public instruction, there were in 1875, in the nine educational districts, 20,376 primary schools, attended by 670,186 boys and 169,379 girls.

Literary and Scientific Institutions, Museums, Press, &c.—Many of the most important institutions in R., as the Academy of Sciences and the Pulkova Observatory, flourish in or near St. Petersburg (q. v.). There are, however, throughout the empire numerous institutions and societies for the promotion of the arts and sciences. The Imperial Library at St. Petersburg, with upwards of a million volumes, is one of the finest in the world. The press of R., not yet much developed, is subject to special censorship, which, though rigorously exercised under the reign of Nicholas I., became, under the milder government of Alexander II., considerably less strict. Each year gives evident proof of the rapidly increasing taste for literature and mental culture in Russia. In 1863, there were published within R. and in the Russian tongue, 1652 volumes. In the years 1873 and 1874, 5206 books were published in Russia, of which 447 were translations from other languages.

Charitable Institutions are for the most part supported by government; and although their number is increasing annually, the scarcity of large national institutions—especially public hospitals—is painfully felt. Medical assistance can only be obtained in the provinces with the greatest difficulty, owing to the distances of the towns and the sparseness of the population. The foundling hospitals of St. Petersburg and Moscow receive annually about 15,000 abandoned infants and orphans.

Public Roads, Railways and Canals.—Good roads and ready means of communication are a great want in R., where the distances are so great, and the population so scanty. To keep the roads in repair, is a work of the greatest difficulty here, for two reasons—the first, a difficulty in concentrating a sufficient amount of labor where the laborers are so few, and so widely dispersed; and the other, the melting of the snows and overflowing of the rivers in spring. During four or five months of the year, the soil is thickly covered with snow, which, when it becomes hardened by the frost, offers an excellent, an easy, and a universal means of transit. On the return of mild weather, however, the snow melting, sinks into and softens the earth, which is also overflowed by the rivers. The roads being thus flooded, are rendered almost wholly impassable for traffic till the soil dries. In autumn, the usual rains fall, and the earth is again soaked, so that the time for easy communication during the summer is very short. In 1856 only 784 miles of railway had been opened, though a large extent was being constructed; but in 1882 there were 14,100 miles in operation (besides 540 miles in Finland), and 1100 miles in construction. Several of the chief cities of the empire are connected by means of macadamized causeways, which are now generally kept in good repair. The other towns are connected by ordinary track-roads, which are generally impracticable in spring and autumn. Owing to the generally bad character of the surface, and to the abundance of the rivers which traverse it, the water-communications of this empire are very important as commercial highways, though the vast transit-trade of the country is not confined to them alone. The transport of merchandise across the broad expanse of the empire, is much facilitated by canals, which have here become an important and a peculiar institution. The four seas surrounding European Russia are connected by canals: 1. The Caspian is connected with the White Sea by the canal of the Prince of Wirtemberg, between the river Scheksna, an affluent of the Volga, and the upper waters of the Northern Dwina. 2. The Caspian and Baltic are connected by three systems of canals. See VOLGA. 3. The Black Sea is connected with the Baltic by three lines of canals—those of Beresina, Oginsky and Dnieper, and Bug, between the affluents of the Dnieper and those of the Western Dwina, Niemen and Vistula.

Postal Service.—This service was inaugurated in 1664. In 1875 there were forwarded 63,244,156 letters, 1,419,094 post-cards, 42,776,220 newspapers and stamped periodicals, and other packets, amounting in all to 121,517,735. The number of offices was 4458 in 1880, and of letters, &c., 227,000,000.

Electric Telegraph.—Notwithstanding the immense extent of the surface of R., and the distance from each other of its principal towns, these are now nearly all united by lines of electric telegraph. In January 1875 upwards of 40,000 miles of telegraphs had been laid by the Russian government, and 18,000 miles by private companies. In the end of November 1871, the telegraph line through Siberia, connecting St. Petersburg with China and Japan, was finished, and a telegram forwarded from Nagasaki to the Russian capital. In 1878, there were sent 4,874,500 telegraphic messages to places within R., 470,000 to places abroad, and 373,000 official. In 1880, there were 7,300,000 messages.

Population.—The population of the empire is spread with great irregularity over the surface. In European Russia, its average is less than 37 per Eng. sq. m.; in the Caucasus, more than 28; in Siberia, ½; in Poland, 112; and in Finland, 14 per Eng. sq. mile. These figures, however, cannot be taken as a correct illustration of the actual distribution of the masses over the enormous surface


RUSSIA
IN EUROPE
Geographical Miles, 60 = One Degree
English Miles, 69 = One Degree
Railways thus
ARCTIC OCEAN
Waranger Fd.
KOLGUEV I.
Mouths of the Petchora R.
WAIGATZ I.
Kara
R. Kara
L. Kara
Kola Bay
Kola
C. Kanin
C. Sviatoi
KANINSKAIA PENA.
Gulf of Tchesskaia
Pustozersk
Arctic Circle
R. Petchora
R. Usa
R. Sivaia
R. Ob
R. Scova
Obdorsk
Mouths of the Obi R.
LAPLAND
KOLA PENINSULA
Gulf of Kandalak
L. Pavo
L. Topo
L. Kolvo
Kemi
R. Kemi
L. Kemi
Tornea
R. Tornea
Ijo
Uleaborg
Brahestad
Kajana
L. Piellis
Kuusamo
Vacolaisted
Wasa
Christinestad
Nystad
Abo
Tammerfors
Biorneborg
Nikolaistad
Jacobstad
Pietarsaari
Kuopio
Kuopio
Kajana
Gulf of Bothnia
SWEDEN
Gulf of Finland
FINLAND
Gulf of Onega
Onega
L. Onega
L. Vigo
L. Vodlo
Povienitz
Sego
L. Ladoga
Pudoj
Petrozavodsk
Olonetz
Svir R.
Lodeinoe Pole
Kargopol
Velsk
Vytegra
L. Bielo
Toma
Tichvin
Tikvin
Lodeinoe
Archangel
Novo Dvinsk
Kholmogory
Onega
Jakogorska
Mezen
BIELOE MORE OR WHITE SEA
Gulf of Mezen
R. Dwina
R. Pinega
R. Mezen
R. Vashka
R. Vaga
R. Toima
R. Sukhona
R. Jug
R. Yuga
R. Yarensk
R. Pokrovskoi
R. Kimsk
R. Vitchegda
R. Ilitsa
R. Pechora
R. Ussa
R. Kolva
R. Vishera
R. Kama
R. Vichera
R. Ishim
R. Tobol
R. Tura
R. Iset
R. Miass
R. Ufa
R. Belaia
R. Sim
R. Ai
R. Ural
R. Or
R. Ilek
R. Samara
R. Kinel
R. Tok
R. Kondurcha
R. Buzuluk
R. Bolshoi Uzen
R. Malyi Uzen
R. Irgiz
R. Tersa
R. Volga
R. Kama
R. Viatka
R. Vetluga
R. Unja
R. Kostroma
R. Sheksna
R. Mologa
R. Tvertza
R. Msta
R. Lovat
R. Dwina
R. Berezina
R. Sosh
R. Pripet
R. Dnieper
R. Desna
R. Oka
R. Moksha
R. Sura
R. Don
R. Donetz
R. Medveditza
R. Khoper
R. Bolshoi Irgiz
R. Tsna
R. Protva
R. Moskwa
R. Nara
R. Ugra
R. Shoshna
R. Zusha
R. Oka
R. Kliasma
R. Pra
R. Tsna
R. Wol

of the country; for, upon comparison, the degree of the density of the population of European Russia is found to vary greatly in the different governments. The government of Moscow contains 166 inhabitants per Eng. sq. m.; while that of Archangel contains only ¼. The central and south-west governments of this part of the empire are the most densely peopled. The town residents are 9½ per cent. of the whole population of European Russia; 7½ per cent. of that of the Caucasus; and 5 per cent. of that of Siberia. Russian society is divided into five classes, and of these the nobility forms 1·49 per cent.; the clergy (including their families) 1·01 per cent.; the burgesses (tiers état), 8·60; the peasants, 82·55; and the military, 6 35 per cent. Irrespective of Asiatic and American Russia, we find that in Europe this empire comprises a greater variety of races than any other European state. It is not, however, like Austria, a composite community, speaking various idioms, and having different physical characteristics and political interests.

In European Russia, the predominant race is the Slavonian, and the Russian 'element' and language prevail almost universally. The 50,500,000 Russians who inhabit Europe are divisible into—1. Great Russians (33,935,000), inhabiting Central Russia. 2. Little Russians (12,015,000), located in the south-west. To the latter may be added the Cossacks (1,600,000), who are spread along the rivers Don, Kouban, Terek, Ural, Tobol, the Lake of Baikal, and the Amur. 3. White Russians (2,950,000), in the western provinces. The other Slavonic races are Poles (4,640,000), in the kingdom of Poland, and partly in the west provinces (where they form only 10⅝ths per cent. of the population); Servians and Bulgarians in Bessarabia and New Russia. The Finnish race (3,800,000), which occupies, under different names, the north and north-east of European Russia, and the north-west of Siberia, has in great part adopted Russian language and manners. The Lithuanians and Letts (2,460,000) dwell mostly between the Niemen and Dwina. The Turkish Tartarian race (5,700,000), in the south-east, and partly in Siberia, comprises Tchuvashes, Tartars of Kazan, Kirghiz, &c. The Mongols (376,000), comprising Kalmucks and other races in the south-east of European Russia, and in the east of Siberia. Besides these races, there are Roumains and Walachs (770,000), in Bessarabia and New Russia; Persians, Kurds, Armenians, &c. (460,000), near the Caspian Sea; Germans (920,000), distributed over the whole empire, but found in the greatest numbers in the Baltic provinces; Swedes (200,000), in Finland; Greeks (52,000), in the south; Bohemians—i. e., Gipsies (50,000)—chiefly in Bessarabia; Jews (2,014,000), mostly in Poland and the west provinces; Caucasians (1,830,000), Samoieds in the north of R., and many other tribes in East Siberia and Russian America.

Climate.—Owing to its vast extent, the Russian empire presents great varieties of climate. At Archangel, the mean temperature of the year is 32° F.; at Yalta, in the Crimea, 52°; and at Kutais, in the Caucasus, 58°. Consisting of an immense area of dry land, the climate of the empire is essentially continental; and the climate of localities in its interior is much more rigorous than that of places on the western shores of Europe in the same latitudes. The mean temperature of Edinburgh and Christiania is higher than that of Moscow and Kazan. The rigor of the climate of the empire increases not only with the latitude, but as you advance eastward; thus, the mean winter temperature of the town of Abo, on the Gulf of Bothnia, is the same as that of Astrakhan—viz., 23° F.; although the former is in lat. 61°, and the other in lat. 47°, or 14° nearer the equator. The difference of the mean summer temperature under the same latitudes is, on the contrary, not very considerable. The isothermal line of Astrakhan (60° F.) passes through Lublin in Poland and Ekaterinoslav. In the east, the maximum heat is even greater than in the west; and such heat-loving plants as the watermelon are grown more successfully in the south-east of R. than in the west of Europe, under the same latitude. The dryness of the atmosphere increases in the direction from north-west to south-east. On the banks of the Baltic, the average number of rainy and snowy days is 150, and the annual rainfall is 20 inches, while near the Caspian the number of such days is 70, and the rainfall only 4 inches. The climate of R. is in general healthy; but there are several places where diseases seem to be localized, as the shores of the Frozen Ocean, where scurvy is common, the marshes along the Niemen and Vistula, where the Plica Polonica (q. v.) is the chief disease, and the marshy lands on the Black, Azof, and Caspian seas, where ague always prevails.

Manufactures.—Manufacturing industry in R. may be said to date from the reign of Peter the Great. With a view to its promotion, foreign manufactured goods are heavily taxed on importation. In 1870, the number of factories (exclusive of iron-works and all establishments engaged in the preparation of metals) was 19,431, which employed 410,225 hands, and produced articles amounting to 373,000,000 roubles. Of these factories, a half were in the governments of St. Petersburg, Moscow, and Vladimir. The metallurgical works are mostly in the government of Perm, and in other eastern governments bordering on the Ural Mountains. Small handicraft manufacturing establishments abound in all the central governments, especially in the neighborhood of Moscow, where whole villages during the winter season are employed in some special industry, as weaving, tanning, fur-dressing, joiners' work, shoemaking, &c. The chief manufacture is spinning and weaving flax and hemp. Linen is manufactured to the value of 100,000,000 roubles, chiefly in hand-looms; although the finer qualities are manufactured by power-looms, mostly in the governments of Jaroslav and Kostroma, and the capitals. Hemp is manufactured into sailcloth and ropes, which articles are largely exported. Woollen and worsted stuffs are made to the value of 50,000,000 roubles, and the quantity is on the increase. Fine cloths and mixed fabrics are made in the capitals, and in the governments of Livonia and Tchernigov. Silk-spinning and weaving are carried on in the factories of Moscow, which is renowned for its brocades, and gold and silver embroideries. Through the influence of the protective system, cotton spinning and weaving have been of late very rapidly extended. In 1870, there were 158 cotton-spinning mills, producing goods to the value of 53,350,000 roubles; and weaving establishments, to the value of 13,000,000 roubles.

After weaving, the next most important branch of industry is tanning, the products of which amount to 20,000,000 roubles. The other important branches of industry are cutlery, made in the town of Tula, the Russian Sheffield, and in the governments of Nijni-Novgorod, Vladimir, and Kostroma; and pottery and glass works, the former carried on in the government of Moscow, the latter in that of Vladimir. The produce of the machine factories in 1870 did not exceed 15,000,000 roubles; of the sugar-refineries 27,250,000 roubles; of the paper-mills, 5,750,000 roubles.

Commerce.—The Russian empire, including provinces varying widely in their natural and industrial resources, presents an extensive field for internal commerce, while the abundance of its products maintains a vast foreign trade. Of the former, which is by far the more important, the extent and value cannot be given, owing to the want of statistical data. Moscow, in the center of the industrial provinces of the empire, and the great dépôt for the wares that supply the trades of the interior, is the chief seat of the home-trade. The other large trading towns are chiefly those on the banks of the great rivers. The goods yearly conveyed by the Volga alone amount to 200,000,000 roubles. Owing to the distances between the great trading towns, fairs are still of great importance in Russia. The transactions of all the fairs in the empire amount to more than 300,000,000 roubles, and the chief are those of Nijni-Novgorod (q. v.), Irbit (q. v.), Kharkov (q. v.), Poltava (q. v.), and Kursk (q. v.).—The foreign trade consists mainly of the export of raw products and the imports of colonial and manufactured goods. The foreign trade by sea is five times greater than the trade by land; and of the latter, the commercial transactions with Europe amount in value to ten times the Asiatic trade. One-third of the whole foreign commerce is transacted at St. Petersburg, one-ninth at Odessa, and one-fifteenth at Riga. The principal exports from R. are as follows, in the order of importance: wheat, rye, flax, linseed, oats, wood, hemp, wool, barley, cattle, maize; also unwrought metal, bristles, tow, leather, tallow, oil, fur, caviare. The chief imports: raw cotton, engines and machinery, wool, tea, cotton yarn, chemicals and drugs, coal and coke, wrought iron, wine, metal wares, non-mineral oils, fruit; also petroleum, salt, tobacco, linen, indigo, glass-wares, coffee, books. (Raw sugar used to be a chief import, but the development of the beet-sugar manufacture has reduced the imports to a very small quantity since 1878.) The exports are sent mostly to Britain, next to Germany, then, at a great interval, to France, Austria, Holland, Belgium, Turkey; the imports are mostly from Germany, and next Great Britain, then from Austria, France, Turkey, South America, and the United States. Between 1871 and 1881, the value per annum of the total exports varied from £55,850,000 (1871) to £96,015,000 (1879); and the total imports, from £54,557,000 (1871) to £91,570,000. The exports to Britain decreased from £24,320,000 (1872) to £14,053,000 (1881); the imports from Britain were £9,000,000 in 1873, and only £6,165,000 in 1881. Exports to Germany were about £23,000,000 in 1880, and imports thence, £45,800,000. Of the total exports to Britain in 1881, the northern ports of R. sent a value of £11,230,000, while the southern sent goods to the amount of £3,825,000. In 1880, the number of vessels that entered the ports of R. was 15,358, and of these 2746 were Russian, 2660 English, 2573 German, 2047 Swedish and Norwegian, 1380 Turkish, 1088 Greek, 892 Danish, &c. The commercial marine of R. is as yet not much developed. In 1880, it comprised 2580 sea-going vessels, of an aggregate burden of 523,000 tons, besides 390 trading steamers on rivers and lakes.

Geology and Mineral Products.—A more intimate knowledge of the geological structure of R. may be said to date from 1841, when the eminent geologist Sir R. I. Murchison, undertook a

scientific journey to R. and the Ural Mountains. His geological investigations, together with the palæontological researches of his colleagues, E. de Verneuil and Count Kayserling, have served as a basis for further surveys. The oldest stratified rocks are the Silurian, on the southern shores of the Gulf of Finland, sinking down below the Devonian strata, which run in two large branches—on the south-east to Voronesh, and on the north-west to Archangel, both overlaid to the east by a still more extensive deposit of carboniferous rocks. The immense triangle between those layers and the Ural is occupied by the Permian system (except the north-east extremity, which is covered by Jurassic beds), named by Sir R. I. Murchison from its development in the government of Perm. To the south of the south-east Devonian branch extend deposits of the cretaceous period, and detached patches of the carboniferous formation. The latter contains, in R., only the older members of the group up to the mountain limestone, which contains numerous but thin seams of coal, generally poor in quality.

The field along the Donetz forms an exception, and yields annually about 96,400 tons (⅘ths of the total quantity raised in R.) of good coal and anthracite. The remaining south-west and south-east parts of the empire are covered by tertiary beds, more or less recent. The Ural Mountains present an outcrop of all the secondary and palæozoic formations down to the stratified gneiss and granite, which latter composes nearly the whole province of Finland, and skirts the middle course of the Dnieper. The Ural Mountains (q. v.), which contain almost all the mineral riches of the country, are the principal seat of mining and metallurgic industry. They produce gold, platinum, copper, and iron of excellent quality, especially the last, which is manufactured from magnetic ore. Emeralds, sapphires, amethysts, agates, rhodonites, rock crystal, jasper, chrysoberyl, and black tourmalin are also found, as well as diamonds of an inferior quality. Gold, silver, copper, plumbago, &c. are also obtained from the Altai and Nerchinsk mines in Siberia (q. v.). A few years ago, the annual produce of the mines amounted to £12,000,000; the chief items being gold, silver, platinum, copper, lead, and iron. Salt is obtained to the annual value of 14,000,000 roubles, chiefly from salt lakes in Bessarabia and the Crimea, from Lake Elton in Astrakhan, and from the inexhaustible layers of rock-salt near Iletzk (q. v.). There is much diversity of opinion as to the total amount of coal available in Russia, the coal-bearing area never having been thoroughly explored; but some good authorities say the coal supplies of R. are more extensive than those of any other European country. The total produce of coal from all the Russian mines in 1874 amounted to 83,575,000 puds (pud = 36 lbs. avoir). Excellent china-clay or kaolin is found near Gluchov, in the government of Tchernigov.

Agriculture and Products.—R. is an eminently agricultural country, although only a comparatively small portion (271,000,000 acres) is under cultivation. In the *central zone* (see above, under *Surface*), the soil is almost entirely black mould, extremely fertile, and hardly ever requiring manure. The system of husbandry most extensively practised is what is called the 'three-field system,' in the working of which, one-third of the land is always in fallow. In the south and south-east, a system of agriculture peculiar to R. is in operation: it is called the 'fallow system,' and consists in raising three or four consecutive crops from the same land, and afterwards allowing it to lie fallow for five or six years, after which time it begins to grow feather-grass (*Stipa pennata*), which is considered a token of returning fertility. Husbandry, in general, has undergone great changes since the emancipation of the serfs, to whom a considerable portion of the land has been transferred in freehold. The landowners, deprived of their former right to the labor of their serfs, now find it more profitable to reduce the amount of their land in cultivation, or grant portions of it in lease to the peasants, often in return for the half of the produce of the crop. A great drawback to the development of agriculture is the want of proper means of communication, and consequently the low price of corn in the locality in which it is grown. Fodder-grass is rarely cultivated, as a sufficient supply of fodder is afforded by the extensive natural meadows. The chief cereals are wheat—which is grown as far north as lat. 62°—rye, barley, and oats. Buckwheat and millet are grown in the south, and from these, but specially from rye, the staple food of the inhabitants is made. Hemp and flax are extensively cultivated; and the oil extracted from the seeds of the former is an indispensable article of the peasant's household, as it is used for food during the fasts, which, taken together, extend over about half the year.

Of flax, 15,000,000 puds are annually produced; of hemp, 7,000,000 puds, and 3,000,000 puds of oil-seeds. After the famine of 1839, government introduced, and afterwards did much to promote the cultivation of potatoes. The yearly produce of this crop amounts to 55,000,000 *tchetverts* (1 tchetvert = 5·77 imp. bushels). Tobacco crops cover 16,000 acres, and the amount produced is 2,500,000 puds. Beet-root and maize are also cultivated; and there are numerous vineyards in the Crimea, in Bessarabia, and along the Don. Gardening is an important branch of industry, the products being cucumbers, onions, cabbages, and other vegetables and fruits. An area of 527,000,000 acres is covered with woods, but the quantity of timber, from which material the peasant supplies almost all his wants, is at present suffering diminution. The Russian builds his cottage with timber, heats his room with it, lights his house with firewood, makes his household utensils from the same material, as well as his cart, &c.; he also wears shoes, and uses mats for coverings, which are made from the inner bark of the lime-tree. In the north, the forests occupy from 90 to 95 per cent. of the whole surface; in the south, they are 2 per cent. less than in England. Coniferous trees are the chief in the northern districts; but in the central tracts, oaks, limes, maples, and ashes are the chief. Timber is the chief article of internal commerce, and is floated down the rivers from the well-wooded districts to those which are destitute of wood.

Animals and Animal Products.—In the northern and central provinces, cattle are kept chiefly for the purpose of obtaining manure; but in other parts, cattle-breeding is an important branch af industry. On an average, there are 30,000,000 head of cattle in Russia. Of horses, the best, chiefly trotters, are reared in breeding stables in the southern central governments; but the great bulk of the horses are obtained from the half-wild studs of the Cossacks, Kalmucks, and Kirghiz. The horses of Viatka, Kazan, and Finland are strong and hardy. The total number of the horses in R. is about 18,000,000. Sheep-breeding is carried on extensively on the southern steppes. The sheep number 50,000,000, of which upwards of 1,000,000 are of the fine merino breed. Besides these animals, there are camels in the south of R., reindeer in the north, and hogs and poultry in great abundance everywhere. A breed of the *Urus* (q. v.), a huge and rare animal, which does not occur in any other country, is preserved in a forest of the government of Grodno. Among the wild animals are (chiefly in the north), the bear, wolf, elk, fox, and marten; on the northern coasts, are found the seal and walrus, and the eider-duck and other wild-fowl. The more expensive kinds of furs are procured from Siberia. The most important Russian fisheries are those of the Caspian and Black Seas, and the Sea of Azov, and their tributaries. The lake fisheries are also very valuable. Herrings, cod-fish, and salmon are caught in abundance in the White Sea, and are the main source of livelihood to the inhabitants of those regions. The value of the Russian fisheries is estimated at about £2,000,000 annually. Bee-culture is very general in R., and silk-worms are reared in the Caucasus.—See the statistical works of Sarauw (1873); Von Lengenfeldt (1875); Wilson (St. Petersburg, 1876); also *Russia*, by D. Mackenzie Wallace (1877); *Russia*, by W. R. Morfill, 1880.

History.—Copious histories of R. are numerous, those of Karamsin, Solovief (1851–77), and Schnitzler (German transl. 1874), being standard Russian works. More accessible are Turgenief, *La Russie* (Par. 1847); Rambaud, *Histoire de Russie* (Par. 1878).—The population of the Russian empire is composed of various nationalities, but the predominant one is the Slavonic (q. v.). The Eastern Slavs, the ancestors of the Russians, were settled near the sources of the rivers Volkhof, Bug, Dniester, Dnieper, and Don, and consisted of several tribes whose chief towns were Novgorod and Kief. Being much harassed by their warlike neighbors, and distracted by intestine dissensions, the Slavs of Novgorod and the neighboring Finnish tribes, in 862, sent ambassadors to 'the Variags (Varangians, Normans) beyond the sea,' inviting their chiefs to come and reign over them. Three brothers of the tribe, called by the old chroniclers *Rurik* (q. v.), Sineous (Sindf), and Truvor, accepted the invitation, and at the head of a band of armed followers (*droujina*) took possession of the territory of Novgorod. Oleg (879—912), who exercised authority as regent to Igor, Rurik's son, took Kief, and made it the capital of the embryo empire, subduing the neighboring tribes, and even successfully attacking the Byzantines. *Igor* (912—945) did nothing of note, but his widow and successor *Olga* (945—957), was a wise and able ruler. She was baptized in 955 by the patriarch of Constantinople, and abdicated soon after in favor of her son *Sviatoslaf* (957—972), a warlike monarch and a pagan, who was treacherously murdered by a neighboring tribe with whom he was at war. On his death, the principality was divided among his three sons, and the quarrels usual in such cases followed, and continued till *Vladimir* (980—1015), the youngest son, became sole ruler. The Normans now definitively became amalgamated with the Slavonic race.

Vladimir's reign is the 'heroic' epoch of Russian history; and the glories of the court, and the valiant feats of the warriors of the 'sunny Prince Vladimir,' have been handed down through ages in legend and song. His successful wars extended the boundaries of R. to Lake Ilmen on the north, to the mouths of the Oka and of the Khoper (an affluent of the Don) on the east, to the falls of the Dnieper on the south, and to the sources of the

Vistula on the west. He became a convert to the Greek faith, and in 988 was baptized with his followers; his example being shortly followed by the whole nation, for whose spiritual guidance and supervision a metropolitan was established at Kief. He followed the evil example of his father in dividing his dominions, and after his death a civil war broke out among his four sons, in which *Jaroslaf*, prince of Novgorod, was ultimately (1036) successful. This prince did much to civilize his subjects by building towns, founding schools, and especially by ordering the compilation of the first Russian code of laws (the 'Rousskaia Pravda'), the most prominent item of which was the limitation of the right of family feud, a limitation which was changed into total abolition after his death in 1054, by his sons, who shared the principality among them. Each of these petty princes in turn divided his portion of territory among his sons, till the once great and united realm became an agglomeration of petty states quarreling with each other, undergoing absorption by a more powerful neighbor, or being redivided. This state of anarchy, confusion, and petty warfare dates from the death of Jaroslaf in 1054, and continued, more or less, till 1478.

The principal among the subdivisions of R. during this period were, according to Russian authorities, *Sousdal*, which occupied the upper and central parts of the basin of the Volga, and from which, in the beginning of the 13th century, sprang the principalities of *Tver*, *Rostof*, and *Vladimir; Tchernigof* and *Seversk*, which occupied the drainage-area of the Dessna (an affluent of the Dnieper), stretching to near the sources of the Oka; *Riazan* and *Murom*, along the Oka basin and the sources of the Don; *Polotsk*, including the basins of the Western Dwina and Beresina; *Smolensk*, occupying the upper parts of the basins of the Western Dwina and Dnieper; *Volhynia* and *Galicia*, the first drained by the Pripet, the second lying on the north-east slope of the Carpathian Mountains, which were united in 1198; *Novgorod*, by far the largest of all, which occupied the immense tract bounded by the Gulf of Finland, the Lake Peipus, the upper parts of the Volga, the White Sea, and the Northern Dwina; and the grand-duchy of *Kief*, which, from its being formerly the seat of the central power, exercised a sort of supremacy over the others. Novgorod, however, from its size and remoteness, as well as from certain privileges which had been granted to it by Jaroslaf, was almost independent of the grand-duchy. The citizens of Novgorod chose their own dukes, archbishops, and in general all their dignitaries, and proved the superiority of their system of self-administration by increasing in power and wealth year by year. One of the chief factories of the great Hanseatic League was established in Novgorod in the 13th century. In fact, so great was its fame throughout R., as to give rise to the proverb, 'Who can resist God and the mighty Novgorod.' The princes of these states had each his standing army, and were continually quarrelling; but the people were less oppressed than would naturally be expected under such circumstances, on account of the establishment in each state of a 'common council' or *veche*, which exercised an important influence in state affairs, and without which the prince was almost powerless. This period was also marked by the gradual amalgamation of the different Slavic races into one, the present Russian race, a process doubtless aided by the universal dissemination of Christianity, which assimilated their various languages, manners, and customs.

The chief of the grand dukes of Kief were *Vladimir*, surnamed 'Monomachus' (1113—1125), whom chroniclers are never tired of lauding as a model prince, and one whose authority was acknowledged almost as paternal by the princes of the other provinces. In 1163, the ruler of Vladimir took possession of Kief, and proclaimed himself grand duke. In 1222, the Mongol tide of invasion had swept westwards to the Polotzes, a nomadic tribe who ranged over the steppes between the Black Sea, and the Don, and whose urgent prayers for aid were promptly complied with by the Russian princes; but in a great battle, fought (1223) on the banks of the Kalka (a tributary of the Sea of Azof), the Russians were totally routed. The Mongols, as usual, did not follow up their victory; but twelve years afterwards, Batû Khan, at the head of half a million of Kiptchak Mongols, conquered the east of Russia, destroying Riazan, Moscow, Vladimir, and other towns. The heroic resistance of Prince George of Vladimir cost the lives of himself and his whole army on the banks of the Siti. The Mongol conqueror's victorious career was, however, arrested by the impenetrable forests and treacherous marshes to the south of Novgorod, and he was forced to return to the Volga. In 1240, he ravaged the south-west, destroying Tchernigof, Galich, and Kief; ravaged Poland and Hungary, defeating the Poles at Wahlstatt, and the Hungarians at Saïo; but being checked in Moravia, and receiving at the same time the news of the khagan's death, he retired to Saraï on the Akhtuba (a tributary of the Volga), which became the capital of the great khanate of Kiptchak. Thither the Russian princes repaired to swear allegiance to the khan, and take part in the humiliating ceremonies which the barbarous conqueror exacted from his tributaries. The taxes of R. were farmed out by the khan to contractors, who were generally oriental merchants, and they were collected by the aid, when necessary, of the khan's soldiers. But in later times (during the most of the 14th and 15th centuries), when the fiery energy of the Mongols was on the decline, the taxes were collected by the Russian princes and sent to Saraï.

The Mongol invasion had an evil influence on the political, social, and moral life of R.; it totally destroyed the elements of self-government, which had already attained a considerable degree of development, arrested the progress of industry, literature, and the other elements of civilization, and threw the country more than 200 years behind the other states of Europe. The principalities of Kief and Tchernigof never recovered this crushing blow, and the seat of the metropolitan was removed to Vladimir. Their decline, however, made room for the rise of Galich to pre-eminence in Western R., and under the rule of a series of wise princes it preserved greater independence than any of the Russian principalities, till, in the latter half of the 13th c. it was taken possession of by Kasimir III. of Poland; and about the same time Volhynia was joined to the grand duchy of Lithuania. The rise of this latter state was much favored by the prostration to which the Russian princes were reduced by the Mongol invasion, and after a flourishing existence of several centuries, during which it extended in power, so as to include Livonia proper, and the Russian provinces of White R., Volhynia, Podolia, and the Ukraine, it was joined in 1569 to Poland. On the north of Lithuania arose in the beginning of the 13th c. another power, the Livonian Knights, Sword-bearers, who took possession of Livonia, Courland, and Esthonia, as well as some portions of the territory of Novgorod and Pskov. The grand-ducal title passed after the Mongol invasion from Kief to Novgorod, and afterwards to Vladimir, where the celebrated Alexander Newski (q. v.) (1252—1263) swayed the sceptre.

In the beginning of the 14th c., Eastern R. consisted of the principalities of Sousdal, Nijni-Novgorod, Tver, Riazan, and Moscow, and long and bloody contests took place between the two most powerful of these, Tver and Moscow, for the supremacy. At last, under the guidance of *Ivan Kalita* (1328—1340), the founder of the system of administrative centralization which prevailed down to the time of Peter the Great, Moscow became the chief grand-duchy. This result was due to various causes, of which the central position of Moscow, the prevalence there of the law of primogeniture, the favor of the Mongol khan, the sympathy of the church, whose head the metropolitan had removed thither from Vladimir in 1325, and the weakness of most of the other princes, were the chief. Ivan's son and successor, *Simeon the Proud* (1340—1353), followed in his father's footsteps, as did also the regency which administered the government during the reign of the weak-minded *Ivan II.* (1353—1359), and the minority of his son, *Dmitri* (1359—1389). Dmitri conquered Nijni-Novgorod, carried on war with success against Tver and Riazan, and profited by the weakness of the Mongol khanate, which was now divided into the four hordes of Nagaisk, Crimea, Kazan, and Astrakhan, to make the first attempt to shake off the shameful yoke under which the Russians had groaned so long. His brilliant victory over the Khan Mamaï on the banks of the Don (1380), which conferred on him the epithet of Donskoï, was the first step to liberation; but the succeeding khan, in revenge, burned Moscow, exacted a heavy tribute from the people, and rivetted their bonds more firmly than ever. *Vassili I.* 1389—1425) obtained possession of the principality of Nijni-Novgorod with the full consent of the khan, and conquered Rostof and Murom. During his reign, R. was twice invaded by the Tartars, first under Timur, and again under Edijeï, and was at the same time attacked by the Livonians.

Vassili II. the Blind (1425—1462) reigned during a period marked with continual civil wars among the various princes for the grand-ducal throne; but from this period the division of power in Eastern R. rapidly disappeared, internal troubles ceased, and the re-united realm acquired from union the power of casting off the Tartar yoke. These results were achieved by *Ivan III.* (1462—1505), surnamed 'the Great,' who availed himself of every opportunity for abolishing the petty principalities which owed him allegiance as grand-duke, and manœuvred so skilfully, that some of the princes voluntarily surrendered their rights, others bequeathed their lands to him; while others, as the prince of Tver, were reduced by force of arms. The heaviest task of all, however, was the reduction of Novgorod, but so vigorously did Ivan carry out his schemes, that in 1478 this last of the great principalities was added to his empire. He then took advantage of the dissensions between Achmet, khan of the Golden Horde, and Mengli-Gheraï, khan of the Crimean Horde, to deliver R. from its state of servitude by uniting with the latter; their combined arms destroying the power of the former in 1480; and the kingdom of Astrakhan, which rose on its ruins, was wholly unable to cope with the now powerful monarchy. He next turned his attention to the western provinces, which had formerly belonged to the descendants of St.

Vladimir, but were now in the hands of the Lithuanians, under whom the adherents of the Greek Church were bitterly oppressed by the Catholics, and accordingly hailed the advance of Ivan's army as a deliverance from persecution. The battle which followed was in favor of the Russians, but was productive of no results of any importance. Ivan married (1472) Sophia, a niece of Constantine Palæologus, the last Byzantine emperor, and introduced the arts of civilization through the medium of architects, founders, coiners, miners, &c., whom he brought from Italy, and the result of whose labors are seen in the Kremlin and the Cathedral of the Assumption (Ouspenski Sobor). He also fortified many towns, introduced to his court the splendor of Byzantium, assumed the title of Czar of all the Russias, adopted the arms of the Greek empire, and united the existing edicts into a body of laws, the *Soudebnik*.

Vassili III. (1505—1533) followed closely his father's policy, made war upon the Lithuanians, from whom he took Smolensk, and incorporated with his dominions the remainder of the small tributary principalities. His son, *Ivan IV.* (1533—1584), known afterwards as 'The Terrible,' became monarch at the age of three years, and the country during his long minority was distracted by the contentions of factious bojars who strove for power. Fortunately, however, on his attaining his majority in 1547, he found two wise and prudent counsellors, Sylvestre and Adascheff, who, along with his queen, Anastasia Romanoff (see ROMANOFF), exercised over him a most beneficent influence. The interior administration was remodelled, the 'soudebuik' of his grandfather was reformed and amended, the *streltzi*, the first standing army in R., were established, and printing introduced. His arms were everywhere victorious; the strongly fortified city of Kazan was captured in 1552, and the kingdom of which it was the capital was annexed to his empire, and the kingdom of Astrakhan shared the same fate soon after. The marauding Tartars of the Crimea were held in check, and the Knights Sword-bearers attacked and driven from Livonia and Esthonia. About this time a remarkable change came over Ivan's character, which seems to have been in some way connected with the death of his wife, Anastasia. He became suspicious of every one, believed himself surrounded with traitors, banished his two counsellors, Sylvestre and Adascheff, and persecuted the bojars, many of whom perished on the scaffold, while others fled to foreign countries. His insane rage fell upon whole towns; thousands of people were destroyed in Tver, Novgorod, and Moscow; and, finally, he murdered his eldest son. Stephen Bathory, king of Poland, meantime wrested Livonia from him, and the Crim-Tartars made an irruption northwards, and burned Moscow. It was during the reign of this monarch that Western Siberia was conquered for R. by the Cossack Ermak. See SIBERIA. His son, *Feodor* (1584—1598), was a feeble prince, who intrusted his brother-in-law, Boris Godounof, with the management of affairs.

Godounof was a man of rare ability and intellect, and proved himself an able administrator. The Russian dominion in Siberia was consolidated, numerous towns and fortresses were erected in the south as barriers against the Crim-Tartars, the Greek Church in R. was declared independent of the patriarch of Constantinople. Feodor was the last reigning monarch of the house of Rurik, for he died childless, and his only brother, Dmitri, was murdered in 1591 by order of Godounof, according to popular rumor. After the death of Feodor, representatives of all classes were convoked at Moscow to elect a new sovereign, and their choice fell on *Godounof* (1598—1604). The mysterious death of Prince Dmitri favored the appearance of pretenders to his name and rank, the first of whom, a supposed monk of the name of Gregory Otrepieff (see DEMETRIUS), was defeated by Godounof, but on the sudden death of the latter he was crowned in 1605. A revolt, headed by Prince *Vassili Shouisky* (1606—1610) soon broke out, the czar was murdered, and Shouisky elevated to the vacant throne. But a second false Dmitri now appeared, and Sigismund of Poland, taking advantage of the confusion thus produced, invaded R., proclaimed his son Vladislaf czar, and took possession of Moscow (1610), carrying away the czar to die in a Polish prison. At the same time hordes of Tartars, predatory bands of Poles, and gangs of robbers devastated the provinces and the wretched country was reduced almost to the verge of complete disorganization. But the clergy nobly stood forth to save the state from ruin, and Minin, a common citizen of Nijni-Novgorod, so worked up the feelings of his fellow-citizens that they volunteered for military service, and chose as their leader the Prince Pojarsky, a man of distinguished valor. Pojarsky retook the capital, drove the Poles out of R., and convoked an assembly of representatives, who unanimously chose for their czar *Michael Feodorovitch Romanoff* (1613—1645). See ROMANOFF.

The first care of the new monarch was to put an end to the revolt of the Don Cossacks, who had set up the son of the first false Dmitri as czar, and to the depredations of the robber-gangs in the south-west of Russia. In 1617, he concluded a treaty with Sweden, by virtue of which that power received the coasts of the Gulf of Finland and a considerable pecuniary indemnity, in consideration of Philip, the brother of the Swedish monarch, renouncing his claims to the Muscovite throne. In 1618 and 1634, he purchased peace from the Poles at the cost of Smolensk and a portion of Seversk. Having thus freed himself from all danger of foreign interference, he directed his attention to the internal administration, which, especially the courts of justice, was reduced to a deplorable condition, and to aid him in this necessary task, he summoned a general council of representatives at Moscow. *Alexei* (1645—1676), his son and successor, being a minor, the nobles seized the opportunity of increasing their power and exercising oppression and extortion over their inferiors, till rebellions broke out in various districts. Other causes of discontent were the heaviness of the taxes, the oppression of the serfs, the depreciation of the currency, which was changed from silver to copper, and the secession from the Russian Greek Church of those who disapproved of the changes and corrections in the books and liturgy of the church introduced by the patriarch Nikon. These malcontents were accordingly persecuted, and fled, some to the north of R., and others to the Ukraine, where they founded many colonies, and still exist apart under the name of 'Old Ritualists' (*Staro-obriadzy*). A general council, which was now convoked to deliberate on the best means of restoring peace to the country, revised the existing laws, and composed (1649) a new code—the 'Sobornoe Ulajenie,' which granted to every subject the right of direct appeal to the czar. Tolls on the highways were abolished, the English and other foreign merchants were deprived of their privilege of free-trade with R., and the silver currency reintroduced.

The chief events in foreign policy were the acquisition of Little Russia, by the voluntary submission of the Cossacks (see POLAND); a consequent war with Poland, in which R. acquired Smolensk and the greater part of White Russia; and a war with Turkey, which continued till after the accession of *Feodor* (1676—1682), when it was terminated (1681) by the treaty of Bakhtchisarai, by which Turkey gave up all claims to Little Russia. After Feodor's death, the general council of the land, in accordance with his last wishes and their own predilections, chose his half-brother Peter as czar, but his half-sister Sophia, an able and ambitious princess (see PETER THE GREAT) succeeded in obtaining the reins of power as princess-regent. She concluded peace with Poland in 1686, made two unsuccessful campaigns against the Tartars of the Crimea; and after an attempt to deprive Peter of his right to the throne, and failing this, to assassinate himself and his mother, she was forced to resign all power and retire to a convent. All her accomplices were executed; and PETER (1689—1725) ascended the throne as sole ruler, his half-brother Ivan being allowed to retain the title of czar conjointly, and to appear as such at public ceremonies, but without any real authority. In order more fully to discover the importance of the changes wrought by Peter in R., a brief retrospect of its social and political condition at the date of his accession is necessary. At the head of government stood the czar with absolute power in administrative, judicial, and military affairs.

In the exercise of authority he was aided by his council, the 'Bojarskaia Douma,' and in cases of extreme need by a general council of representatives of the people, which latter, however, possessed only a right of deliberation. The criminal code was cruel in the extreme. Of the standing army the streltzi only deserved the name. The population were divided into two great classes, the *bojars* or nobles, who were bound to render service for their estates, and the *burghus* or industrial and trading classes, and *serfs*, who were bound to the soil.

The clergy exercised great influence over all classes, possessed offices in the 'douma,' and exercised political functions. Agriculture was at a low ebb, and the few manufactories and industrial establishments were in the hands of foreigners. Civilization and learning, which had been introduced during the confederative period, had never recovered the shock they had received from the Mongol invasion, but in later times they entered R. through the connection of Novgorod with the Hanse League, and from intercourse with Poland, though they never reached the rural population or the lower classes. The education even of the higher classes was limited to reading and writing, and the first school for classics and theology only made its appearance during Feodor's reign. Fine arts were limited to architecture and painting (of sacred subjects) after the Byzantine school. The first newspaper appeared (in Moscow), and the first theater was established during the reign of Alexis. The degraded condition of civilization and the Oriental influence of the Mongols left powerful traces on the domestic manners and habits of the Russians, among which was the despotic authority of the father over his household, and the low position of women in domestic life; those of the lower ranks being made mere slaves, while those of higher rank were completely excluded from social intercourse with the other sex, and were condemned to pass a dull and dreary existence in their 'terems.' Marriages were concluded by the parents without the consent of the bride and bridegroom.

The history of R. during Peter I.'s reign is merely a biography of that monarch, and under his name is given a brief sketch of the numerous and important improvements effected by him in the government and civilization of his subjects. It must, however, be noted, that in the carrying out of his well-meant schemes, he seldom consulted the national character of his people, or the natural conditions of the country; and consequently, when the irresistible pressure of his high intellect and indomitable will was withdrawn, it was found that, in great part, the civilization which he had forced upon his subjects was but skin-deep. In accordance with the terms of his will, his second wife, *Catharine I.* (q. v.) (1725—1727), succeeded him, though the old or anti-improvement part of the nobility supported the claims of the only son of the unfortunate Alexei (q. v.), *Peter II.* (q. v.) (1727—1730), who soon after obtained the imperial throne. The reigns of both of these sovereigns were occupied with court quarrels and intrigues, Menchikow (q. v.) during the former, and Dolgorouki during the latter, being the real rulers. On the death of Peter II., the privy council, setting aside the other descendants of Peter I., conferred the crown on *Anna* (q. v.), Duchess of Courland, the daughter of Ivan. Her reign (1730—1740) was marked by the predominance of the German party at court, who, unchecked by the weak sovereign, treated R. as a great emporium of plunder, and the Russians as barbarians (see BIRON.) Under their influence, R. restored to Persia her lost Caspian provinces, and was led into a war with Turkey, which was productive of nothing but an immense loss of men and money. Her successor was *Ivan* (1740—1741), the son of her niece, the Duchess of Brunswick, Anna Carlovna (q. v.); but he was speedily dethroned by *Elizabeth* (q. v.) (1741—1762), the daughter of Peter I., who deprived the German party of the influence it had so shamefully abused, restored the senate to the power with which it had been intrusted by Peter the Great, established a regular system of recruiting, abolished tolls, and increased the duties on imports.

During her reign, French influence was paramount, and the language of that nation supplanted German at court. R. gained by the treaty of Abo (1743) a portion of Finland, and took part in the *Seven Years' War* (q. v.). Elizabeth's nephew and successor, *Peter III.* (q. v.) (1762—1762), put a stop to all interference with the quarrels of Western Europe, and introduced some commendable ameliorations of the oppressive enactments of his predecessors; but he was speedily dethroned by his able and unscrupulous consort, who, as *Catharine II.* (q. v.) (1762—1796), ascended the throne, and proved herself the greatest sovereign of R. after Peter I. Her successful wars with Turkey, Persia, Sweden, and Poland, largely extended the limits of the empire; and while by her foreign policy protecting her subjects from external invasion, she as little forgot the necessity for internal reforms. The laws and administrative arrangements were revised, and the empire was divided into governments (an arrangement which, with very slight modification, still subsists), each government being under a separate administration, both as to matters of polity and justice. Her son and successor, *Paul I.* (q. v.) (1796—1801), at first, through apprehension of the revolution in France, joined the Austrians and British against France, but soon after capriciously withdrew, and was about to commence war with Britain, when his assassination took place. He gave freedom of worship to the 'Old Ritualists,' which till this time had been withheld; but he also established a severe censorship of the press, prohibited the introduction of foreign publications, and organized a secret police. His eldest son, *Alexander I.* (q. v.) (1801—1825), was at the outset desirous of peace, but was soon drawn into the vortex of the great struggle with France, in which he played a prominent, although at one period an inconsistent, part, and raised R. to the first rank among European States. The character of his rule and the internal improvements he effected are sketched under his name; and an outline of the warlike operations is given in the article NAPOLEON.

The Holy Alliance (q. v.) and the example of conservative policy set by Austria, exercised a pernicious influence on the latter part of his reign; and the higher classes, who had looked for the introduction of at least a portion of the liberal institutions they had seen and admired in Western Europe, became so dissatisfied, that when his youngest brother, *Nicholas I.* (q. v.) (1825—1855), from whom they had nothing to hope, succeeded, they broke out into open rebellion, which was speedily crushed. A full stop was now put to the rapid advance of R.'s prosperity; wars were declared with Persia and Turkey; and a long and deadly struggle commenced with the Caucasian mountaineers—all for the ill-concealed object of extending Russian domination; and the cession of Erivan and Nahituvan by Persia, of the plain of the Kuban, of the protectorate of the Danubian principalities, and of the free right of navigation of the Black Sea, the Dardanelles, and the Danube by Turkey, only whetted his appetite for more spoil. In 1830, he converted Poland (q. v.) into a Russian province; in 1849, he officiously aided Austria in quelling the insurrection of the Magyars; and in 1853, his almost irresistible craving for more territory led him (being, in all probability, under the impression that Turkey would stand alone, as she had always done hitherto) into the Crimean war, in which, though the allies, Britain, France, and Sardinia, did not obtain any decided success, R. suffered immense loss of military prestige on the Danube, at Silistria, the Alma, and before Sebastopol, and was almost drained of her vast resources of men and money. The accession of Nicholas's son, *Alexander II.* (1855)—one of whose first acts was the conclusion of the peace of Paris (1856), by which R. lost the right of navigation on the Danube, a strip of territory to the north of that river, and the unrestricted navigation of the Black Sea—has been the signal for the revival of those schemes of reform which had been crushed so despotically by the late czar. Alexander's first great reform was the abolition of serfdom, which created 14 millions of new free citizens. Corporal punishment, and the farming-system of the indirect taxes, were also abolished; and the judicial power was separated from the administrative, and founded on trial by jury.

The insurrection in Poland (q. v.), in 1863—1864, was suppressed with extreme severity; and in 1868 the last relics of Polish independence disappeared in the thorough incorporation of the kingdom with the Russian Empire. The subjugation of the Caucasus was completed in 1859. Successive expeditions, the last of which were those against Khiva and Khokan, have resulted in the establishment of Russian supremacy over all the states of Turkestan. In 1876, on the death of the Governor-general of the Baltic Provinces, their administration was merged in that of the central government. R in 1870 intimated that she no longer felt bound by certain conditions of the Treaty of 1856, and in a conference at London in 1871 her claims were admitted. The misgovernment of her Christian subjects by Turkey, and her cruel suppression of incipient rebellion in Bulgaria in 1876, led to a conference of the European Powers at Constantinople. Turkey rejected the proposals made by the conference with a view to the better administration of the subject provinces; and R., to enforce these concessions on Turkey, declared war in April 1877. At first the Russian progress was rapid; but the energy displayed by the Turks during the summer compelled the invaders largely to augment their forces both in Bulgaria and in Armenia. The chief events in the war were the desperate but unsuccessful attempts to expel the Russians from the Shipka Pass in the Balkans, the fall of Kars in November, the resolute defence of Plevna by Osman Pasha from July till December, and the capture of the Turkish army of the Shipka in January. The armistice signed in Jan. 1878 was followed in March by the treaty of San Stefano; and after diplomatic difficulties that seemed for a time not unlikely to issue in war between R. and England, a Congress of the Great Powers met at Berlin in June 1878, sanctioned the re-arrangement of the Ottoman empire explained under the article TURKEY, and the cession to Russia of the part of Bessarabia given to Moldavia in 1856, as also of the port of Batum, of Kars, and of Ardahan. The growth of Nihilism (q. v.) and revolutionary discontent, leading to severe repressive measures, has been marked by many murderous outrages, culminating in the assassination of Alexander II., in 1881.

RUSSIAN CHURCH, the community of Christians subject to the emperor of Russia, using the Slavonic liturgy, and following the Russian rite. Christianity was introduced into Russia in the 9th c. (see OLGA); but it was not till the end of the 10th that the foundation was regularly laid. In the great schism between the churches of Constantinople and Rome, the R. C. naturally followed silently in the train of Constantinople, yet, at the time of the Council of Florence (1439), the adherents of the Roman Church throughout Russia were as numerous as those of the Greek party. The complete separation of the R. C. from Rome was effected in the latter part of the same century.

For more than a century from this date, the R. C. continued directly subject to the patriarch of Constantinople; but in the year 1588, the patriarch Jeremias being in Russia, held a synod of the Russian bishops, and erected the see of Moscow into a patriarchate, with jurisdiction over the entire territory; this decree being afterwards confirmed by a synod held at Constantinople. This dignity, however, was subordinate to the patriarch of Constantinople, and the subordination was acquiesced in down to the reign of Alexis Michaelowitz, father of Peter the Great, when the patriarch of Moscow, Nikon, refused to acknowledge it further. The pretensions of this prelate, and of his successors, however, gave offence to the czar, and one of the first among the great schemes for the reorganization of his empire, conceived by Peter the Great, was the direct subordination of the church to the headship of the emperor. On the death of the patriarch Adrian, in 1700, he did not fill up the vacant dignity, but appointed in the meantime as acting director of ecclesiastical affairs a bishop, with the title of Exarch. After an interval of 20 years, the public mind having been taught to forget the patriarchate, that office was formally abolished in 1721; and the permanent

administration of church affairs was placed under the direction of a council, called the 'Holy Synod,' or 'Permanent Synod,' consisting of archbishop, bishops, and archimandrites, all named by the emperor.

Under the direction of this council, a series of official acts and formularies, and catechetical, doctrinal, and disciplinary treatises was drawn up, by which the whole scheme of the doctrine, discipline, and church government of the R. C. was settled in detail, and to which all members of the clergy, and all officials and dignitaries, are required to subscribe. The leading principle of the new constitution thus imposed in the R. C., is the absolute supremacy of the czar; and in order to mark still more signally the principle that the crown is the source of all church dignity and of all ecclesiastical jurisdiction, the arrangement of provinces, archbishopries, and bishoprics underwent a complete revision; the old metropolitan sees, as they became vacant, were filled up with simple bishops, and not with archbishops as before; and a new arrangement of archbishopries was established, partly by the act of the czar himself, partly by the interposition of the permanent synod.

The constitution of the R. C. established by Peter, has been maintained in substance to the present time. The Holy Synod is regarded as one of the great departments of the government, the Minister of Public Worship being *ex officio* a member. One of the most cherished objects of the traditional imperial policy of Russia, has been to effect a uniformity of religious profession throughout the empire. Dissent, in all its forms, has not only been discouraged, but in many cases rigorously and even cruelly repressed; and as the Roman Catholic dissentients from the R. C. form the most numerous, and the most formidable class, they have generally, but more particularly under the Czar Nicholas, been the object of especial severity.

As regards doctrine, the R. C. may be regarded as identical with the common body of the GREEK CHURCH (q. v.). With that church the R. C. rejects the supremacy of the pope, and the double procession of the Holy Ghost. All the great leading characteristics of its discipline, too, are the same; the differences of ceremonial which exist, although in many cases considered by the Russians themselves of vital importance, being too minute to permit our entering into the detail. There is one point on which some explanation may be required. The liturgy of the R. C. is the same as that of the church of Constantinople; but it is celebrated not in the Greek, but in the Slavonic language. The service books, however, are not in the modern Russian, but in the ancient language, such as when they were originally translated, with the exception of the modification which they underwent at the time of the patriarch Nikon (see RASKOLNIK, PHILIPPINS), and the further revision under Czar Peter. The discipline, as to the marriage of the clergy, is the same as that described for the Greek Church; and in carrying out the law which enforces celibacy upon bishops, the Russians adopt the same expedient with the Greeks, viz., of selecting the bishops from among the monks, who are celibates in virtue of their vow.

Besides the established R. C., there exists also in Russia a not inconsiderable body of dissenters of various kinds. One class of these has been already described under the head Raskolniks. But by far the most numerous dissenters are the Roman Catholics, who are found chiefly in Poland and White Russia. At the partition of Poland, a special provision was made for the Roman Catholic people of Poland, under the new government, by the erection of an archbishopric in communion with Rome, at Mohilew, in 1783; and the organization was still more formally completed by the czar, Paul, who established, in 1798, five bishoprics under that metropolitan see; and the arrangements of the Congress of Vienna having somewhat deranged these ecclesiastical dispositions, a new arragement was entered into by Pius VII. in 1818. But it cannot be doubted that the whole policy of the Russian government, in reference to the church, makes it almost impossible that they should permit free exercise of worship and of thought to the Catholics in communion with Rome.

The direct legislation, and still more the practical administration of Russia in Poland, in reference to marriage, to church property, to conventual establishments, and to ecclesiastical regulations generally, has been a policy of repression and of compulsory proselytism. This policy has been more sedulously pursued since the recent reorganization of Poland. In 1867, the archbishopric of Warsaw was abolished, and all the Roman Catholics of the empire were made subject to the archbishop of Mohilev.

According to the St. Petersburg Calendar for 1876, the orthodox adherents of the R. C. were upwards of 60,000,000; while the Raskolniks numbered over 1,170,000. The Roman Catholics, including nearly 4,600,000 in Poland, amounted to about 7,500,000. The government's contribution for the maintenance of religion was upwards of £1,350,000.

RUSSIAN LANGUAGE AND LITERATURE. Russian, a principal member of the Slavic family of languages, first became a written language in the time of Peter the Great, till which period the Old Slavic—the language of the Church—had been the only medium of literary expression, and had, in consequence, exercised an important influence on the Russian popular speech, as on that of other Slavic dialects. The Mongol conquest, and the preponderance of Polish elements in the western parts of the empire, have also introduced into the Russian language a great number of Mongolian and Polish expressions; in addition to which, the efforts of Peter the Great to give his subjects the benefits of western culture, have enlarged the Russian vocabulary, especially in arts and industry, with numerous German, French, and Dutch words. The chief characteristics of Russian as a language, are simplicity and naturalness. The grammatical connection of sentences is slight, and the number of conjunctions scanty. Perspicuity and expressiveness are obtained by the freedom allowed in the placing of words. Auxiliary verbs and articles there are none; while personal pronouns may or may not be used along with verbs. The vocabulary of Russian is very rich—foreign words being, so to speak, Russianized.

The capability of the language for forming compounds and derivatives is so great that from a single root not less than 2000 words are sometimes derived. The purest and most grammatical Russian is spoken in the center, about Moscow. The oldest Russian Grammar is that of Ludolf (Oxf. 1696); others are the Grammars of the St. Petersburg Academy (1802), of Gretsch (Petersb. 1823; new ed. 1834), and of Vostokov (10th ed. Petersb. 1859). A *Russian Grammar for Englishmen* was published at St. Petersburg in 1822, and another (by Heard) in 1827. The best Dictionaries are those of the Russian Academy (4 vols. Petersb. 1847), of Heym (1803—1805), of Schmidt (Lps. 1815), Oldekop (4 vols. 1825), Sokolov (Petersb. 1834), Reiff (1862), and Paulovski (1859). There is an English-Russian grammar and dictionary by Constantinoff (3 vols.).

The beginnings of Russian literature are contemporaneous with the introduction of Christianity by the missionaries Cyril (q. v.) and Method, who employed the Old Slavic church-tongue for literary purposes. To this earliest period belongs—besides the *Prawda Ruskaja*, a book on law—the noted history or chronicle of Nestorius. After the subjugation of Russia by the Tartars, knowledge withdrew into the shelter of the monasteries, whence proceeded several important historical works. During this period of foreign domination, the Russian people seem to have sought consolation and hope in writing patriotic ballads and songs about their great hero-king, Vladimir—the Russian Charlemagne—the most celebrated of which is *Igor's Expedition against the Polowzi* (Berl. 1855). When at length the country was freed from the oppression of the Mongols by Ivan I., in 1478, Russian literature received a fresh impulse, but so tardy, nevertheless, were its motions, so circumscribed its achievements that up to the commencement of the 18th c., the only notable names that can be mentioned are the metropolitan Makarius (died 1564), who wrote *Lives of the Saints*, &c.; Zizania, the author of a Slavic Grammar (Wilna, 1596; and Matviejev (17th c.), who composed several historical and heraldic works.

The czar, Alexei Michailovitch (whose prime-minister Matviejev was), caused a valuable collection of Russian laws to be printed in 1644, and shortly after founded an academy at Moscow, in which grammar, rhetoric, poetry, dialectics, philosophy, and theology were taught. But from political causes, the Polish element now began to predominate in Russian literature, and continued to do so, more or less, until the time of Peter the Great, who made his native language the universal vehicle of communication in business and writing. He established schools and founded the famous St. Petersburg Academy. During his reign, the metropolitans Demetrius (b. 1651—d. 1709) and Javorskij (b. 1658—d. 1722); the archbishop Prokopovitch (1681—1736); Sellij (d. 1746); the national historian Tatishshev (1686—1750); the poets Kantemir; and the Cossacks, Klimovskij and Danilov; were the most distinguished supports of literature. The first to place on a firm basis the Russian metrical system, was Trediakovskij (1703—1769). In the period that followed the death of Peter, the writer that exercised the strongest influence on Russian literature was Lomonossov, who first drew the lines of distinction sharply between old Slavic and Russian, and established the literary supremacy of the dialect of Great Russia. Among his successors, the poet Sumarokov (1718—1777) did great service in the development of the Russian drama; so did Kniashnin (1742—1791), whose pieces still keep their place on the Russian stage; while Wizin (1745—1792) ranks as one of the first prose writers of his age.—Some of his prose comedies are full of the most genuine humor. Other notable names in poetry, belonging in whole or part to this period, are Cheraskov, Oserov, Prince Michailovitch, Dolgoruki, Chvostov, Petrov, Bogdanovicz, and Derzawin (q. v.), the first universally popular Russian poet. Prose literature, however, developed itself more slowly. Lomonossov was for a long time the model that was followed. Among the first to make a fresh reputation, were Platon, the metropolitan of Moscow, and

Lewanda (1736—1814), archpriest of Kiev; who distinguished themselves from the mass of their bombastic brethren by the strength and vigor of their thinking; the historians Schtscherbatov (1733—1790), Boltin (1735—1792), and Muraviev (1757—1807).

Still more important, in the same department, were the labors of the German, Gerh. Friedr. Müller, a native of Westphalia, who, in 1755, established at St. Petersburgh the first literary journal. Novikov (1744—1818) gave a powerful stimulus to the book-trade and to literary productivity, partly by his professional zeal, and partly by the publication of a satirical journal, entitled *The Painter*, which was widely read.

A new epoch in Russian literature commenced with Alexander I., who was enthusiastic in the cause of education and progress. The number of universities was raised to seven; learned societies were also increased. The great ornament of literature at this period was Karamsin (q. v.), who freed it from the trammels of the pseudo-classicism, within which it had been confined by Lomonossov. His labors were continued by Dmïtriev and Batjushkov, while Shishkov combated with success the tendency to deprive the language of its Slavic character; and in the poetry of Shakovski, the national elements again re-asserted themselves. Along with these may be mentioned the historian Bolchovitihov (1767—1837) and the theologian Drosdov, archbishop of Moscow; the poets Koslov, Prince Alexander, Shachovski (d. 1846), one of the best comic authors of Russia, and possessed of amazing fertility; Gribojedov, Glinka, Prince Vjasemski (b. 1792), a celebrated song-writer, elegist, and critic; Davidov, and Gnieditsh. Mersijakov, who died a professor in Moscow, was a very able critic; while Chemnicer (1744—1784) and Krylov (1768—1844) rank first among the original fabulists of Russia. Bulgarin and Gretsh belong rather to the most recent period of Russian literature—a period characterized by the predominance of Russian influences, and the complete absorption into the one national spirit of all minor and foreign elements. The late czar Nicholas labored with his wonted passionate energy in this direction.

Among the poets of this thoroughly Russian period, the most conspicuous and brilliant is Pushkin (q. v.), whose verses are a mirror of Russian life, in which we see shadowed forth the joys and griefs, the humor and the patriotism of the true Russian peasant. The most remarkable of Pushkin's contemporaries and successors are the poets Baratynski (d. 1844), Baron Delvig, Benediktov, Podolinski, and Lermontov; the dramatists Nikolaus Polevoi and Nestor Kukolnik, who drew the matter of their dramas from the national history; and Gogol (q. v.), one of the most illustrious names in Russian literature. Russian novels exhibit a condition of society in which barbarism struggles for supremacy with a superficial civilization. The best writers in this department are Bestushev, Bulgarin, Sagoskin, Vasili Ushakov, author of *Kirgis-Kaisak*, &c.; Count Solohub, whose novels give a graphic picture of St. Petersburg society; Prince Odojevski, Baron Theodor, Korff, Konst. Masalski, and Senkovski, reckoned one of the first journalists in Russia; Dostoievsky, and Pisemski, both of whom died in 1881; Turgenief, known by numerous French and English translations; nor must the name of Alexander Herzen (q. v.), the 'liberal Russian' exile, be omitted. The delineations of Cossack life are too numerous for special notice, but they constitute quite a distinct section of the literature of Russian fiction, and are composed for the most part in the dialect of Little Russia. Great attention has also been paid in Russia, as in all Slavic countries, to popular songs and proverbs. The principal collections of these are by Novikov, Kashin, Maximovitch, Makarov, and Sacharov. The latest developments of Russian literature have been chiefly in the department of history, and among the most distinguished names are those of Professor Ustrialov of St. Petersburg, Professor Pogodin of Moscow, Polevoi, Vasili Berg (d. 1834), Lieutenant-general Michailovski Danilevski, Professor Sujegirev, Sreznevski, Slovzov, Samailov, Solovjev, Strovjev, Neverov, and Arszenjev. Such philosophy as exists in Russia is an echo of the modern German and English schools, and therefore possesses no particular originality.

Advances in theology are hardly to be looked for as yet from a church so deeply sunk in ignorance and intellectual stupor as the Russian, yet nowhere is reform more urgently required. As writers on jurisprudence, Nevolin, Moroshkin, Spassowitsch deserve mention; amongst mathematicians, Simonov, Perevoschtschikov, Wesselovski; amongst physicists, Turtschaninov, Metschnikov, Sokolov, Kutorga, Kokscharov and as linguists, Vostokov, Biliarski, Buslajev. See Borg. *Poetic Works of the Russians* (Ger., 2 vols.; Riga, 1823); Gretsch, *Extracts from the Poets and Prose-writers of Russia* (St. Petersb. 1821); Gretsch's *History of Russian Literature* (Petersb. 1822); Jevgenij, *History of Russian Literature* (Petersb. 1818—1827—1838); König, *Literary Pictures from Russia* (Stuttg. 1837); Otto, *Textbook of Russian Literature* (Lps. 1837; translated into English by Cox, Oxford, 1839); Jordan, *History of Russian Literature* (Lps. 1846); Talvi (Mrs. Robinson), *View of Literature of the Slavic Nations* (1850); Courrière, *Histoire de la Littérature Contemporaine en Russie* (Paris, 1875).

RU'SSIAS, ALL THE, the official designation of the Russian empire in Europe, was assumed in 1654, when the Czar Alexei Mikailowitch styled himself for the first time 'Tzar of All the Russias,' after his conquest of Little Russia and acquisition of Smolensk from Poland. This phrase at first included only Great Russia, White Russia, and Little Russia. *Great Russia*, formerly called Muscovy, which is by far the largest of these three divisions, includes the territory now comprehended in the 19 governments of Archangel, Olonetz, Vologda, Novgorod, Tver, Jaroslav, Kostroma, Pskov, Smolensk (partly), Moscow, Vladimir, Nijni, Novgorod, Kalouga, Toula, Riazan, Tambov, Orel, Koursk, and Voronetz.—*White Russia* included the provinces of Vitebsk, Mohilev, and the rest of Smolensk, and though long held by the Poles, was re-united to Russia at the first and second partitions of Poland (1772 and 1793). In 1793, it also received the accession of the Polish provinces which now form the governments of Vilna, Minsk, Kovno, Volhynia, Podolsk; and White Russia with these accessions was then denominated *West Russia*.—*Little Russia* contains the ancient Russian possessions in the south-west, which, in the middle ages, became independent under the Cossacks of the Ukraine, and were finally reunited to Russia in 1654; and is divided into the four provinces of Kiev, Tchernigov, Poltava, and Kharkov. During the 18th c., the countries wrested from the Turks, lying between Great Russia and the Black Sea, were formed into a fourth great division, under the name of *Southern Russia*. This last includes the districts occupied by the Don Cossacks, sometimes called *New Russia*.—*Red Russia* was a portion of the Russian principality of Galich (Galicia), and with the rest of it, was subdued by Casimir III. of Poland; it included what is now the province of Lublin, in the kingdom of Poland, and the eastern portion of Austrian Galicia, and is inhabited by Poles, and another and antagonistic people, called Russniaks (q. v.).

RU'SSNIAKS, also RUSSINE and RUTHENI, the name of a variety of peoples who form a branch of the great Slavic race, and are sharply distinguished from the Muscovites, or Russians proper, by their language and the entire character of their life. They are divided into the R. of Galicia, North Hungary, Podolia, Volhynia, and Lithuania, and are estimated by Schafarik at 13,000,000. They are almost all agriculturists, and, on the whole, rather uncultivated. Before the 17th c., they were a free race, but were then subjugated, partly by the Lithuanians, partly by the Poles, and for a long time belonged to the Polish kingdom. Their language has consequently become closely assimilated to the Polish. It earlier times it was a written speech, with quite distinctive characteristics, as may be seen from the translation of the Bible, published at Ostrog, in 1581, and other literary monuments. The R. belong, for the most part, to the United Greek Church, but in part also to the Non-united. They preserve many old customs peculiar to themselves, and much folklore, prose and poetic, very like that current in Poland and Servia. Of late the name *Ruthenians* has been chiefly reserved for the Slavonian inhabitants of Austria, on both sides of the Carpathians; and distinguishes them from their kinsman, the Little Russians of Russia. Dislike to Poland has led them to incline to the Russian language. In 1880, there were nearly 3,000,000 R. in Austria.

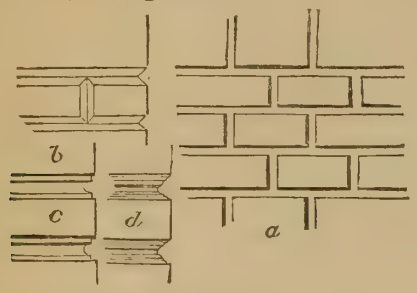
RU'SSO-GE'RMAN WAR, the name given by German historians to the last stage of the great European war against Napoleon, beginning with the Russian campaign of 1812, and terminating on the field of Waterloo. See NAPOLEON.

RUST, the name given to a disease of plants, which shows itself on the stems and leaves of many plants, and on the ears of grasses, both of the cereal grasses, and of many pasture or forage grasses; in brown, yellow, or orange-colored spots; and after destroying the epidermis of the plant, assumes the form of a powder, which soils the fingers when touched. R. seems to consist at first of small fungi of one cell, sometimes divided by a transverse wall, belonging to the genera *Uredo* and *Puccinia;* which, finally, breaking through the diseased epidermis, form a colored dust consisting of mere spores. The name R. is sometimes restricted to the *Uredo rubigo vera*, but it is doubted by some if this is not really a young state of a *Puccinia*. Not a few authors regard R. as an eruptive disease (*exanthema*), which makes its appearance chiefly in damp weather, and sometimes extends so far as seriously to injure the plants affected by it, the mycelium and spores which appear in it being regarded as present accidentally, or in consequence of the disease. This, however, is the least probable opinion concerning it.—R. is sometimes very injurious to crops. No remedy is known for it; but it is certain that rank manures tend to produce or aggravate it. See UREDO.

RUSTCHUK, an important town of the principality of Bulgaria, and 70 miles west-south-west of Silistria, on the south bank of the Danube, opposite Giurgevo. Its position on a range of

hills, with its white chimneys, its mosques and minarets rising from amid forests of fruit-trees, give it a striking and picturesque appearance. The Danube is here about 2 miles wide, but its channel is marked with islets and shallows. R. has manufactures of meerschaum pipes, pottery, saddlery, leather, cloth, tobacco and silk, and is connected by rail with Varna. It was determined by the Berlin Congress in 1878 that the fortifications of R., extensive but not very important, should, like those of the other Bulgarian fortresses, be destroyed. Pop., of which nearly half are Mohammedans, 30,000.

RU'STIC OR RU'STICATED WORK and RUSTICA'TION. The name of that kind of masonry in which the various stones or courses are marked at the joints by splays or recesses. The surface of the stone is sometimes left rough, and sometimes polished or otherwise dressed. Rustication is chiefly used in classical or Italian architecture, although Rustic Quoins (q. v.) are often used



Rustication.

in rough Gothic work. In the figure, *a* and *b* show forms of rustication usually applied to surfaces; *c* and *d* show rustic quoins with mouldings on the angles.

RUSTRE, in Heraldry, one of the subordinaries, consisting of a Lozenge (q. v.) with a circular opening pierced in its center, Ancient armor was sometimes composed of rustres sewed on cloth.

RUTA BAGA. See TURNIP.

RUTA'CEÆ, a natural order of exogenous plants, consisting mostly of trees and shrubs, but containing a few herbaceous plants. The leaves have no stipules, are simple and entire, lobed, pinnate, or decompound, and are covered with pellucid resinous dots. The flowers are hermaphrodite, sometimes irregular. The calyx has four or five segments; the petals are equal in number to its segments, or wanting, or are united into a monopetalous corolla; the stamens are equal in number to them, or fewer by abortion, or twice or thrice as many. There is a cup-shaped disk. The ovary is sometimes stalked; it has as many carpels as there are petals, or fewer; there are generally two ovules in each carpel. The fruit consists of several capsules, cohering firmly or imperfectly.—There are about 400 known species, natives of the warmer temperate and of tropical regions. The *Diosmaceæ* are sometimes separated as a distinct order. A bitter taste and powerful odor are general characteristics. Rue, Bucku, and Dittany are examples of the order. See also ANGOSTURA BARK and BRUCEA. The barks of a number of tropical species of different genera, possess febrifugal properties.

RUTH, BOOK OF, one of the Hagiographa, placed in the Authorized Version, as in the LXX., between Judges and Samuel; and in the Jewish canon, as the second of the five Megilloth, coming after the Song of Songs. It consists of four chapters, and describes how Ruth, the Moabite widow of a Hebrew, Machlon by name, in the time of the Judges, became—by faithful, loving adherence to her mother-in-law, Naomi, for whose sake she had left her home and kindred—the wife of Boaz, and through him the ancestress of David himself. A fragmentary genealogy of David's house—of which the principal links only are given—forms the conclusion of the book, which is characterized throughout by the most naïve simplicity, and minute truthfulness of detail. If there be a tendency in the book—which is doubtful—it would naturally be to show how utterly even that strictest of prejudices, in the mind of ancient peoples, especially the Hebrews, against intermarriage with the 'stranger,' is vanquished by genuine human love and piety; nay, that the heroine of the tale, even a Moabite, was deemed worthy for her virtue to become the foundress of the royal house of Israel. Considering that the Book of Kings contains no details about David's genealogy, this book, apart from its indescribable natural charm, becomes a most useful historical record, and further supplies many items on the forms and domestic customs of a time about which we have such very scant information elsewhere.

The time of the events related mounts back to about a century before David, yet both the contents and tendency of the book show clearly enough that it was hardly written before the last years of David's reign, if it was at all written in his lifetime. For a change had already taken place in the interval in the manners and customs of the people (cf. the 'in former time,' iv. 7), and the genealogy carried down to David, shows the theocratic significance he had acquired by the time it was written.

RUTHENIANS. See RUSSNIAKS.

RUTHE'NIUM (symb. Ru, equiv. 52—new system, 104—spec. grav. 11·3) is a metal discovered in 1843 by Claus in the ore of platinum. In most respects, excepting in its specific gravity, it closely resembles iridium, the colored reaction of the salts being almost without exception the same in both. For details regarding this metal, which is of no practical importance, the reader may consult Deville and Debray's 'Memoir on Platinum and its Ores,' or works on the chemistry of the metals.

RU'THERGLEN, or, by popular abbreviation, RUGLEN, a royal, parliamentary, and municipal burgh, in Lanarkshire, on the Clyde, three miles south-east of Glasgow. It consists of one long wide street and of several narrow streets or lanes branching from it at right angles. In ancient times it was a place of considerable importance, carried on a large traffic on the river, and embraced Glasgow within its municipal boundaries. Its trade is now mainly dependent upon that of Glasgow, and its inhabitants are employed in weaving muslins for Glasgow manufacturers, and in the mills, print, chemical, and dye-works, and collieries of the burgh and vicinity. Pop. (1881) 11,265. In parliamentary representation, it is one of the Kilmarnock district of burghs.

RU'THIN, a municipal and parliamentary borough of North Wales, in the county of Denbigh, eight miles south-east of the town of that name, stands on the summit and slope of a hill on the right bank of the Clwyd. The site of the ancient castle, said to have been built in the reign of Edward I., is occupied by a fine modern castellated edifice in Gothic. Pop. (1881) 3034.

RU'THVEN, RAID OF, a conspiracy of note in Scottish history, contrived and executed in 1582 by William, first Earl of Gowrie, father of the principal actor in the Gowrie Conspiracy (q. v.), in conjunction with Lord Lindsay of the Byres, the Earl of Mar, and the Master of Glammis. The object of the conspirators was to obtain the control of the state by seizing the person of James VI., then a boy of 16, and under the guardianship of the Duke of Lennox and Earl of Arran. The king being by invitation at Gowrie's seat of Ruthven Castle, the conspirators assembled 1000 of their vassals, surrounded the castle, and obtained complete possession of James. Arran was thrown into prison, and Lennox retired to France, where he died broken-hearted. The Presbyterian clergy warmly espoused the cause of the Ruthven lords, who received the thanks of the General Assembly, and full indemnity from a Convention of Estates. Nearly a year elapsed before the king regained his freedom. His feigned acquiescence in his position led the confederates so to relax their vigilance that he was enabled to throw himself into the castle of St. Andrews, whose keeper was in his confidence, and thus to become his own master. Gowrie and the other lords made their submission, and were pardoned; but soon afterwards a royal proclamation characterized their enterprise as treason. Gowrie was commanded to leave Scotland; but while waiting for a vessel at Dundee, he was drawn into a conspiracy to surprise the castle of Stirling, for which he was tried and executed.

RU'TILE, a mineral, which is essentially *Oxide of Titanium* or *Titanic Acid*, although generally containing a little peroxide of iron. It is of a brown, red, or yellow color; and is found massive, disseminated, in thin laminæ, and in four-sided or six-sided prisms, which permeate rock-crystal. It is found also in granite, syenite, &c. It is used to give a yellow color to porcelain.

RU'TLAND, a town of Vermont, U. S., 50 miles S.S.W. of Montpelier. The chief industry of the neighborhood is the production of marble, which employs about 1500 men. Pop. (1870) 9834; (1880) 12,149.

RU'TLANDSHIRE is the smallest county in England; area, 94,889 acres; pop. (1881) 21,434. The Wash divides it into two portions, of which the northern is a somewhat elevated table-land, while the southern consists of a number of valleys running east and west, and separated by low hills. The principal streams are the Welland, forming the boundary on the south-east, and its affluents the Wash and Chater. R. has no manufactures, and its chief mineral production is fine building stone. The climate is mild and healthy, the soil loamy and rich, and there is hardly an acre of waste land in the county. It is not, however, a crop-producing, but a grazing country; and oxen and sheep are reared in great numbers. R., which abounds in pleasing scenery, contains many stately mansions, as well as a number of ecclesiastical remains dating from the Norman period. It returns two members to the House of Commons.

RUVIGADO, a town of the United States of Colombia, in the department of Cundinamarca. Pop. 10,000.

AE
5
C443
1888
v.6

Chambers's encyclopaedia

PLEASE DO NOT REMOVE
CARDS OR SLIPS FROM THIS POCKET

UNIVERSITY OF TORONTO LIBRARY

UTL AT DOWNSVIEW
D RANGE BAY SHLF POS ITEM C
39 11 09 16 10 008 6